**SBML Model Report**

# Model name: "Smith2013 - Regulation of Insulin Signalling by Oxidative Stress"

May 5, 2016

## 1  General Overview

This is a document in SBML Level 2 Version 4 format. This model was created by the following two authors: Vijayalakshmi Chelliah[1] and Graham Smith[2] at September sixth 2013 at 4:13 p. m. and last time modified at October tenth 2014 at 10:26 a. m. Table 1 provides an overview of the quantities of all components of this model.

Table 1: Number of components in this model, which are described in the following sections.

| Element | Quantity | Element | Quantity |
|---|---|---|---|
| compartment types | 0 | compartments | 5 |
| species types | 0 | species | 133 |
| events | 0 | constraints | 0 |
| reactions | 367 | function definitions | 366 |
| global parameters | 81 | unit definitions | 3 |
| rules | 29 | initial assignments | 0 |

## Model Notes

Smith2013 - Regulation of Insulin Signalling by Oxidative Stress

The model describes insulin signalling (in rodent adipocytes), which includes in addition to the core pathway, the transcriptional feedback through the Forkhead box type O (FOXO) transcription factor and interaction with oxidative stress.

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[1] EMBL-EBI, `viji@ebi.ac.uk`

[2] Newcastle University, `graham.smith3@ncl.ac.uk`

This model is described in the article:<span style="color:blue">Computational modelling of the regulation of Insulin signalling by oxidative stress.</span>Smith GR, Shanley DP.BMC Syst Biol. 2013 May 24;7:41.

Abstract:

**BACKGROUND:** Existing models of insulin signalling focus on short term dynamics, rather than the longer term dynamics necessary to understand many physiologically relevant behaviours. We have developed a model of insulin signalling in rodent adipocytes that includes both transcriptional feedback through the Forkhead box type O (FOXO) transcription factor, and interaction with oxidative stress, in addition to the core pathway. In the model Reactive Oxygen Species are both generated endogenously and can be applied externally. They regulate signalling though inhibition of phosphatases and induction of the activity of Stress Activated Protein Kinases, which themselves modulate feedbacks to insulin signalling and FOXO.

**RESULTS:** Insulin and oxidative stress combined produce a lower degree of activation of insulin signalling than insulin alone. Fasting (nutrient withdrawal) and weak oxidative stress upregulate antioxidant defences while stronger oxidative stress leads to a short term activation of insulin signalling but if prolonged can have other effects including degradation of the insulin receptor substrate (IRS1) and FOXO. At high insulin the protective effect of moderate oxidative stress may disappear.

**CONCLUSION:** Our model is consistent with a wide range of experimental data, some of which is difficult to explain. Oxidative stress can have effects that are both up- and down-regulatory on insulin signalling. Our model therefore shows the complexity of the interaction between the two pathways and highlights the need for such integrated computational models to give insight into the dysregulation of insulin signalling along with more data at the individual level.A complete SBML model file can be downloaded from BIOMODELS (https://www.ebi.ac.uk/biomodels-main) with unique identifier MODEL1212210000.Other files and scripts are available as additional files with this journal article and can be downloaded from https://github.com/graham1034/Smith2012_insulin_si

This model is hosted on <span style="color:blue">BioModels Database</span> and identifiedby: <span style="color:blue">BIOMD0000000474</span> .

To cite BioModels Database, please use: <span style="color:blue">BioModels Database: An enhanced, curated and annotated resourcefor published quantitative kinetic models</span> .

# 2 Unit Definitions

This is an overview of five unit definitions of which two are predefined by SBML and not mentioned in the model.

## 2.1 Unit `volume`

**Definition** 1

*Produced by* SBML2LATEX

## 2.2 Unit `substance`

**Definition** item

## 2.3 Unit `time`

**Definition** 60 s

## 2.4 Unit `area`

**Notes** Square metre is the predefined SBML unit for `area` since SBML Level 2 Version 1.

**Definition** $m^2$

## 2.5 Unit `length`

**Notes** Metre is the predefined SBML unit for `length` since SBML Level 2 Version 1.

**Definition** m

# 3 Compartments

This model contains five compartments.

Table 2: Properties of all compartments.

| Id | Name | SBO | Spatial Dimensions | Size | Unit | Constant | Outside |
|---|---|---|---|---|---|---|---|
| extracellular | extracellular | 0000290 | 3 | $8.3 \cdot 10^{-12}$ | 1 | ✓ | |
| cellsurface | cellsurface | 0000290 | 3 | $6.4 \cdot 10^{-14}$ | 1 | ✓ | extracellular |
| cytoplasm | cytoplasm | 0000290 | 3 | $1.65 \cdot 10^{-11}$ | 1 | ✓ | cellsurface |
| nucleus | nucleus | 0000290 | 3 | $5 \cdot 10^{-13}$ | 1 | ✓ | cytoplasm |
| dnabound | dnabound | 0000290 | 3 | $10^{-13}$ | 1 | ✓ | nucleus |

## 3.1 Compartment `extracellular`

This is a three dimensional compartment with a constant size of $8.3 \cdot 10^{-12}$ litre.

**Name** extracellular

**SBO:0000290** physical compartment

## 3.2 Compartment `cellsurface`

This is a three dimensional compartment with a constant size of $6.4 \cdot 10^{-14}$ litre, which is surrounded by `extracellular` (extracellular).

**Name** cellsurface

**SBO:0000290** physical compartment

### 3.3 Compartment `cytoplasm`

This is a three dimensional compartment with a constant size of $1.65 \cdot 10^{-11}$ litre, which is surrounded by `cellsurface` (cellsurface).

**Name** cytoplasm

**SBO:0000290** physical compartment

### 3.4 Compartment `nucleus`

This is a three dimensional compartment with a constant size of $5 \cdot 10^{-13}$ litre, which is surrounded by `cytoplasm` (cytoplasm).

**Name** nucleus

**SBO:0000290** physical compartment

### 3.5 Compartment `dnabound`

This is a three dimensional compartment with a constant size of $10^{-13}$ litre, which is surrounded by `nucleus` (nucleus).

**Name** dnabound

**SBO:0000290** physical compartment

*Produced by* SBML2LATEX

# 4 Species

This model contains 133 species. The boundary condition of 29 of these species is set to `true` so that these species' amount cannot be changed by any reaction. Section 9 provides further details and the derived rates of change of each species.

Table 3: Properties of each species.

| Id | Name | Compartment | Derived Unit | Constant | Boundary Condition |
|---|---|---|---|---|---|
| NULL | NULL | cytoplasm | $item \cdot l^{-1}$ | ☑ | ☑ |
| Ins | Ins | extracellular | $item \cdot l^{-1}$ | ☑ | ☑ |
| InR | InR | cellsurface | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| Ins_InR | Ins_InR | cellsurface | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| Ins_InR_P | Ins_InR_P | cellsurface | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| Ins_2_InR_P | Ins_2_InR_P | cellsurface | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| cytoplasm_InR | cytoplasm_InR | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Ins_2-_InR_P | cytoplasm_Ins_2_InR_P | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Ins-_InR_P | cytoplasm_Ins_InR_P | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| InR_tot | InR_tot | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ☑ |
| InR_bound | InR_bound | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ☑ |
| InR_active | InR_active | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ☑ |
| PTP1B | PTP1B | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| IRS1_TyrP_PI3K | IRS1_TyrP_PI3K | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| PI345P3 | PI345P3 | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| PIP2 | PIP2 | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| PI345P3_mol | PI345P3_mol | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ☑ |
| PIP2_mol | PIP2_mol | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ☑ |
| Akt | Akt | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ⊟ |

| Id | Name | Compartment | Derived Unit | Constant | Boundary Condition |
|---|---|---|---|---|---|
| Akt_P2 | Akt_P2 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| PKC | PKC | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| PKC_P | PKC_P | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| AS160 | AS160 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| AS160_P | AS160_P | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| cytoplasm_GLUT4 | cytoplasm_GLUT4 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| cellsurface_GLUT4 | cellsurface_GLUT4 | cellsurface | item·l$^{-1}$ | ⊟ | ⊟ |
| PTEN | PTEN | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| PP2A | PP2A | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| extracellular_ROS | extracellular_ROS | extracellular | item·l$^{-1}$ | ☑ | ☑ |
| PTP1B_ox | PTP1B_ox | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| PTP1B_plus_PTP1B-_ox | PTP1B_plus_PTP1B_ox | cytoplasm | item·l$^{-1}$ | ⊟ | ☑ |
| PTEN_ox | PTEN_ox | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| PTEN_plus_PTEN_ox | PTEN_plus_PTEN_ox | cytoplasm | item·l$^{-1}$ | ⊟ | ☑ |
| ROS | ROS | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| GSH | GSH | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| GSSG | GSSG | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| cytoplasm_SOD2 | cytoplasm_SOD2 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| NOX_inact | NOX_inact | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| NOX | NOX | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| NOX_deact | NOX_deact | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| NOX_total | NOX_total | cytoplasm | item·l$^{-1}$ | ⊟ | ☑ |
| Mt | Mt | cytoplasm | item·l$^{-1}$ | ☑ | ☑ |
| IRS1 | IRS1 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| IRS1_TyrP | IRS1_TyrP | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| IRS1_PolySerP | IRS1_PolySerP | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |

| Id | Name | Compartment | Derived Unit | Constant | Boundary Condition |
|---|---|---|---|---|---|
| IRS1_TyrP_PolySerP | IRS1_TyrP_PolySerP | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| IRS_total | IRS_total | cytoplasm | item·l$^{-1}$ | ⊟ | ☑ |
| PI3K | PI3K | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| JNK_P | JNK_P | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| IKK_P | IKK_P | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| JNK | JNK | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| JNK_plus_JNK_P | JNK_plus_JNK_P | cytoplasm | item·l$^{-1}$ | ⊟ | ☑ |
| IKK | IKK | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| IKK_plus_IKK_P | IKK_plus_IKK_P | cytoplasm | item·l$^{-1}$ | ⊟ | ☑ |
| DUSP | DUSP | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| DUSP_ox | DUSP_ox | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| DUSP_plus_DUSP_ox | DUSP_plus_DUSP_ox | cytoplasm | item·l$^{-1}$ | ⊟ | ☑ |
| null | null | cytoplasm | item·l$^{-1}$ | ☑ | ☑ |
| degr_Foxo1 | degr_Foxo1 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus | item·l$^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound | item·l$^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus | item·l$^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound | item·l$^{-1}$ | ⊟ | ⊟ |

| Id | Name | Compartment | Derived Unit | Constant | Boundary Condition |
|---|---|---|---|---|---|
| cytoplasm_Foxo1-_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm | $\text{item} \cdot \text{l}^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1-_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus | $\text{item} \cdot \text{l}^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1-_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound | $\text{item} \cdot \text{l}^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1-_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm | $\text{item} \cdot \text{l}^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1-_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus | $\text{item} \cdot \text{l}^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1-_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound | $\text{item} \cdot \text{l}^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1-_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm | $\text{item} \cdot \text{l}^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1-_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus | $\text{item} \cdot \text{l}^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1-_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound | $\text{item} \cdot \text{l}^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1-_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm | $\text{item} \cdot \text{l}^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1-_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus | $\text{item} \cdot \text{l}^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1-_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound | $\text{item} \cdot \text{l}^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1-_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm | $\text{item} \cdot \text{l}^{-1}$ | ⊟ | ⊟ |

| Id | Name | Compartment | Derived Unit | Constant | Boundary Condition |
|---|---|---|---|---|---|
| nucleus_Foxo1-_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus | item$\cdot$l$^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1-_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound | item$\cdot$l$^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1-_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm | item$\cdot$l$^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1-_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus | item$\cdot$l$^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1-_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound | item$\cdot$l$^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1-_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm | item$\cdot$l$^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1-_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus | item$\cdot$l$^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1-_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound | item$\cdot$l$^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1-_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm | item$\cdot$l$^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1-_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus | item$\cdot$l$^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1-_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound | item$\cdot$l$^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1-_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm | item$\cdot$l$^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1-_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus | item$\cdot$l$^{-1}$ | ⊟ | ⊟ |

| Id | Name | Compartment | Derived Unit | Constant | Boundary Condition |
|---|---|---|---|---|---|
| dnabound_Foxo1-_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound | item·l$^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1-_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1-_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus | item·l$^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1-_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound | item·l$^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1-_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1-_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus | item·l$^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1-_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound | item·l$^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1-_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1-_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus | item·l$^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1-_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound | item·l$^{-1}$ | ⊟ | ⊟ |
| cytoplasm_Foxo1-_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1-_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus | item·l$^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1-_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound | item·l$^{-1}$ | ⊟ | ⊟ |

| Id | Name | Compartment | Derived Unit | Constant | Boundary Condition |
|---|---|---|---|---|---|
| cytoplasm_Foxo1-_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| nucleus_Foxo1-_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| dnabound_Foxo1-_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| Foxo1_Pa0_tot | Foxo1_Pa0_tot | extracellular | $item \cdot l^{-1}$ | ⊟ | ☑ |
| Foxo1_Pa1_tot | Foxo1_Pa1_tot | extracellular | $item \cdot l^{-1}$ | ⊟ | ☑ |
| Foxo1_Pd0_tot | Foxo1_Pd0_tot | extracellular | $item \cdot l^{-1}$ | ⊟ | ☑ |
| Foxo1_Pd1_tot | Foxo1_Pd1_tot | extracellular | $item \cdot l^{-1}$ | ⊟ | ☑ |
| Foxo1_Pe0_tot | Foxo1_Pe0_tot | extracellular | $item \cdot l^{-1}$ | ⊟ | ☑ |
| Foxo1_Pe1_tot | Foxo1_Pe1_tot | extracellular | $item \cdot l^{-1}$ | ⊟ | ☑ |
| Foxo1_pUb0_tot | Foxo1_pUb0_tot | extracellular | $item \cdot l^{-1}$ | ⊟ | ☑ |
| Foxo1_pUb1_tot | Foxo1_pUb1_tot | extracellular | $item \cdot l^{-1}$ | ⊟ | ☑ |
| cytoplasm_Foxo1-_tot | cytoplasm_Foxo1_tot | extracellular | $item \cdot l^{-1}$ | ⊟ | ☑ |
| nucleus_Foxo1_tot | nucleus_Foxo1_tot | extracellular | $item \cdot l^{-1}$ | ⊟ | ☑ |
| dnabound_Foxo1-_tot | dnabound_Foxo1_tot | extracellular | $item \cdot l^{-1}$ | ⊟ | ☑ |
| Foxo1_all | Foxo1_all | extracellular | $item \cdot l^{-1}$ | ⊟ | ☑ |
| nucleus_RNA_InR | nucleus_RNA_InR | nucleus | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| cytoplasm_RNA_InR | cytoplasm_RNA_InR | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | nucleus | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| cytoplasm_RNA-_SOD2 | cytoplasm_RNA_SOD2 | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| E2F1 | E2F1 | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ⊟ |
| SGK | SGK | cytoplasm | $item \cdot l^{-1}$ | ⊟ | ⊟ |

| Id | Name | Compartment | Derived Unit | Constant | Boundary Condition |
|---|---|---|---|---|---|
| CDK2 | CDK2 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| AMPK | AMPK | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| CBPP300 | CBPP300 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| SIRT1 | SIRT1 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| E3 | E3 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| USP7 | USP7 | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| SCF | SCF | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |
| Proteasome | Proteasome | cytoplasm | item·l$^{-1}$ | ⊟ | ⊟ |

# 5 Parameters

This model contains 81 global parameters.

Table 4: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| k1 | k1 | | $2 \cdot 10^{-5}$ | | ☑ |
| kminus1 | kminus1 | | 12072.000 | | ☑ |
| k2 | k2 | | $1.2 \cdot 10^{-5}$ | | ☑ |
| kminus2 | kminus2 | | 90000.000 | | ☑ |
| k3 | k3 | | 2500.000 | | ☑ |
| kminus3 | kminus3 | | $2 \cdot 10^{-6}$ | | ☑ |
| k4 | k4 | | 0.033 | | ☑ |
| kminus4 | kminus4 | | 0.300 | | ☑ |
| k4prime | k4prime | | 0.002 | | ☑ |
| kminus4prime | kminus4prime | | $2.1 \cdot 10^{-4}$ | | ☑ |
| k6 | k6 | | $4.61 \cdot 10^{-6}$ | | ☑ |
| cellsurf_vol | cellsurf_vol | | 1.000 | | ☑ |
| cyto_vol | cyto_vol | | 1.000 | | ☑ |
| vextracellular | vextracellular | | $8.3 \cdot 10^{-12}$ | | ☑ |
| vcellsurface | vcellsurface | | $6.4 \cdot 10^{-14}$ | | ☑ |
| vcytoplasm | vcytoplasm | | $1.65 \cdot 10^{-11}$ | | ☑ |
| navo | navo | | $6.02 \cdot 10^{23}$ | | ☑ |
| insconc | insconc | | 0.000 | | ⊟ |
| k9_basal | k9_basal | | 0.131 | | ☑ |
| k9 | k9 | | 0.006 | | ☑ |
| kminus9-_basal | kminus9_basal | | 2.700 | | ☑ |
| kminus9 | kminus9 | | 0.001 | | ☑ |
| k11 | k11 | | $2.5 \cdot 10^{-5}$ | | ☑ |
| kminus11 | kminus11 | | $1.1878 \cdot 10^{-6}$ | | ☑ |
| k12 | k12 | | $3.5 \cdot 10^{-5}$ | | ☑ |
| kminus12 | kminus12 | | $1.25 \cdot 10^{-6}$ | | ☑ |
| kr16a | kr16a | | $3.33 \cdot 10^{-4}$ | | ☑ |
| kminusr16a | kminusr16a | | $10^{-6}$ | | ☑ |
| k13_basal | k13_basal | | 0.015 | | ☑ |
| k13 | k13 | | $7.5 \cdot 10^{-6}$ | | ☑ |
| kminus13 | kminus13 | | 0.167 | | ☑ |
| k14 | k14 | | 110.880 | | ☑ |
| kminus14 | kminus14 | | 0.001 | | ☑ |
| sc_pip | sc_pip | | 1000.000 | | ☑ |
| pip3_basal | pip3_basal | | 200.000 | | ☑ |
| k30f | k30f | | 0.080 | | ☑ |

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| k30r | k30r | | 0.005 | | ☑ |
| k31f | k31f | | $2.7 \cdot 10^{-4}$ | | ☑ |
| k31r | k31r | | 0.002 | | ☑ |
| k34f | k34f | | $2 \cdot 10^{-5}$ | | ☑ |
| k34r1 | k34r1 | | 0.001 | | ☑ |
| k34r2 | k34r2 | | 0.250 | | ☑ |
| k34r3 | k34r3 | | 0.001 | | ☑ |
| k35f | k35f | | 450.000 | | ☑ |
| k35r | k35r | | 0.120 | | ☑ |
| k36f | k36f | | 180.000 | | ☑ |
| k_ros_perm | k_ros_perm | | 4.810 | | ⊟ |
| ros_perm | ros_perm | | $7.4 \cdot 10^{8}$ | | ☑ |
| membrane_area | membrane_area | | $6.5 \cdot 10^{-9}$ | | ☑ |
| k38r | k38r | | 2.000 | | ☑ |
| k38f | k38f | | 0.050 | | ☑ |
| ros_ext_conc | ros_ext_conc | | 0.000 | | ⊟ |
| ros_cyto_conc | ros_cyto_conc | | 0.000 | | ⊟ |
| sc_ros | sc_ros | | 1000.000 | | ☑ |
| k7 | k7 | | 5.800 | | ☑ |
| kminus7a | kminus7a | | $8.75 \cdot 10^{-5}$ | | ☑ |
| kminus7b | kminus7b | | $2.8 \cdot 10^{-6}$ | | ☑ |
| k8 | k8 | | $2.6 \cdot 10^{-6}$ | | ☑ |
| kminus8 | kminus8 | | 1.550 | | ☑ |
| IRp | IRp | | 90000.000 | | ☑ |
| molec_per_fm | molec_per_fm | | $6.02 \cdot 10^{8}$ | | ☑ |
| k2psp | k2psp | | $2.2 \cdot 10^{-4}$ | | ☑ |
| kcat82 | kcat82 | | 3.000 | | ☑ |
| Km82 | Km82 | | 100.000 | | ☑ |
| k_irs1_basal_syn | k_irs1_basal_syn | | 260.000 | | ☑ |
| k_irs1_basal_degr | k_irs1_basal_degr | | 0.001 | | ☑ |
| k_irs1_polyserp_degr | k_irs1_polyserp_degr | | 0.010 | | ☑ |
| kcat51 | kcat51 | | 0.870 | | ☑ |
| kcat52 | kcat52 | | 6.950 | | ☑ |
| Km51 | Km51 | | 100.000 | | ☑ |
| Km52 | Km52 | | 100.000 | | ☑ |
| k42f | k42f | | $5 \cdot 10^{-5}$ | | ☑ |

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| k42r | k42r | | $5 \cdot 10^{-7}$ | | ☑ |
| k43f | k43f | | $5 \cdot 10^{-5}$ | | ☑ |
| k43r | k43r | | $5 \cdot 10^{-7}$ | | ☑ |
| alpha_ox | alpha_ox | | 5.000 | | ☑ |
| k32f | k32f | | $6 \cdot 10^{-4}$ | | ☑ |
| k32r | k32r | | $4 \cdot 10^{-4}$ | | ☑ |
| rosconc | rosconc | | 0.000 | | ⊟ |
| by_jnk_phos-_factor | by_jnk_phos_factor | | 2.000 | | ☑ |
| by_ikk_phos-_factor | by_ikk_phos_factor | | 3.000 | | ☑ |

# 6 Function definitions

This is an overview of 366 function definitions.

## 6.1 Function definition `function_358`

**Name** Constant flux (irreversible)

**Argument** v

**Mathematical Expression**

$$v \tag{1}$$

## 6.2 Function definition `function_359`

**Name** Function for export of InR RNA_1

**Arguments** kexp, vol (nucleus), [nucleus_RNA_InR]

**Mathematical Expression**

$$[\text{nucleus\_RNA\_InR}] \cdot \text{vol (nucleus)} \cdot \text{kexp} \tag{2}$$

## 6.3 Function definition `function_360`

**Name** Function for cyto degr of InR RNA_1

**Arguments** vol (cytoplasm), [cytoplasm_RNA_InR], kmdeg

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_RNA\_InR}] \cdot \text{vol (cytoplasm)} \cdot \text{kmdeg}}{\text{vol (cytoplasm)}} \tag{3}$$

## 6.4 Function definition `function_361`

**Name**  Function for translation of InR_1

**Arguments**  vol (cytoplasm), [cytoplasm_RNA_InR], ktransl

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_RNA\_InR}] \cdot \text{vol (cytoplasm)} \cdot \text{ktransl}}{\text{vol (cytoplasm)}} \tag{4}$$

## 6.5 Function definition `function_362`

**Name**  Function for degradation of InR protein_1

**Arguments**  vol (cytoplasm), [cytoplasm_InR], kpdeg

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_InR}] \cdot \text{vol (cytoplasm)} \cdot \text{kpdeg}}{\text{vol (cytoplasm)}} \tag{5}$$

## 6.6 Function definition `function_363`

**Name**  Function for export of SOD2 RNA_1

**Arguments**  kexp, vol (nucleus), [nucleus_RNA_SOD2]

**Mathematical Expression**

$$[\text{nucleus\_RNA\_SOD2}] \cdot \text{vol (nucleus)} \cdot \text{kexp} \tag{6}$$

## 6.7 Function definition `function_364`

**Name**  Function for cyto degr of SOD2 RNA_1

**Arguments**  vol (cytoplasm), [cytoplasm_RNA_SOD2], kmdeg

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_RNA\_SOD2}] \cdot \text{vol (cytoplasm)} \cdot \text{kmdeg}}{\text{vol (cytoplasm)}} \tag{7}$$

## 6.8 Function definition `function_365`

**Name**  Function for translation of SOD2_1

**Arguments**  vol (cytoplasm), [cytoplasm_RNA_SOD2], ktransl

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_RNA\_SOD2}] \cdot \text{vol (cytoplasm)} \cdot \text{ktransl}}{\text{vol (cytoplasm)}} \tag{8}$$

## 6.9 Function definition `function_366`

**Name** Function for degradation of SOD2 protein_1

**Arguments** vol (cytoplasm), [cytoplasm_SOD2], kpdeg

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_SOD2}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kpdeg}}{\text{vol}(\text{cytoplasm})} \tag{9}$$

## 6.10 Function definition `function_22`

**Name** Function for R17r_1

**Arguments** [PKC_P], [PP2A], vol (cytoplasm), kminus12

**Mathematical Expression**

$$\frac{\text{kminus12} \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PKC\_P}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})} \tag{10}$$

## 6.11 Function definition `function_23`

**Name** Function for R20f_1

**Arguments** [AS160_P], vol (cytoplasm), [cytoplasm_GLUT4], k13, k13_basal

**Mathematical Expression**

$$(\text{k13\_basal} + \text{k13} \cdot [\text{AS160\_P}] \cdot \text{vol}(\text{cytoplasm})) \cdot [\text{cytoplasm\_GLUT4}] \cdot \text{vol}(\text{cytoplasm})$$
$$\tag{11}$$

## 6.12 Function definition `function_24`

**Name** Function for R20r_1

**Arguments** vol (cellsurface), [cellsurface_GLUT4], kminus13

**Mathematical Expression**

$$\text{kminus13} \cdot [\text{cellsurface\_GLUT4}] \cdot \text{vol}(\text{cellsurface}) \tag{12}$$

## 6.13 Function definition `function_25`

**Name** Function for R30f_1

**Arguments** [PTP1B], [ROS], vol (cytoplasm), k30f

**Mathematical Expression**

$$\frac{\text{k30f} \cdot [\text{PTP1B}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{ROS}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})} \tag{13}$$

## 6.14 Function definition `function_26`

**Name** Function for R30r_1

**Arguments** [GSH], [PTP1B_ox], vol (cytoplasm), k30r

**Mathematical Expression**

$$\frac{\text{k30r} \cdot [\text{PTP1B\_ox}] \cdot \text{vol (cytoplasm)} \cdot [\text{GSH}] \cdot \text{vol (cytoplasm)}}{\text{vol (cytoplasm)}} \tag{14}$$

## 6.15 Function definition `function_27`

**Name** Function for R31f_1

**Arguments** [PTEN], [ROS], vol (cytoplasm), k31f

**Mathematical Expression**

$$\frac{\text{k31f} \cdot [\text{PTEN}] \cdot \text{vol (cytoplasm)} \cdot [\text{ROS}] \cdot \text{vol (cytoplasm)}}{\text{vol (cytoplasm)}} \tag{15}$$

## 6.16 Function definition `function_28`

**Name** Function for R31r_1

**Arguments** [GSH], [PTEN_ox], vol (cytoplasm), k31r

**Mathematical Expression**

$$\frac{\text{k31r} \cdot [\text{PTEN\_ox}] \cdot \text{vol (cytoplasm)} \cdot [\text{GSH}] \cdot \text{vol (cytoplasm)}}{\text{vol (cytoplasm)}} \tag{16}$$

## 6.17 Function definition `function_29`

**Name** Function for R34f_1

**Arguments** [Ins], [NOX_inact], vol (cytoplasm), vol (extracellular), k34f

**Mathematical Expression**

$$\text{k34f} \cdot [\text{NOX\_inact}] \cdot \text{vol (cytoplasm)} \cdot [\text{Ins}] \cdot \text{vol (extracellular)} \tag{17}$$

## 6.18 Function definition `function_30`

**Name** Function for R34r1_1

**Arguments** [NOX], vol (cytoplasm), k34r1

**Mathematical Expression**

$$\frac{\text{k34r1} \cdot [\text{NOX}] \cdot \text{vol (cytoplasm)} \cdot [\text{NOX}] \cdot \text{vol (cytoplasm)}}{\text{vol (cytoplasm)}} \tag{18}$$

## 6.19 Function definition `function_31`

**Name** Function for R34r2_1

**Arguments** [NOX], vol (cytoplasm), k34r2

**Mathematical Expression**

$$\frac{\text{k34r2} \cdot [\text{NOX}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{19}$$

## 6.20 Function definition `function_32`

**Name** Function for R34r3_1

**Arguments** [NOX_deact], vol (cytoplasm), k34r3

**Mathematical Expression**

$$\frac{\text{k34r3} \cdot [\text{NOX\_deact}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{NOX\_deact}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{20}$$

## 6.21 Function definition `function_33`

**Name** Function for R35f_1

**Arguments** [NOX], vol (cytoplasm), k35f

**Mathematical Expression**

$$\frac{\text{k35f} \cdot [\text{NOX}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{21}$$

## 6.22 Function definition `function_34`

**Name** Function for R35r_1

**Arguments** [ROS], vol (cytoplasm), [cytoplasm_SOD2], k35r

**Mathematical Expression**

$$\frac{\text{k35r} \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{cytoplasm\_SOD2}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{22}$$

## 6.23 Function definition `function_35`

**Name**  Function for R36f_1

**Arguments**  $[\text{Mt}]$, $\text{vol}\,(\text{cytoplasm})$, k36f

**Mathematical Expression**

$$\frac{\text{k36f} \cdot [\text{Mt}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{23}$$

## 6.24 Function definition `function_36`

**Name**  Function for R37f_1

**Arguments**  $\text{vol}\,(\text{extracellular})$, $[\text{extracellular\_ROS}]$, k_ros_perm

**Mathematical Expression**

$$\text{k\_ros\_perm} \cdot [\text{extracellular\_ROS}] \cdot \text{vol}\,(\text{extracellular}) \tag{24}$$

## 6.25 Function definition `function_37`

**Name**  Function for R37r_1

**Arguments**  $[\text{ROS}]$, $\text{vol}\,(\text{cytoplasm})$, $\text{vol}\,(\text{extracellular})$, k_ros_perm

**Mathematical Expression**

$$\text{k\_ros\_perm} \cdot \frac{\text{vol}\,(\text{extracellular})}{\text{vol}\,(\text{cytoplasm})} \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm}) \tag{25}$$

## 6.26 Function definition `function_38`

**Name**  Function for R38f_1

**Arguments**  $[\text{GSH}]$, $[\text{ROS}]$, $\text{vol}\,(\text{cytoplasm})$, k38f

**Mathematical Expression**

$$\frac{\text{k38f} \cdot [\text{GSH}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{26}$$

## 6.27 Function definition `function_39`

**Name**  Function for R38r_1

**Arguments**  $[\text{GSSG}]$, $\text{vol}\,(\text{cytoplasm})$, k38r

**Mathematical Expression**

$$\frac{\text{k38r} \cdot [\text{GSSG}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{27}$$

## 6.28 Function definition `function_40`

**Name** Function for R12f_1

**Arguments** [IRS1], IRp, [Ins_2_InR_P], [Ins_InR_P], vol (cellsurface), cyto_vol, vol (cytoplasm), k7

**Mathematical Expression**

$$\text{cyto\_vol} \cdot \frac{\frac{\text{k7}\cdot[\text{IRS1}]\cdot\text{vol(cytoplasm)}\cdot([\text{Ins\_2\_InR\_P}]\cdot\text{vol(cellsurface)}+[\text{Ins\_InR\_P}]\cdot\text{vol(cellsurface)})}{\text{IRp}}}{\text{vol (cytoplasm)}} \quad (28)$$

## 6.29 Function definition `function_41`

**Name** Function for R12r_1

**Arguments** [IRS1_TyrP], [PTP1B], cyto_vol, vol (cytoplasm), kminus7a

**Mathematical Expression**

$$\frac{\text{cyto\_vol} \cdot \text{kminus7a} \cdot [\text{PTP1B}] \cdot \text{vol (cytoplasm)} \cdot [\text{IRS1\_TyrP}] \cdot \text{vol (cytoplasm)}}{\text{vol (cytoplasm)}} \quad (29)$$

## 6.30 Function definition `function_42`

**Name** Function for R12_a_f_1

**Arguments** [IRS1], [PKC_P], cyto_vol, vol (cytoplasm), k2psp

**Mathematical Expression**

$$\frac{\text{cyto\_vol} \cdot \text{k2psp} \cdot [\text{IRS1}] \cdot \text{vol (cytoplasm)} \cdot [\text{PKC\_P}] \cdot \text{vol (cytoplasm)}}{\text{vol (cytoplasm)}} \quad (30)$$

## 6.31 Function definition `function_43`

**Name** Function for R12_a_r_1

**Arguments** [IRS1_PolySerP], [PP2A], cyto_vol, vol (cytoplasm), kminus7b

**Mathematical Expression**

$$\frac{\text{cyto\_vol} \cdot \text{kminus7b} \cdot [\text{PP2A}] \cdot \text{vol (cytoplasm)} \cdot [\text{IRS1\_PolySerP}] \cdot \text{vol (cytoplasm)}}{\text{vol (cytoplasm)}}$$

$$(31)$$

## 6.32 Function definition `function_44`

**Name** Function for R12_b_f_1

**Arguments** [IRS1_TyrP], [PKC_P], cyto_vol, vol (cytoplasm), k2psp

**Mathematical Expression**

$$\frac{\text{cyto\_vol} \cdot \text{k2psp} \cdot [\text{IRS1\_TyrP}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PKC\_P}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{32}$$

## 6.33 Function definition `function_45`

**Name** Function for R12_b_r_1

**Arguments** [IRS1_TyrP_PolySerP], [PP2A], cyto_vol, vol (cytoplasm), kminus7b

**Mathematical Expression**

$$\frac{\text{cyto\_vol} \cdot \text{kminus7b} \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IRS1\_TyrP\_PolySerP}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}$$

$$\tag{33}$$

## 6.34 Function definition `function_46`

**Name** Function for R13f_1

**Arguments** [IRS1_TyrP], [PI3K], cyto_vol, vol (cytoplasm), k8

**Mathematical Expression**

$$\frac{\text{cyto\_vol} \cdot \text{k8} \cdot [\text{IRS1\_TyrP}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PI3K}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{34}$$

## 6.35 Function definition `function_47`

**Name** Function for R13r_1

**Arguments** [IRS1_TyrP_PI3K], cyto_vol, vol (cytoplasm), kminus8

**Mathematical Expression**

$$\frac{\text{cyto\_vol} \cdot \text{kminus8} \cdot [\text{IRS1\_TyrP\_PI3K}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{35}$$

## 6.36 Function definition `function_48`

**Name**  Function for R50f_1

**Arguments**  vol (cytoplasm), k_irs1_basal_syn

**Mathematical Expression**

$$\frac{\text{k\_irs1\_basal\_syn}}{\text{vol (cytoplasm)}} \tag{36}$$

## 6.37 Function definition `function_49`

**Name**  Function for R50r1_1

**Arguments**  [IRS1], vol (cytoplasm), k_irs1_basal_degr

**Mathematical Expression**

$$\frac{[\text{IRS1}] \cdot \text{vol (cytoplasm)} \cdot \text{k\_irs1\_basal\_degr}}{\text{vol (cytoplasm)}} \tag{37}$$

## 6.38 Function definition `function_50`

**Name**  Function for R50r2_1

**Arguments**  [IRS1_TyrP], vol (cytoplasm), k_irs1_basal_degr

**Mathematical Expression**

$$\frac{[\text{IRS1\_TyrP}] \cdot \text{vol (cytoplasm)} \cdot \text{k\_irs1\_basal\_degr}}{\text{vol (cytoplasm)}} \tag{38}$$

## 6.39 Function definition `function_51`

**Name**  Function for R50r3_1

**Arguments**  [IRS1_PolySerP], vol (cytoplasm), k_irs1_polyserp_degr

**Mathematical Expression**

$$\frac{[\text{IRS1\_PolySerP}] \cdot \text{vol (cytoplasm)} \cdot \text{k\_irs1\_polyserp\_degr}}{\text{vol (cytoplasm)}} \tag{39}$$

## 6.40 Function definition `function_52`

**Name** Function for R50r4_1

**Arguments** [IRS1_TyrP_PolySerP], vol (cytoplasm), k_irs1_polyserp_degr

**Mathematical Expression**

$$\frac{[\text{IRS1\_TyrP\_PolySerP}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{k\_irs1\_polyserp\_degr}}{\text{vol}\,(\text{cytoplasm})} \tag{40}$$

## 6.41 Function definition `function_53`

**Name** Function for R51f_1

**Arguments** [IKK_P], [IRS1], Km51, vol (cytoplasm), kcat51

**Mathematical Expression**

$$\frac{\frac{\text{kcat51} \cdot [\text{IRS1}] \cdot \text{vol(cytoplasm)} \cdot [\text{IKK\_P}] \cdot \text{vol(cytoplasm)}}{\text{Km51} + [\text{IRS1}] \cdot \text{vol(cytoplasm)}}}{\text{vol}\,(\text{cytoplasm})} \tag{41}$$

## 6.42 Function definition `function_54`

**Name** Function for R52f_1

**Arguments** [IRS1], [JNK_P], Km52, vol (cytoplasm), kcat52

**Mathematical Expression**

$$\frac{\frac{\text{kcat52} \cdot [\text{IRS1}] \cdot \text{vol(cytoplasm)} \cdot [\text{JNK\_P}] \cdot \text{vol(cytoplasm)}}{\text{Km52} + [\text{IRS1}] \cdot \text{vol(cytoplasm)}}}{\text{vol}\,(\text{cytoplasm})} \tag{42}$$

## 6.43 Function definition `function_55`

**Name** Function for R42f_1

**Arguments** [JNK], [ROS], alpha_ox, vol (cytoplasm), k42f

**Mathematical Expression**

$$\frac{\text{k42f} \cdot \text{alpha\_ox} \cdot [\text{JNK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{43}$$

## 6.44 Function definition `function_56`

**Name** Function for R42r_1

**Arguments** [DUSP], [JNK_P], vol (cytoplasm), k42r

**Mathematical Expression**

$$\frac{\text{k42r} \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{DUSP}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{44}$$

## 6.45 Function definition `function_57`

**Name** Function for R43f_1

**Arguments** [IKK], [ROS], vol (cytoplasm), k43f

**Mathematical Expression**

$$\frac{\text{k43f} \cdot [\text{IKK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{45}$$

## 6.46 Function definition `function_58`

**Name** Function for R43r_1

**Arguments** [DUSP], [IKK_P], vol (cytoplasm), k43r

**Mathematical Expression**

$$\frac{\text{k43r} \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{DUSP}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{46}$$

## 6.47 Function definition `function_59`

**Name** Function for R32f_1

**Arguments** [DUSP], [ROS], vol (cytoplasm), k32f

**Mathematical Expression**

$$\frac{\text{k32f} \cdot [\text{DUSP}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{47}$$

## 6.48 Function definition `function_60`

**Name**  Function for R32r_1

**Arguments**  [DUSP_ox], [GSH], vol (cytoplasm), k32r

**Mathematical Expression**

$$\frac{\text{k32r} \cdot [\text{DUSP\_ox}] \cdot \text{vol (cytoplasm)} \cdot [\text{GSH}] \cdot \text{vol (cytoplasm)}}{\text{vol (cytoplasm)}} \tag{48}$$

## 6.49 Function definition `function_61`

**Name**  Function for Synthesis_1

**Arguments**  [E2F1], vol (cytoplasm), ksynth

**Mathematical Expression**

$$\frac{[\text{E2F1}] \cdot \text{vol (cytoplasm)} \cdot \text{ksynth}}{\text{vol (cytoplasm)}} \tag{49}$$

## 6.50 Function definition `function_62`

**Name**  Function for transport cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd0-_Pe0_pUb0_1

**Arguments**  vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol (cytoplasm)} \cdot \text{ktr} \tag{50}$$

## 6.51 Function definition `function_63`

**Name**  Function for transport nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb0_1

**Arguments**  ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol (nucleus)} \cdot \text{ktr} \tag{51}$$

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## 6.52 Function definition `function_64`

**Name** Function for transport nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb0_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr} \qquad (52)$$

## 6.53 Function definition `function_65`

**Name** Function for transport dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd0-_Pe0_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktr} \qquad (53)$$

## 6.54 Function definition `function_66`

**Name** Function for transport cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd0-_Pe0_pUb1_1

**Arguments** vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{ktr} \qquad (54)$$

## 6.55 Function definition `function_67`

**Name** Function for transport nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb1_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr} \qquad (55)$$

## 6.56 Function definition `function_68`

**Name** Function for transport nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb1_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol (nucleus)} \cdot \text{ktr} \qquad (56)$$

## 6.57 Function definition `function_69`

**Name** Function for transport dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd0-_Pe0_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol (dnabound)} \cdot \text{ktr} \qquad (57)$$

## 6.58 Function definition `function_70`

**Name** Function for transport cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd0-_Pe1_pUb0_1

**Arguments** vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (cytoplasm)} \cdot \text{ktr} \qquad (58)$$

## 6.59 Function definition `function_71`

**Name** Function for transport nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb0_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (nucleus)} \cdot \text{ktr} \qquad (59)$$

## 6.60 Function definition `function_72`

**Name** Function for transport nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb0_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr} \tag{60}$$

## 6.61 Function definition `function_73`

**Name** Function for transport dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd0-_Pe1_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktr} \tag{61}$$

## 6.62 Function definition `function_74`

**Name** Function for transport cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd0-_Pe1_pUb1_1

**Arguments** vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{ktr} \tag{62}$$

## 6.63 Function definition `function_75`

**Name** Function for transport nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb1_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr} \tag{63}$$

## 6.64 Function definition `function_76`

**Name**  Function for transport nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb1_1

**Arguments**  ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol (nucleus)} \cdot \text{ktr} \qquad (64)$$

## 6.65 Function definition `function_77`

**Name**  Function for transport dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd0-_Pe1_pUb1_1

**Arguments**  vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol (dnabound)} \cdot \text{ktr} \qquad (65)$$

## 6.66 Function definition `function_78`

**Name**  Function for transport cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd1-_Pe0_pUb0_1

**Arguments**  vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol (cytoplasm)} \cdot \text{ktr} \qquad (66)$$

## 6.67 Function definition `function_79`

**Name**  Function for transport nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb0_1

**Arguments**  ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol (nucleus)} \cdot \text{ktr} \qquad (67)$$

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## 6.68 Function definition `function_80`

**Name** Function for transport nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb0_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr} \tag{68}$$

## 6.69 Function definition `function_81`

**Name** Function for transport dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd1-_Pe0_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktr} \tag{69}$$

## 6.70 Function definition `function_82`

**Name** Function for transport cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd1-_Pe0_pUb1_1

**Arguments** vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{ktr} \tag{70}$$

## 6.71 Function definition `function_83`

**Name** Function for transport nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb1_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr} \tag{71}$$

## 6.72 Function definition `function_84`

**Name** Function for transport nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb1_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol} \,(\text{nucleus}) \cdot \text{ktr} \qquad (72)$$

## 6.73 Function definition `function_85`

**Name** Function for transport dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd1-_Pe0_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol} \,(\text{dnabound}) \cdot \text{ktr} \qquad (73)$$

## 6.74 Function definition `function_86`

**Name** Function for transport cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd1-_Pe1_pUb0_1

**Arguments** vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol} \,(\text{cytoplasm}) \cdot \text{ktr} \qquad (74)$$

## 6.75 Function definition `function_87`

**Name** Function for transport nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb0_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol} \,(\text{nucleus}) \cdot \text{ktr} \qquad (75)$$

## 6.76 Function definition `function_88`

**Name** Function for transport nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb0_1

**Arguments** ktr, vol(nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot \text{ktr} \qquad (76)$$

## 6.77 Function definition `function_89`

**Name** Function for transport dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd1-_Pe1_pUb0_1

**Arguments** vol(dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktr} \qquad (77)$$

## 6.78 Function definition `function_90`

**Name** Function for transport cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd1-_Pe1_pUb1_1

**Arguments** vol(cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{ktr} \qquad (78)$$

## 6.79 Function definition `function_91`

**Name** Function for transport nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb1_1

**Arguments** ktr, vol(nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot \text{ktr} \qquad (79)$$

## 6.80 Function definition `function_92`

**Name** Function for transport nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb1_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol (nucleus)} \cdot \text{ktr} \qquad (80)$$

## 6.81 Function definition `function_93`

**Name** Function for transport dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd1-_Pe1_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol (dnabound)} \cdot \text{ktr} \qquad (81)$$

## 6.82 Function definition `function_94`

**Name** Function for transport cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd0-_Pe0_pUb0_1

**Arguments** vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol (cytoplasm)} \cdot \text{ktr} \qquad (82)$$

## 6.83 Function definition `function_95`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb0_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol (nucleus)} \cdot \text{ktr} \qquad (83)$$

## 6.84 Function definition `function_96`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb0_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr} \qquad (84)$$

## 6.85 Function definition `function_97`

**Name** Function for transport dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd0-_Pe0_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktr} \qquad (85)$$

## 6.86 Function definition `function_98`

**Name** Function for transport cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd0-_Pe0_pUb1_1

**Arguments** vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{ktr} \qquad (86)$$

## 6.87 Function definition `function_99`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb1_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr} \qquad (87)$$

## 6.88 Function definition `function_100`

**Name**  Function for transport nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb1_1

**Arguments**  ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr} \qquad (88)$$

## 6.89 Function definition `function_101`

**Name**  Function for transport dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd0-_Pe0_pUb1_1

**Arguments**  vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktr} \qquad (89)$$

## 6.90 Function definition `function_102`

**Name**  Function for transport cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd0-_Pe1_pUb0_1

**Arguments**  vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{ktr} \qquad (90)$$

## 6.91 Function definition `function_103`

**Name**  Function for transport nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb0_1

**Arguments**  ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr} \qquad (91)$$

## 6.92 Function definition `function_104`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb0_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0]

**Mathematical Expression**

$$[nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0] \cdot vol\,(nucleus) \cdot ktr \qquad (92)$$

## 6.93 Function definition `function_105`

**Name** Function for transport dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd0-_Pe1_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0], ktr

**Mathematical Expression**

$$[dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0] \cdot vol\,(dnabound) \cdot ktr \qquad (93)$$

## 6.94 Function definition `function_106`

**Name** Function for transport cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd0-_Pe1_pUb1_1

**Arguments** vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1], ktr

**Mathematical Expression**

$$[cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1] \cdot vol\,(cytoplasm) \cdot ktr \qquad (94)$$

## 6.95 Function definition `function_107`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb1_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1]

**Mathematical Expression**

$$[nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1] \cdot vol\,(nucleus) \cdot ktr \qquad (95)$$

## 6.96 Function definition `function_108`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb1_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol (nucleus)} \cdot \text{ktr} \qquad (96)$$

## 6.97 Function definition `function_109`

**Name** Function for transport dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd0-_Pe1_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol (dnabound)} \cdot \text{ktr} \qquad (97)$$

## 6.98 Function definition `function_110`

**Name** Function for transport cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd1-_Pe0_pUb0_1

**Arguments** vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol (cytoplasm)} \cdot \text{ktr} \qquad (98)$$

## 6.99 Function definition `function_111`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb0_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol (nucleus)} \cdot \text{ktr} \qquad (99)$$

## 6.100 Function definition `function_112`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb0_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr} \qquad (100)$$

## 6.101 Function definition `function_113`

**Name** Function for transport dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd1-_Pe0_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktr} \qquad (101)$$

## 6.102 Function definition `function_114`

**Name** Function for transport cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd1-_Pe0_pUb1_1

**Arguments** vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{ktr} \qquad (102)$$

## 6.103 Function definition `function_115`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb1_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr} \qquad (103)$$

## 6.104 Function definition `function_116`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb1_1

**Arguments** ktr, vol(nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot \text{ktr} \tag{104}$$

## 6.105 Function definition `function_117`

**Name** Function for transport dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd1-_Pe0_pUb1_1

**Arguments** vol(dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktr} \tag{105}$$

## 6.106 Function definition `function_118`

**Name** Function for transport cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd1-_Pe1_pUb0_1

**Arguments** vol(cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{ktr} \tag{106}$$

## 6.107 Function definition `function_119`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb0_1

**Arguments** ktr, vol(nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot \text{ktr} \tag{107}$$

## 6.108 Function definition `function_120`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb0_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol} \,(\text{nucleus}) \cdot \text{ktr} \qquad (108)$$

## 6.109 Function definition `function_121`

**Name** Function for transport dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd1-_Pe1_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol} \,(\text{dnabound}) \cdot \text{ktr} \qquad (109)$$

## 6.110 Function definition `function_122`

**Name** Function for transport cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd1-_Pe1_pUb1_1

**Arguments** vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1], ktr

**Mathematical Expression**

$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol} \,(\text{cytoplasm}) \cdot \text{ktr} \qquad (110)$$

## 6.111 Function definition `function_123`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb1_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol} \,(\text{nucleus}) \cdot \text{ktr} \qquad (111)$$

## 6.112 Function definition `function_124`

**Name** Function for transport nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb1_1

**Arguments** ktr, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1]

**Mathematical Expression**

$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol (nucleus)} \cdot \text{ktr} \qquad (112)$$

## 6.113 Function definition `function_125`

**Name** Function for transport dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd1-_Pe1_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1], ktr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol (dnabound)} \cdot \text{ktr} \qquad (113)$$

## 6.114 Function definition `function_126`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 to cytoplasm_Foxo1-_Pa1_Pd0_Pe0_pUb0 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol (cytoplasm)} \cdot [\text{Akt\_P2}] \cdot \text{vol (cytoplasm)} \cdot \text{kkin}}{\text{vol (cytoplasm)}}$$

$$(114)$$

## 6.115 Function definition `function_127`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1-_Pd0_Pe0_pUb0 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol (nucleus)} \cdot [\text{Akt\_P2}] \cdot \text{vol (cytoplasm)} \cdot \text{kkin}}{\text{vol (nucleus)}}$$

$$(115)$$

## 6.116 Function definition `function_128`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 to dnabound_Foxo1-_Pa1_Pd0_Pe0_pUb0 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

(116)

## 6.117 Function definition `function_129`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 to cytoplasm_Foxo1-_Pa1_Pd0_Pe0_pUb1 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

(117)

## 6.118 Function definition `function_130`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa1-_Pd0_Pe0_pUb1 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

(118)

## 6.119 Function definition `function_131`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 to dnabound_Foxo1-_Pa1_Pd0_Pe0_pUb1 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

(119)

## 6.120 Function definition `function_132`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 to cytoplasm_Foxo1-_Pa1_Pd0_Pe1_pUb0 by Akt_P2_1

**Arguments** [Akt_P2], vol(cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

(120)

## 6.121 Function definition `function_133`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1-_Pd0_Pe1_pUb0 by Akt_P2_1

**Arguments** [Akt_P2], vol(cytoplasm), kkin, vol(nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

(121)

## 6.122 Function definition `function_134`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 to dnabound_Foxo1-_Pa1_Pd0_Pe1_pUb0 by Akt_P2_1

**Arguments** [Akt_P2], vol(cytoplasm), vol(dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

(122)

## 6.123 Function definition `function_135`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 to cytoplasm_Foxo1-_Pa1_Pd0_Pe1_pUb1 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol (cytoplasm)} \cdot [\text{Akt\_P2}] \cdot \text{vol (cytoplasm)} \cdot \text{kkin}}{\text{vol (cytoplasm)}}$$

(123)

## 6.124 Function definition `function_136`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa1-_Pd0_Pe1_pUb1 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol (nucleus)} \cdot [\text{Akt\_P2}] \cdot \text{vol (cytoplasm)} \cdot \text{kkin}}{\text{vol (nucleus)}}$$

(124)

## 6.125 Function definition `function_137`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 to dnabound_Foxo1-_Pa1_Pd0_Pe1_pUb1 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol (dnabound)} \cdot [\text{Akt\_P2}] \cdot \text{vol (cytoplasm)} \cdot \text{kkin}}{\text{vol (dnabound)}}$$

(125)

## 6.126 Function definition `function_138`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 to cytoplasm_Foxo1-_Pa1_Pd1_Pe0_pUb0 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

(126)

## 6.127 Function definition `function_139`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1-_Pd1_Pe0_pUb0 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

(127)

## 6.128 Function definition `function_140`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 to dnabound_Foxo1-_Pa1_Pd1_Pe0_pUb0 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

(128)

## 6.129 Function definition `function_141`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 to cytoplasm_Foxo1-_Pa1_Pd1_Pe0_pUb1 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

(129)

## 6.130 Function definition `function_142`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa1-_Pd1_Pe0_pUb1 by Akt_P2_1

**Arguments** $[\text{Akt\_P2}]$, $\text{vol}\,(\text{cytoplasm})$, kkin, $\text{vol}\,(\text{nucleus})$, $[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]$

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

(130)

## 6.131 Function definition `function_143`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 to dnabound_Foxo1-_Pa1_Pd1_Pe0_pUb1 by Akt_P2_1

**Arguments** $[\text{Akt\_P2}]$, $\text{vol}\,(\text{cytoplasm})$, $\text{vol}\,(\text{dnabound})$, $[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]$, kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

(131)

## 6.132 Function definition `function_144`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 to cytoplasm_Foxo1-_Pa1_Pd1_Pe1_pUb0 by Akt_P2_1

**Arguments** $[\text{Akt\_P2}]$, $\text{vol}\,(\text{cytoplasm})$, $[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]$, kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

(132)

## 6.133 Function definition `function_145`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1-_Pd1_Pe1_pUb0 by Akt_P2_1

**Arguments** $[\text{Akt\_P2}]$, $\text{vol}\,(\text{cytoplasm})$, kkin, $\text{vol}\,(\text{nucleus})$, $[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]$

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

(133)

## 6.134 Function definition `function_146`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 to dnabound_Foxo1-
_Pa1_Pd1_Pe1_pUb0 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0],
kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

(134)

## 6.135 Function definition `function_147`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 to cytoplasm_Foxo1-
_Pa1_Pd1_Pe1_pUb1 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

(135)

## 6.136 Function definition `function_148`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa1-
_Pd1_Pe1_pUb1 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

(136)

## 6.137 Function definition `function_149`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 to dnabound_Foxo1-_Pa1_Pd1_Pe1_pUb1 by Akt_P2_1

**Arguments** [Akt_P2], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

(137)

## 6.138 Function definition `function_150`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 to cytoplasm_Foxo1-_Pa1_Pd0_Pe0_pUb0 by SGK_1

**Arguments** [SGK], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

(138)

## 6.139 Function definition `function_151`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1-_Pd0_Pe0_pUb0 by SGK_1

**Arguments** [SGK], vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

(139)

## 6.140 Function definition `function_152`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 to dnabound_Foxo1-_Pa1_Pd0_Pe0_pUb0 by SGK_1

**Arguments** [SGK], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

(140)

## 6.141 Function definition `function_153`

**Name** Function for conversion of cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1 to cytoplasm\_Foxo1-\_Pa1\_Pd0\_Pe0\_pUb1 by SGK\_1

**Arguments** [SGK], vol (cytoplasm), [cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

(141)

## 6.142 Function definition `function_154`

**Name** Function for conversion of nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1 to nucleus\_Foxo1\_Pa1-\_Pd0\_Pe0\_pUb1 by SGK\_1

**Arguments** [SGK], vol (cytoplasm), kkin, vol (nucleus), [nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

(142)

## 6.143 Function definition `function_155`

**Name** Function for conversion of dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1 to dnabound\_Foxo1-\_Pa1\_Pd0\_Pe0\_pUb1 by SGK\_1

**Arguments** [SGK], vol (cytoplasm), vol (dnabound), [dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

(143)

## 6.144 Function definition `function_156`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 to cytoplasm_Foxo1-_Pa1_Pd0_Pe1_pUb0 by SGK_1

**Arguments** [SGK], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (cytoplasm)} \cdot [\text{SGK}] \cdot \text{vol (cytoplasm)} \cdot \text{kkin}}{\text{vol (cytoplasm)}}$$

(144)

## 6.145 Function definition `function_157`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1-_Pd0_Pe1_pUb0 by SGK_1

**Arguments** [SGK], vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (nucleus)} \cdot [\text{SGK}] \cdot \text{vol (cytoplasm)} \cdot \text{kkin}}{\text{vol (nucleus)}}$$

(145)

## 6.146 Function definition `function_158`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 to dnabound_Foxo1-_Pa1_Pd0_Pe1_pUb0 by SGK_1

**Arguments** [SGK], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (dnabound)} \cdot [\text{SGK}] \cdot \text{vol (cytoplasm)} \cdot \text{kkin}}{\text{vol (dnabound)}}$$

(146)

## 6.147 Function definition `function_159`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 to cytoplasm_Foxo1-_Pa1_Pd0_Pe1_pUb1 by SGK_1

**Arguments** [SGK], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})}$$

(147)

## 6.148 Function definition `function_160`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa1-_Pd0_Pe1_pUb1 by SGK_1

**Arguments** [SGK], vol(cytoplasm), kkin, vol(nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{nucleus})}$$

(148)

## 6.149 Function definition `function_161`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 to dnabound_Foxo1-_Pa1_Pd0_Pe1_pUb1 by SGK_1

**Arguments** [SGK], vol(cytoplasm), vol(dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{dnabound})}$$

(149)

## 6.150 Function definition `function_162`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 to cytoplasm_Foxo1-_Pa1_Pd1_Pe0_pUb0 by SGK_1

**Arguments** [SGK], vol(cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})}$$

(150)

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## 6.151 Function definition `function_163`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1-_Pd1_Pe0_pUb0 by SGK_1

**Arguments** [SGK], vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol (nucleus)} \cdot [\text{SGK}] \cdot \text{vol (cytoplasm)} \cdot \text{kkin}}{\text{vol (nucleus)}}$$

(151)

## 6.152 Function definition `function_164`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 to dnabound_Foxo1-_Pa1_Pd1_Pe0_pUb0 by SGK_1

**Arguments** [SGK], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol (dnabound)} \cdot [\text{SGK}] \cdot \text{vol (cytoplasm)} \cdot \text{kkin}}{\text{vol (dnabound)}}$$

(152)

## 6.153 Function definition `function_165`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 to cytoplasm_Foxo1-_Pa1_Pd1_Pe0_pUb1 by SGK_1

**Arguments** [SGK], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol (cytoplasm)} \cdot [\text{SGK}] \cdot \text{vol (cytoplasm)} \cdot \text{kkin}}{\text{vol (cytoplasm)}}$$

(153)

## 6.154 Function definition `function_21`

**Name** Function for R17f_1

**Arguments** [PI345P3], [PKC], vol (cytoplasm), k12, pip3_basal

**Mathematical Expression**

$$\frac{\text{k12} \cdot [\text{PKC}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \begin{cases} [\text{PI345P3}] \cdot \text{vol}\,(\text{cytoplasm}) - \text{pip3\_basal} & \text{if } [\text{PI345P3}] \cdot \text{vol}\,(\text{cytoplasm}) > \text{pip3\_b} \\ 0 & \text{otherwise} \end{cases}}{\text{vol}\,(\text{cytoplasm})} \tag{154}$$

## 6.155 Function definition `function_166`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa1-_Pd1_Pe0_pUb1 by SGK_1

**Arguments** [SGK], vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$\tag{155}$$

## 6.156 Function definition `function_167`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 to dnabound_Foxo1-_Pa1_Pd1_Pe0_pUb1 by SGK_1

**Arguments** [SGK], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$\tag{156}$$

## 6.157 Function definition `function_168`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 to cytoplasm_Foxo1-_Pa1_Pd1_Pe1_pUb0 by SGK_1

**Arguments** [SGK], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

$$\tag{157}$$

## 6.158 Function definition `function_169`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1-_Pd1_Pe1_pUb0 by SGK_1

**Arguments** [SGK], vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{nucleus})}$$

(158)

## 6.159 Function definition `function_170`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 to dnabound_Foxo1-_Pa1_Pd1_Pe1_pUb0 by SGK_1

**Arguments** [SGK], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{dnabound})}$$

(159)

## 6.160 Function definition `function_171`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 to cytoplasm_Foxo1-_Pa1_Pd1_Pe1_pUb1 by SGK_1

**Arguments** [SGK], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})}$$

(160)

## 6.161 Function definition `function_172`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa1-_Pd1_Pe1_pUb1 by SGK_1

**Arguments** [SGK], vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{nucleus})}$$

(161)

## 6.162 Function definition `function_173`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 to dnabound_Foxo1-_Pa1_Pd1_Pe1_pUb1 by SGK_1

**Arguments** [SGK], vol(cytoplasm), vol(dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{dnabound})}$$

(162)

## 6.163 Function definition `function_174`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 to cytoplasm_Foxo1-_Pa0_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

(163)

## 6.164 Function definition `function_175`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa0-_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), kdephos, vol(nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

(164)

## 6.165 Function definition `function_176`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 to dnabound_Foxo1-_Pa0_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

(165)

## 6.166 Function definition `function_177`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 to cytoplasm_Foxo1-_Pa0_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

(166)

## 6.167 Function definition `function_178`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa0-_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

(167)

## 6.168 Function definition `function_179`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 to dnabound_Foxo1-_Pa0_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

(168)

## 6.169 Function definition `function_180`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 to cytoplasm_Foxo1-_Pa0_Pd0_Pe1_pUb0 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

(169)

## 6.170 Function definition `function_181`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa0-_Pd0_Pe1_pUb0 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), kdephos, vol(nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

(170)

## 6.171 Function definition `function_182`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 to dnabound_Foxo1-_Pa0_Pd0_Pe1_pUb0 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), vol(dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

(171)

## 6.172 Function definition `function_183`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 to cytoplasm_Foxo1-_Pa0_Pd0_Pe1_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

(172)

## 6.173 Function definition `function_184`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa0-_Pd0_Pe1_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

(173)

## 6.174 Function definition `function_185`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 to dnabound_Foxo1-_Pa0_Pd0_Pe1_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

(174)

## 6.175 Function definition `function_186`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 to cytoplasm_Foxo1-_Pa0_Pd1_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

(175)

## 6.176 Function definition `function_187`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa0-_Pd1_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

(176)

## 6.177 Function definition `function_188`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 to dnabound_Foxo1-_Pa0_Pd1_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

(177)

## 6.178 Function definition `function_189`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 to cytoplasm_Foxo1-_Pa0_Pd1_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

(178)

## 6.179 Function definition `function_190`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa0-_Pd1_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

(179)

## 6.180 Function definition `function_191`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 to dnabound_Foxo1-_Pa0_Pd1_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

(180)

## 6.181 Function definition `function_192`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 to cytoplasm_Foxo1-_Pa0_Pd1_Pe1_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

(181)

## 6.182 Function definition `function_193`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa0-_Pd1_Pe1_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

$$(182)$$

## 6.183 Function definition `function_194`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 to dnabound_Foxo1-_Pa0_Pd1_Pe1_pUb0 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), vol(dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

$$(183)$$

## 6.184 Function definition `function_195`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 to cytoplasm_Foxo1-_Pa0_Pd1_Pe1_pUb1 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

$$(184)$$

## 6.185 Function definition `function_196`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa0-_Pd1_Pe1_pUb1 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), kdephos, vol(nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

$$(185)$$

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## 6.186 Function definition `function_197`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 to dnabound_Foxo1-_Pa0_Pd1_Pe1_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

(186)

## 6.187 Function definition `function_198`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 to cytoplasm_Foxo1-_Pa0_Pd1_Pe0_pUb0 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$
(187)

## 6.188 Function definition `function_199`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa0-_Pd1_Pe0_pUb0 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$
(188)

## 6.189 Function definition `function_200`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 to dnabound_Foxo1-_Pa0_Pd1_Pe0_pUb0 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$
(189)

## 6.190 Function definition `function_201`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 to cytoplasm_Foxo1-_Pa0_Pd1_Pe0_pUb1 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \tag{190}$$

## 6.191 Function definition `function_202`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa0-_Pd1_Pe0_pUb1 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})} \tag{191}$$

## 6.192 Function definition `function_203`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 to dnabound_Foxo1-_Pa0_Pd1_Pe0_pUb1 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})} \tag{192}$$

## 6.193 Function definition `function_204`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 to cytoplasm_Foxo1-_Pa0_Pd1_Pe1_pUb0 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \tag{193}$$

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## 6.194 Function definition `function_205`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa0-_Pd1_Pe1_pUb0 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})} \tag{194}$$

## 6.195 Function definition `function_206`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 to dnabound_Foxo1-_Pa0_Pd1_Pe1_pUb0 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})} \tag{195}$$

## 6.196 Function definition `function_207`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 to cytoplasm_Foxo1-_Pa0_Pd1_Pe1_pUb1 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \tag{196}$$

## 6.197 Function definition `function_208`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa0-_Pd1_Pe1_pUb1 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})} \tag{197}$$

## 6.198 Function definition `function_209`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 to dnabound_Foxo1-_Pa0_Pd1_Pe1_pUb1 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})} \quad (198)$$

## 6.199 Function definition `function_210`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 to cytoplasm_Foxo1-_Pa0_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$(199)$$

## 6.200 Function definition `function_211`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa0-_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

$$(200)$$

## 6.201 Function definition `function_212`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 to dnabound_Foxo1-_Pa0_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

(201)

## 6.202 Function definition `function_213`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 to cytoplasm_Foxo1-_Pa0_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

(202)

## 6.203 Function definition `function_214`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa0-_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), kdephos, vol(nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

(203)

## 6.204 Function definition `function_215`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 to dnabound_Foxo1-_Pa0_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), vol(dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

(204)

## 6.205 Function definition `function_216`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 to cytoplasm_Foxo1-_Pa0_Pd0_Pe1_pUb0 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

(205)

## 6.206 Function definition `function_217`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa0-_Pd0_Pe1_pUb0 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), kdephos, vol(nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

(206)

## 6.207 Function definition `function_218`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 to dnabound_Foxo1-_Pa0_Pd0_Pe1_pUb0 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), vol(dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

(207)

## 6.208 Function definition `function_219`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 to cytoplasm_Foxo1-_Pa0_Pd0_Pe1_pUb1 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

(208)

## 6.209 Function definition `function_220`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa0-_Pd0_Pe1_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

(209)

## 6.210 Function definition `function_221`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 to dnabound_Foxo1-_Pa0_Pd0_Pe1_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

(210)

## 6.211 Function definition `function_222`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 to cytoplasm_Foxo1-_Pa1_Pd1_Pe0_pUb0 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

(211)

## 6.212 Function definition `function_223`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1-_Pd1_Pe0_pUb0 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})} \tag{212}$$

## 6.213 Function definition `function_224`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 to dnabound_Foxo1-_Pa1_Pd1_Pe0_pUb0 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})} \tag{213}$$

## 6.214 Function definition `function_225`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 to cytoplasm_Foxo1-_Pa1_Pd1_Pe0_pUb1 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \tag{214}$$

## 6.215 Function definition `function_226`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa1-_Pd1_Pe0_pUb1 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})} \tag{215}$$

## 6.216 Function definition `function_227`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 to dnabound_Foxo1-_Pa1_Pd1_Pe0_pUb1 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol (dnabound)} \cdot [\text{IKK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol (dnabound)}} \tag{216}$$

## 6.217 Function definition `function_228`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 to cytoplasm_Foxo1-_Pa1_Pd1_Pe1_pUb0 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (cytoplasm)} \cdot [\text{IKK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol (cytoplasm)}} \tag{217}$$

## 6.218 Function definition `function_229`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1-_Pd1_Pe1_pUb0 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (nucleus)} \cdot [\text{IKK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol (nucleus)}} \tag{218}$$

## 6.219 Function definition `function_230`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 to dnabound_Foxo1-_Pa1_Pd1_Pe1_pUb0 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (dnabound)} \cdot [\text{IKK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol (dnabound)}} \tag{219}$$

## 6.220 Function definition `function_231`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 to cytoplasm_Foxo1-_Pa1_Pd1_Pe1_pUb1 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \tag{220}$$

## 6.221 Function definition `function_232`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa1-_Pd1_Pe1_pUb1 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})} \tag{221}$$

## 6.222 Function definition `function_233`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 to dnabound_Foxo1-_Pa1_Pd1_Pe1_pUb1 by IKK_P_1

**Arguments** [IKK_P], by_ikk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})} \tag{222}$$

## 6.223 Function definition `function_234`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 to cytoplasm_Foxo1-_Pa1_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\tag{223}$$

## 6.224 Function definition `function_235`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1-_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

(224)

## 6.225 Function definition `function_236`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 to dnabound_Foxo1-_Pa1_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

(225)

## 6.226 Function definition `function_237`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 to cytoplasm_Foxo1-_Pa1_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

(226)

## 6.227 Function definition `function_238`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa1-_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

(227)

## 6.228 Function definition `function_239`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 to dnabound_Foxo1-_Pa1_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), vol(dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

(228)

## 6.229 Function definition `function_240`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 to cytoplasm_Foxo1-_Pa1_Pd0_Pe1_pUb0 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

(229)

## 6.230 Function definition `function_241`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1-_Pd0_Pe1_pUb0 by PP2A_1

**Arguments** [PP2A], vol(cytoplasm), kdephos, vol(nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

(230)

### 6.231 Function definition `function_242`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 to dnabound_Foxo1-_Pa1_Pd0_Pe1_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

(231)

### 6.232 Function definition `function_243`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 to cytoplasm_Foxo1-_Pa1_Pd0_Pe1_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

(232)

### 6.233 Function definition `function_244`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa1-_Pd0_Pe1_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

(233)

### 6.234 Function definition `function_245`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 to dnabound_Foxo1-_Pa1_Pd0_Pe1_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

(234)

## 6.235 Function definition `function_246`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 to cytoplasm_Foxo1-_Pa0_Pd0_Pe1_pUb0 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol(cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})}$$

(235)

## 6.236 Function definition `function_247`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa0-_Pd0_Pe1_pUb0 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol(cytoplasm), kkin, vol(nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{nucleus})}$$

(236)

## 6.237 Function definition `function_248`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 to dnabound_Foxo1-_Pa0_Pd0_Pe1_pUb0 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol(cytoplasm), vol(dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{dnabound})}$$

(237)

## 6.238 Function definition `function_249`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 to cytoplasm_Foxo1-_Pa0_Pd0_Pe1_pUb1 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})} \quad (238)$$

## 6.239 Function definition `function_250`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa0-_Pd0_Pe1_pUb1 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{nucleus})} \quad (239)$$

## 6.240 Function definition `function_251`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 to dnabound_Foxo1-_Pa0_Pd0_Pe1_pUb1 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{dnabound})} \quad (240)$$

## 6.241 Function definition `function_252`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 to cytoplasm_Foxo1-_Pa0_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

$$(241)$$

## 6.242 Function definition `function_253`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa0-_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

$$(242)$$

## 6.243 Function definition `function_254`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 to dnabound_Foxo1-_Pa0_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

$$(243)$$

## 6.244 Function definition `function_255`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 to cytoplasm_Foxo1-_Pa0_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

$$(244)$$

## 6.245 Function definition `function_256`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa0-_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

(245)

## 6.246 Function definition `function_257`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 to dnabound_Foxo1-_Pa0_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

(246)

## 6.247 Function definition `function_258`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 to cytoplasm_Foxo1-_Pa0_Pd1_Pe1_pUb0 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

(247)

## 6.248 Function definition `function_259`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa0-_Pd1_Pe1_pUb0 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

(248)

## 6.249 Function definition `function_260`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 to dnabound_Foxo1-_Pa0_Pd1_Pe1_pUb0 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol (dnabound)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (dnabound)}} \tag{249}$$

## 6.250 Function definition `function_261`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 to cytoplasm_Foxo1-_Pa0_Pd1_Pe1_pUb1 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol (cytoplasm)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (cytoplasm)}} \tag{250}$$

## 6.251 Function definition `function_262`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa0-_Pd1_Pe1_pUb1 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol (nucleus)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (nucleus)}} \tag{251}$$

## 6.252 Function definition `function_263`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 to dnabound_Foxo1-_Pa0_Pd1_Pe1_pUb1 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol (dnabound)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (dnabound)}} \tag{252}$$

## 6.253 Function definition `function_264`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 to cytoplasm_Foxo1-
_Pa0_Pd1_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

(253)

## 6.254 Function definition `function_265`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa0-
_Pd1_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

(254)

## 6.255 Function definition `function_266`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 to dnabound_Foxo1-
_Pa0_Pd1_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0],
kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

(255)

## 6.256 Function definition `function_267`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 to cytoplasm_Foxo1-
_Pa0_Pd1_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

(256)

## 6.257 Function definition `function_268`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa0-_Pd1_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

(257)

## 6.258 Function definition `function_269`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 to dnabound_Foxo1-_Pa0_Pd1_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

(258)

## 6.259 Function definition `function_270`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 to cytoplasm_Foxo1-_Pa1_Pd0_Pe1_pUb0 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})}$$

(259)

## 6.260 Function definition `function_271`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1-_Pd0_Pe1_pUb0 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol (nucleus)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (nucleus)}} \tag{260}$$

## 6.261 Function definition `function_272`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 to dnabound_Foxo1-_Pa1_Pd0_Pe1_pUb0 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol (dnabound)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (dnabound)}} \tag{261}$$

## 6.262 Function definition `function_273`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 to cytoplasm_Foxo1-_Pa1_Pd0_Pe1_pUb1 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol (cytoplasm)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (cytoplasm)}} \tag{262}$$

## 6.263 Function definition `function_274`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa1-_Pd0_Pe1_pUb1 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol (nucleus)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (nucleus)}} \tag{263}$$

## 6.264 Function definition `function_275`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 to dnabound_Foxo1-_Pa1_Pd0_Pe1_pUb1 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{dnabound})} \quad (264)$$

## 6.265 Function definition `function_276`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 to cytoplasm_Foxo1-_Pa1_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

$$(265)$$

## 6.266 Function definition `function_277`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1-_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

$$(266)$$

## 6.267 Function definition `function_278`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 to dnabound_Foxo1-_Pa1_Pd0_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

(267)

## 6.268 Function definition `function_279`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 to cytoplasm_Foxo1-_Pa1_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

(268)

## 6.269 Function definition `function_280`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa1-_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

(269)

## 6.270 Function definition `function_281`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 to dnabound_Foxo1-_Pa1_Pd0_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

(270)

## 6.271 Function definition `function_282`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 to cytoplasm_Foxo1-
_Pa1_Pd1_Pe1_pUb0 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0],
kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol (cytoplasm)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (cytoplasm)}} \quad (271)$$

## 6.272 Function definition `function_283`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1-
_Pd1_Pe1_pUb0 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol (nucleus)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (nucleus)}} \quad (272)$$

## 6.273 Function definition `function_284`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 to dnabound_Foxo1-
_Pa1_Pd1_Pe1_pUb0 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0],
kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol (dnabound)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (dnabound)}} \quad (273)$$

## 6.274 Function definition `function_285`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 to cytoplasm_Foxo1-
_Pa1_Pd1_Pe1_pUb1 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1],
kkin

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol (cytoplasm)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (cytoplasm)}} \quad (274)$$

## 6.275 Function definition `function_286`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa1-
_Pd1_Pe1_pUb1 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), kkin, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol (nucleus)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (nucleus)}} \quad (275)$$

## 6.276 Function definition `function_287`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 to dnabound_Foxo1-
_Pa1_Pd1_Pe1_pUb1 by JNK_P_1

**Arguments** [JNK_P], by_jnk_phos_factor, vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1], kkin

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol (dnabound)} \cdot [\text{JNK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol (dnabound)}} \quad (276)$$

## 6.277 Function definition `function_288`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 to cytoplasm_Foxo1-
_Pa1_Pd1_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol (cytoplasm)} \cdot [\text{PP2A}] \cdot \text{vol (cytoplasm)} \cdot \text{kdephos}}{\text{vol (cytoplasm)}}$$

$$(277)$$

## 6.278 Function definition `function_289`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1-
_Pd1_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol (nucleus)} \cdot [\text{PP2A}] \cdot \text{vol (cytoplasm)} \cdot \text{kdephos}}{\text{vol (nucleus)}}$$

$$(278)$$

## 6.279 Function definition `function_290`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 to dnabound_Foxo1-_Pa1_Pd1_Pe0_pUb0 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol} (\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol} (\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol} (\text{dnabound})}$$

(279)

## 6.280 Function definition `function_291`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 to cytoplasm_Foxo1-_Pa1_Pd1_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol} (\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol} (\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol} (\text{cytoplasm})}$$

(280)

## 6.281 Function definition `function_292`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa1-_Pd1_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), kdephos, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol} (\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol} (\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol} (\text{nucleus})}$$

(281)

## 6.282 Function definition `function_293`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 to dnabound_Foxo1-_Pa1_Pd1_Pe0_pUb1 by PP2A_1

**Arguments** [PP2A], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1], kdephos

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

(282)

## 6.283 Function definition `function_294`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 to cytoplasm_Foxo1-_Pa0_Pd0_Pe0_pUb1 by SCF_1

**Arguments** [SCF], vol(cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$

(283)

## 6.284 Function definition `function_295`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa0-_Pd0_Pe0_pUb1 by SCF_1

**Arguments** [SCF], vol(cytoplasm), kub, vol(nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{nucleus})}$$

(284)

## 6.285 Function definition `function_296`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 to dnabound_Foxo1-_Pa0_Pd0_Pe0_pUb1 by SCF_1

**Arguments** [SCF], vol(cytoplasm), vol(dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})}$$

(285)

## 6.286 Function definition `function_297`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 to cytoplasm_Foxo1-_Pa0_Pd0_Pe1_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (cytoplasm)} \cdot [\text{SCF}] \cdot \text{vol (cytoplasm)} \cdot \text{kub}}{\text{vol (cytoplasm)}}$$

(286)

## 6.287 Function definition `function_298`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa0-_Pd0_Pe1_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), kub, vol (nucleus), [nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (nucleus)} \cdot [\text{SCF}] \cdot \text{vol (cytoplasm)} \cdot \text{kub}}{\text{vol (nucleus)}}$$

(287)

## 6.288 Function definition `function_299`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 to dnabound_Foxo1-_Pa0_Pd0_Pe1_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (dnabound)} \cdot [\text{SCF}] \cdot \text{vol (cytoplasm)} \cdot \text{kub}}{\text{vol (dnabound)}}$$

(288)

## 6.289 Function definition `function_300`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 to cytoplasm_Foxo1-_Pa0_Pd1_Pe0_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$

(289)

## 6.290 Function definition `function_301`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa0-_Pd1_Pe0_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), kub, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{nucleus})}$$

(290)

## 6.291 Function definition `function_302`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 to dnabound_Foxo1-_Pa0_Pd1_Pe0_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})}$$

(291)

## 6.292 Function definition `function_303`

**Name** Function for conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 to cytoplasm_Foxo1-_Pa0_Pd1_Pe1_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$

(292)

## 6.293 Function definition `function_304`

**Name** Function for conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa0-_Pd1_Pe1_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), kub, vol (nucleus), [nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{nucleus})}$$

(293)

## 6.294 Function definition `function_305`

**Name** Function for conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 to dnabound_Foxo1-_Pa0_Pd1_Pe1_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})}$$

(294)

## 6.295 Function definition `function_306`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 to cytoplasm_Foxo1-_Pa1_Pd0_Pe0_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$

(295)

## 6.296 Function definition `function_307`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1-_Pd0_Pe0_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), kub, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{nucleus})}$$

(296)

## 6.297 Function definition `function_308`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 to dnabound_Foxo1-_Pa1_Pd0_Pe0_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})}$$

(297)

## 6.298 Function definition `function_309`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 to cytoplasm_Foxo1-_Pa1_Pd0_Pe1_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$

(298)

## 6.299 Function definition `function_310`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1-_Pd0_Pe1_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), kub, vol (nucleus), [nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{nucleus})}$$

(299)

## 6.300 Function definition `function_311`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 to dnabound_Foxo1-_Pa1_Pd0_Pe1_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (dnabound)} \cdot [\text{SCF}] \cdot \text{vol (cytoplasm)} \cdot \text{kub}}{\text{vol (dnabound)}}$$

(300)

## 6.301 Function definition `function_312`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 to cytoplasm_Foxo1-_Pa1_Pd1_Pe0_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol (cytoplasm)} \cdot [\text{SCF}] \cdot \text{vol (cytoplasm)} \cdot \text{kub}}{\text{vol (cytoplasm)}}$$

(301)

## 6.302 Function definition `function_313`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1-_Pd1_Pe0_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), kub, vol (nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol (nucleus)} \cdot [\text{SCF}] \cdot \text{vol (cytoplasm)} \cdot \text{kub}}{\text{vol (nucleus)}}$$

(302)

## 6.303 Function definition `function_314`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 to dnabound_Foxo1-_Pa1_Pd1_Pe0_pUb1 by SCF_1

**Arguments** [SCF], vol (cytoplasm), vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}(\text{dnabound})}$$

(303)

## 6.304 Function definition `function_315`

**Name** Function for conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 to cytoplasm_Foxo1-_Pa1_Pd1_Pe1_pUb1 by SCF_1

**Arguments** [SCF], vol(cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}(\text{cytoplasm})}$$

(304)

## 6.305 Function definition `function_316`

**Name** Function for conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1-_Pd1_Pe1_pUb1 by SCF_1

**Arguments** [SCF], vol(cytoplasm), kub, vol(nucleus), [nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0]

**Mathematical Expression**

$$\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}(\text{nucleus})}$$

(305)

## 6.306 Function definition `function_317`

**Name** Function for conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 to dnabound_Foxo1-_Pa1_Pd1_Pe1_pUb1 by SCF_1

**Arguments** [SCF], vol(cytoplasm), vol(dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0], kub

**Mathematical Expression**

$$\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}(\text{dnabound})}$$

(306)

## 6.307 Function definition `function_318`

**Name** Function for degradation of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1_1

**Arguments** [Proteasome], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1], kdeg

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})} \tag{307}$$

## 6.308 Function definition `function_319`

**Name** Function for degradation of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1_1

**Arguments** [Proteasome], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1], kdeg

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})} \tag{308}$$

## 6.309 Function definition `function_320`

**Name** Function for degradation of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1_1

**Arguments** [Proteasome], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1], kdeg

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})} \tag{309}$$

## 6.310 Function definition `function_321`

**Name** Function for degradation of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1_1

**Arguments** [Proteasome], vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1], kdeg

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})} \tag{310}$$

### 6.311 Function definition `function_322`

**Name** Function for degradation of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1_1

**Arguments** [Proteasome], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1], kdeg

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})} \tag{311}$$

### 6.312 Function definition `function_323`

**Name** Function for degradation of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1_1

**Arguments** [Proteasome], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1], kdeg

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})} \tag{312}$$

### 6.313 Function definition `function_324`

**Name** Function for degradation of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1_1

**Arguments** [Proteasome], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1], kdeg

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})} \tag{313}$$

### 6.314 Function definition `function_325`

**Name** Function for degradation of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1_1

**Arguments** [Proteasome], vol (cytoplasm), [cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1], kdeg

**Mathematical Expression**

$$\frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})} \tag{314}$$

### 6.315 Function definition `function_326`

**Name** Function for transcription of InR by dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (315)$$

### 6.316 Function definition `function_327`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (316)$$

### 6.317 Function definition `function_328`

**Name** Function for transcription of InR by dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (317)$$

### 6.318 Function definition `function_329`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (318)$$

### 6.319 Function definition `function_330`

**Name** Function for transcription of InR by dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (319)$$

## 6.320 Function definition `function_331`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (320)$$

## 6.321 Function definition `function_332`

**Name** Function for transcription of InR by dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (321)$$

## 6.322 Function definition `function_333`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (322)$$

## 6.323 Function definition `function_334`

**Name** Function for transcription of InR by dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (323)$$

## 6.324 Function definition `function_335`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (324)$$

### 6.325 Function definition `function_336`

**Name**  Function for transcription of InR by dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1_1

**Arguments**  vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktranscr} \quad (325)$$

### 6.326 Function definition `function_337`

**Name**  Function for transcription of SOD2 by dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1_1

**Arguments**  vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktranscr} \quad (326)$$

### 6.327 Function definition `function_338`

**Name**  Function for transcription of InR by dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0_1

**Arguments**  vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktranscr} \quad (327)$$

### 6.328 Function definition `function_339`

**Name**  Function for transcription of SOD2 by dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0_1

**Arguments**  vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktranscr} \quad (328)$$

### 6.329 Function definition `function_340`

**Name**  Function for transcription of InR by dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1_1

**Arguments**  vol (dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktranscr} \quad (329)$$

### 6.330 Function definition `function_341`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1_1

**Arguments** vol(dnabound), [dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (330)$$

### 6.331 Function definition `function_342`

**Name** Function for transcription of InR by dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0_1

**Arguments** vol(dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (331)$$

### 6.332 Function definition `function_343`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0_1

**Arguments** vol(dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (332)$$

### 6.333 Function definition `function_344`

**Name** Function for transcription of InR by dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1_1

**Arguments** vol(dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (333)$$

### 6.334 Function definition `function_345`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1_1

**Arguments** vol(dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot \text{ktranscr} \quad (334)$$

### 6.335 Function definition `function_346`

**Name** Function for transcription of InR by dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0], ktranscr

**Mathematical Expression**

$$[dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0] \cdot vol\,(dnabound) \cdot ktranscr \quad (335)$$

### 6.336 Function definition `function_347`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0], ktranscr

**Mathematical Expression**

$$[dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0] \cdot vol\,(dnabound) \cdot ktranscr \quad (336)$$

### 6.337 Function definition `function_348`

**Name** Function for transcription of InR by dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1], ktranscr

**Mathematical Expression**

$$[dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1] \cdot vol\,(dnabound) \cdot ktranscr \quad (337)$$

### 6.338 Function definition `function_349`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1], ktranscr

**Mathematical Expression**

$$[dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1] \cdot vol\,(dnabound) \cdot ktranscr \quad (338)$$

### 6.339 Function definition `function_350`

**Name** Function for transcription of InR by dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0], ktranscr

**Mathematical Expression**

$$[dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0] \cdot vol\,(dnabound) \cdot ktranscr \quad (339)$$

## 6.340 Function definition `function_351`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktranscr} \quad (340)$$

## 6.341 Function definition `function_352`

**Name** Function for transcription of InR by dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktranscr} \quad (341)$$

## 6.342 Function definition `function_353`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktranscr} \quad (342)$$

## 6.343 Function definition `function_354`

**Name** Function for transcription of InR by dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktranscr} \quad (343)$$

## 6.344 Function definition `function_355`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktranscr} \quad (344)$$

### 6.345 Function definition `function_356`

**Name** Function for transcription of InR by dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol} (\text{dnabound}) \cdot \text{ktranscr} \quad (345)$$

### 6.346 Function definition `function_357`

**Name** Function for transcription of SOD2 by dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1_1

**Arguments** vol (dnabound), [dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1], ktranscr

**Mathematical Expression**

$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol} (\text{dnabound}) \cdot \text{ktranscr} \quad (346)$$

### 6.347 Function definition `function_1`

**Name** Function for R1f_1

**Arguments** [InR], [Ins], vol (cellsurface), vol (extracellular), k1

**Mathematical Expression**

$$k1 \cdot [\text{Ins}] \cdot \text{vol} (\text{extracellular}) \cdot [\text{InR}] \cdot \text{vol} (\text{cellsurface}) \quad (347)$$

### 6.348 Function definition `function_2`

**Name** Function for R1r_1

**Arguments** [Ins_InR], vol (cellsurface), kminus1

**Mathematical Expression**

$$kminus1 \cdot [\text{Ins\_InR}] \cdot \text{vol} (\text{cellsurface}) \quad (348)$$

### 6.349 Function definition `function_3`

**Name** Function for R2_1

**Arguments** [Ins_InR], vol (cellsurface), k3

**Mathematical Expression**

$$\frac{k3 \cdot [\text{Ins\_InR}] \cdot \text{vol} (\text{cellsurface})}{\text{vol} (\text{cellsurface})} \quad (349)$$

## 6.350 Function definition `function_4`

**Name**  Function for R3f_1

**Arguments**  [Ins], [Ins_InR_P], vol (cellsurface), vol (extracellular), k2

**Mathematical Expression**

$$k2 \cdot [\text{Ins}] \cdot \text{vol}\,(\text{extracellular}) \cdot [\text{Ins\_InR\_P}] \cdot \text{vol}\,(\text{cellsurface}) \qquad (350)$$

## 6.351 Function definition `function_5`

**Name**  Function for R3r_1

**Arguments**  [Ins_2_InR_P], vol (cellsurface), kminus2

**Mathematical Expression**

$$\text{kminus2} \cdot [\text{Ins\_2\_InR\_P}] \cdot \text{vol}\,(\text{cellsurface}) \qquad (351)$$

## 6.352 Function definition `function_6`

**Name**  Function for R4_1

**Arguments**  [Ins_InR_P], [PTP1B], vol (cellsurface), vol (cytoplasm), kminus3

**Mathematical Expression**

$$\frac{\text{kminus3} \cdot [\text{PTP1B}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Ins\_InR\_P}] \cdot \text{vol}\,(\text{cellsurface})}{\text{vol}\,(\text{cellsurface})} \qquad (352)$$

## 6.353 Function definition `function_7`

**Name**  Function for R5f_1

**Arguments**  [InR], vol (cellsurface), k4

**Mathematical Expression**

$$k4 \cdot [\text{InR}] \cdot \text{vol}\,(\text{cellsurface}) \qquad (353)$$

## 6.354 Function definition `function_8`

**Name**  Function for R5r_1

**Arguments**  vol (cytoplasm), [cytoplasm_InR], kminus4

**Mathematical Expression**

$$\text{kminus4} \cdot [\text{cytoplasm\_InR}] \cdot \text{vol}\,(\text{cytoplasm}) \qquad (354)$$

### 6.355 Function definition `function_9`

**Name**  Function for R6f_1

**Arguments**  $[Ins\_2\_InR\_P]$, $vol\,(cellsurface)$, k4prime

**Mathematical Expression**

$$k4prime \cdot [Ins\_2\_InR\_P] \cdot vol\,(cellsurface) \tag{355}$$

### 6.356 Function definition `function_10`

**Name**  Function for R6r_1

**Arguments**  $vol\,(cytoplasm)$, $[cytoplasm\_Ins\_2\_InR\_P]$, kminus4prime

**Mathematical Expression**

$$kminus4prime \cdot [cytoplasm\_Ins\_2\_InR\_P] \cdot vol\,(cytoplasm) \tag{356}$$

### 6.357 Function definition `function_11`

**Name**  Function for R7f_1

**Arguments**  $[Ins\_InR\_P]$, $vol\,(cellsurface)$, k4prime

**Mathematical Expression**

$$k4prime \cdot [Ins\_InR\_P] \cdot vol\,(cellsurface) \tag{357}$$

### 6.358 Function definition `function_12`

**Name**  Function for R7r_1

**Arguments**  $vol\,(cytoplasm)$, $[cytoplasm\_Ins\_InR\_P]$, kminus4prime

**Mathematical Expression**

$$kminus4prime \cdot [cytoplasm\_Ins\_InR\_P] \cdot vol\,(cytoplasm) \tag{358}$$

### 6.359 Function definition `function_13`

**Name**  Function for R10_1

**Arguments**  $[PTP1B]$, $vol\,(cytoplasm)$, $[cytoplasm\_Ins\_2\_InR\_P]$, k6

**Mathematical Expression**

$$\frac{k6 \cdot [PTP1B] \cdot vol\,(cytoplasm) \cdot [cytoplasm\_Ins\_2\_InR\_P] \cdot vol\,(cytoplasm)}{vol\,(cytoplasm)} \tag{359}$$

## 6.360 Function definition `function_14`

**Name**  Function for R11_1

**Arguments**  [PTP1B], vol (cytoplasm), [cytoplasm_Ins_InR_P], k6

**Mathematical Expression**

$$\frac{\text{k6} \cdot [\text{PTP1B}] \cdot \text{vol (cytoplasm)} \cdot [\text{cytoplasm\_Ins\_InR\_P}] \cdot \text{vol (cytoplasm)}}{\text{vol (cytoplasm)}} \quad (360)$$

## 6.361 Function definition `function_15`

**Name**  Function for R14f_1

**Arguments**  [IRS1_TyrP_PI3K], [PIP2], vol (cytoplasm), k9, k9_basal

**Mathematical Expression**

$$\frac{(\text{k9\_basal} + \text{k9} \cdot [\text{IRS1\_TyrP\_PI3K}] \cdot \text{vol (cytoplasm)}) \cdot [\text{PIP2}] \cdot \text{vol (cytoplasm)}}{\text{vol (cytoplasm)}} \quad (361)$$

## 6.362 Function definition `function_16`

**Name**  Function for R14r_1

**Arguments**  [PI345P3], [PTEN], vol (cytoplasm), kminus9, kminus9_basal

**Mathematical Expression**

$$\frac{(\text{kminus9\_basal} + \text{kminus9} \cdot [\text{PTEN}] \cdot \text{vol (cytoplasm)}) \cdot [\text{PI345P3}] \cdot \text{vol (cytoplasm)}}{\text{vol (cytoplasm)}}$$

$$(362)$$

## 6.363 Function definition `function_17`

**Name**  Function for R16f_1

**Arguments**  [Akt], [PI345P3], vol (cytoplasm), k11, pip3_basal

**Mathematical Expression**

$$\frac{\text{k11} \cdot [\text{Akt}] \cdot \text{vol (cytoplasm)} \cdot \begin{cases} [\text{PI345P3}] \cdot \text{vol (cytoplasm)} - \text{pip3\_basal} & \text{if } [\text{PI345P3}] \cdot \text{vol (cytoplasm)} > \text{pip3\_ba} \\ 0 & \text{otherwise} \end{cases}}{\text{vol (cytoplasm)}} \quad (363)$$

## 6.364 Function definition `function_18`

**Name** Function for R16r_1

**Arguments** [Akt_P2], [PP2A], vol(cytoplasm), kminus11

**Mathematical Expression**

$$\frac{\text{kminus11} \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})} \tag{364}$$

## 6.365 Function definition `function_19`

**Name** Function for R16a_f_1

**Arguments** [AS160], [Akt_P2], vol(cytoplasm), kr16a

**Mathematical Expression**

$$\frac{\text{kr16a} \cdot [\text{Akt\_P2}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{AS160}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})} \tag{365}$$

## 6.366 Function definition `function_20`

**Name** Function for R16a_r_1

**Arguments** [AS160_P], [PP2A], vol(cytoplasm), kminusr16a

**Mathematical Expression**

$$\frac{\text{kminusr16a} \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{AS160\_P}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})} \tag{366}$$

# 7 Rules

This is an overview of 29 rules.

## 7.1 Rule `JNK_plus_JNK_P`

Rule `JNK_plus_JNK_P` is an assignment rule for species `JNK_plus_JNK_P`:

$$\text{JNK\_plus\_JNK\_P} = \frac{[\text{JNK}] \cdot \text{vol}(\text{cytoplasm}) + [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})} \tag{367}$$

**Derived unit** $\text{item} \cdot l^{-1}$

## 7.2 Rule IKK_plus_IKK_P

Rule IKK_plus_IKK_P is an assignment rule for species IKK_plus_IKK_P:

$$\text{IKK\_plus\_IKK\_P} = \frac{[\text{IKK}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \quad (368)$$

**Derived unit** $\text{item} \cdot \text{l}^{-1}$

## 7.3 Rule DUSP_plus_DUSP_ox

Rule DUSP_plus_DUSP_ox is an assignment rule for species DUSP_plus_DUSP_ox:

$$\text{DUSP\_plus\_DUSP\_ox} = \frac{[\text{DUSP}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{DUSP\_ox}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \quad (369)$$

**Derived unit** $\text{item} \cdot \text{l}^{-1}$

## 7.4 Rule k_ros_perm

Rule k_ros_perm is an assignment rule for parameter k_ros_perm:

$$\text{k\_ros\_perm} = \text{ros\_perm} \cdot \text{membrane\_area} \quad (370)$$

## 7.5 Rule insconc

Rule insconc is an assignment rule for parameter insconc:

$$\text{insconc} = \frac{[\text{Ins}] \cdot \text{vol}\,(\text{extracellular})}{\text{navo} \cdot \text{vextracellular}} \quad (371)$$

## 7.6 Rule Foxo1_Pa0_tot

Rule Foxo1_Pa0_tot is an assignment rule for species Foxo1_Pa0_tot:

Foxo1_Pa0_tot $\quad\quad (372)$
$= \dfrac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) +}{}$

**Derived unit** $\text{item} \cdot \text{l}^{-1}$

## 7.7 Rule Foxo1_Pa1_tot

Rule Foxo1_Pa1_tot is an assignment rule for species Foxo1_Pa1_tot:

Foxo1_Pa1_tot $\quad\quad (373)$
$= \dfrac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) +}{}$

**Derived unit** $\text{item} \cdot \text{l}^{-1}$

## 7.8 Rule Foxo1_Pd0_tot

Rule Foxo1_Pd0_tot is an assignment rule for species Foxo1_Pd0_tot:

$$\text{Foxo1\_Pd0\_tot} \qquad\qquad\qquad\qquad (374)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) +}{}$$

**Derived unit**  $\text{item} \cdot \text{l}^{-1}$

## 7.9 Rule Foxo1_Pd1_tot

Rule Foxo1_Pd1_tot is an assignment rule for species Foxo1_Pd1_tot:

$$\text{Foxo1\_Pd1\_tot} \qquad\qquad\qquad\qquad (375)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) +}{}$$

**Derived unit**  $\text{item} \cdot \text{l}^{-1}$

## 7.10 Rule Foxo1_Pe0_tot

Rule Foxo1_Pe0_tot is an assignment rule for species Foxo1_Pe0_tot:

$$\text{Foxo1\_Pe0\_tot} \qquad\qquad\qquad\qquad (376)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) +}{}$$

**Derived unit**  $\text{item} \cdot \text{l}^{-1}$

## 7.11 Rule Foxo1_Pe1_tot

Rule Foxo1_Pe1_tot is an assignment rule for species Foxo1_Pe1_tot:

$$\text{Foxo1\_Pe1\_tot} \qquad\qquad\qquad\qquad (377)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) +}{}$$

**Derived unit**  $\text{item} \cdot \text{l}^{-1}$

## 7.12 Rule Foxo1_pUb0_tot

Rule Foxo1_pUb0_tot is an assignment rule for species Foxo1_pUb0_tot:

$$\text{Foxo1\_pUb0\_tot} \qquad\qquad\qquad\qquad (378)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) +}{}$$

**Derived unit**  $\text{item} \cdot \text{l}^{-1}$

*Produced by* SBML2LATEX

## 7.13 Rule `Foxo1_pUb1_tot`

Rule `Foxo1_pUb1_tot` is an assignment rule for species `Foxo1_pUb1_tot`:

$$
\text{Foxo1\_pUb1\_tot} \tag{379}
$$
$$
= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) +}{}
$$

**Derived unit** $\text{item} \cdot \text{l}^{-1}$

## 7.14 Rule `cytoplasm_Foxo1_tot`

Rule `cytoplasm_Foxo1_tot` is an assignment rule for species `cytoplasm_Foxo1_tot`:

$$
\text{cytoplasm\_Foxo1\_tot} \tag{380}
$$
$$
= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplas}}{}
$$

**Derived unit** $\text{item} \cdot \text{l}^{-1}$

## 7.15 Rule `nucleus_Foxo1_tot`

Rule `nucleus_Foxo1_tot` is an assignment rule for species `nucleus_Foxo1_tot`:

$$
\text{nucleus\_Foxo1\_tot} \tag{381}
$$
$$
= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) + [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) + [\text{nuc}}{}
$$

**Derived unit** $\text{item} \cdot \text{l}^{-1}$

## 7.16 Rule `dnabound_Foxo1_tot`

Rule `dnabound_Foxo1_tot` is an assignment rule for species `dnabound_Foxo1_tot`:

$$
\text{dnabound\_Foxo1\_tot} \tag{382}
$$
$$
= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) + [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnaboun}}{}
$$

**Derived unit** $\text{item} \cdot \text{l}^{-1}$

## 7.17 Rule `Foxo1_all`

Rule `Foxo1_all` is an assignment rule for species `Foxo1_all`:

$$
\text{Foxo1\_all} \tag{383}
$$
$$
= \frac{[\text{cytoplasm\_Foxo1\_tot}] \cdot \text{vol}\,(\text{extracellular}) + [\text{nucleus\_Foxo1\_tot}] \cdot \text{vol}\,(\text{extracellular}) + [\text{dnabound\_Foxo1\_tot}] \cdot \text{vo}}{\text{vol}\,(\text{extracellular})}
$$

**Derived unit** $\text{item} \cdot \text{l}^{-1}$

## 7.18 Rule ros_ext_conc

Rule ros_ext_conc is an assignment rule for parameter ros_ext_conc:

$$\text{ros\_ext\_conc} = \frac{\text{sc\_ros} \cdot [\text{extracellular\_ROS}] \cdot \text{vol}\,(\text{extracellular})}{\text{navo} \cdot \text{vol}\,(\text{extracellular})} \tag{384}$$

## 7.19 Rule ros_cyto_conc

Rule ros_cyto_conc is an assignment rule for parameter ros_cyto_conc:

$$\text{ros\_cyto\_conc} = \frac{\text{sc\_ros} \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{navo} \cdot \text{vol}\,(\text{cytoplasm})} \tag{385}$$

## 7.20 Rule PTP1B_plus_PTP1B_ox

Rule PTP1B_plus_PTP1B_ox is an assignment rule for species PTP1B_plus_PTP1B_ox:

$$\text{PTP1B\_plus\_PTP1B\_ox} = \frac{[\text{PTP1B}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{PTP1B\_ox}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{386}$$

**Derived unit** $\text{item} \cdot \text{l}^{-1}$

## 7.21 Rule PTEN_plus_PTEN_ox

Rule PTEN_plus_PTEN_ox is an assignment rule for species PTEN_plus_PTEN_ox:

$$\text{PTEN\_plus\_PTEN\_ox} = \frac{[\text{PTEN}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{PTEN\_ox}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{387}$$

**Derived unit** $\text{item} \cdot \text{l}^{-1}$

## 7.22 Rule NOX_total

Rule NOX_total is an assignment rule for species NOX_total:

$$\text{NOX\_total}$$
$$= \frac{[\text{NOX\_inact}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{NOX}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{NOX\_deact}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}$$
$$\tag{388}$$

**Derived unit** $\text{item} \cdot \text{l}^{-1}$

## 7.23 Rule IRS_total

Rule IRS_total is an assignment rule for species IRS_total:

$$\text{IRS\_total} \tag{389}$$
$$= \frac{[\text{IRS1}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{IRS1\_TyrP}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{IRS1\_PolySerP}] \cdot \text{vol}\,(\text{cytoplasm}) + [\text{IRS1\_TyrP\_Poly}}{\text{vol}\,(\text{cytoplasm})}$$

**Derived unit** $\text{item} \cdot \text{l}^{-1}$

*Produced by SBML2LATEX*

## 7.24 Rule `InR_tot`

Rule `InR_tot` is an assignment rule for species `InR_tot`:

$$
\begin{aligned}
&\text{InR\_tot} \quad (390)\\
&= \frac{[\text{InR}] \cdot \text{vol}\,(\text{cellsurface}) + [\text{Ins\_InR}] \cdot \text{vol}\,(\text{cellsurface}) + [\text{Ins\_InR\_P}] \cdot \text{vol}\,(\text{cellsurface}) + [\text{Ins\_2\_InR\_P}] \cdot \text{vol}\,(\text{cellsu}}{}
\end{aligned}
$$

**Derived unit**  $\text{item} \cdot \text{l}^{-1}$

## 7.25 Rule `InR_bound`

Rule `InR_bound` is an assignment rule for species `InR_bound`:

$$
\begin{aligned}
&\text{InR\_bound} \quad (391)\\
&= \frac{[\text{Ins\_2\_InR\_P}] \cdot \text{vol}\,(\text{cellsurface}) + [\text{Ins\_InR\_P}] \cdot \text{vol}\,(\text{cellsurface}) + [\text{Ins\_InR}] \cdot \text{vol}\,(\text{cellsurface})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned}
$$

**Derived unit**  $\text{item} \cdot \text{l}^{-1}$

## 7.26 Rule `InR_active`

Rule `InR_active` is an assignment rule for species `InR_active`:

$$
\text{InR\_active} = \frac{[\text{Ins\_2\_InR\_P}] \cdot \text{vol}\,(\text{cellsurface}) + [\text{Ins\_InR\_P}] \cdot \text{vol}\,(\text{cellsurface})}{\text{vol}\,(\text{cytoplasm})} \quad (392)
$$

**Derived unit**  $\text{item} \cdot \text{l}^{-1}$

## 7.27 Rule `PI345P3_mol`

Rule `PI345P3_mol` is an assignment rule for species `PI345P3_mol`:

$$
\text{PI345P3\_mol} = \frac{\text{sc\_pip} \cdot [\text{PI345P3}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \quad (393)
$$

## 7.28 Rule `PIP2_mol`

Rule `PIP2_mol` is an assignment rule for species `PIP2_mol`:

$$
\text{PIP2\_mol} = \frac{\text{sc\_pip} \cdot [\text{PIP2}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \quad (394)
$$

## 7.29 Rule `rosconc`

Rule `rosconc` is an assignment rule for parameter `rosconc`:

$$
\text{rosconc} = \frac{[\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{navo} \cdot \text{vcytoplasm}} \quad (395)
$$

# 8 Reactions

This model contains 367 reactions. All reactions are listed in the following table and are subsequently described in detail. If a reaction is affected by a modifier, the identifier of this species is written above the reaction arrow.

Table 5: Overview of all reactions

| № | Id | Name | Reaction Equation | SBO |
|---|-----|------|-------------------|-----|
| 1 | R1f | R1f | $\text{Ins} + \text{InR} \xrightarrow{\text{InR, Ins}} \text{Ins\_InR}$ | |
| 2 | R1r | R1r | $\text{Ins\_InR} \xrightarrow{\text{Ins\_InR}} \text{InR} + \text{Ins}$ | |
| 3 | R2 | R2 | $\text{Ins\_InR} \xrightarrow{\text{Ins\_InR}} \text{Ins\_InR\_P}$ | |
| 4 | R3f | R3f | $\text{Ins} + \text{Ins\_InR\_P} \xrightarrow{\text{Ins, Ins\_InR\_P}} \text{Ins\_2\_InR\_P}$ | |
| 5 | R3r | R3r | $\text{Ins\_2\_InR\_P} \xrightarrow{\text{Ins\_2\_InR\_P}} \text{Ins\_InR\_P} + \text{Ins}$ | |
| 6 | R4 | R4 | $\text{Ins\_InR\_P} \xrightarrow{\text{PTP1B, Ins\_InR\_P, PTP1B}} \text{InR}$ | |
| 7 | R5f | R5f | $\text{InR} \xrightarrow{\text{InR}} \text{cytoplasm\_InR}$ | |
| 8 | R5r | R5r | $\text{cytoplasm\_InR} \xrightarrow{\text{cytoplasm\_InR}} \text{InR}$ | |
| 9 | R6f | R6f | $\text{Ins\_2\_InR\_P} \xrightarrow{\text{Ins\_2\_InR\_P}} \text{cytoplasm\_Ins\_2\_InR\_P}$ | |
| 10 | R6r | R6r | $\text{cytoplasm\_Ins\_2\_InR\_P} \xrightarrow{\text{cytoplasm\_Ins\_2\_InR\_P}} \text{Ins\_2\_InR\_P}$ | |
| 11 | R7f | R7f | $\text{Ins\_InR\_P} \xrightarrow{\text{Ins\_InR\_P}} \text{cytoplasm\_Ins\_InR\_P}$ | |
| 12 | R7r | R7r | $\text{cytoplasm\_Ins\_InR\_P} \xrightarrow{\text{cytoplasm\_Ins\_InR\_P}} \text{Ins\_InR\_P}$ | |
| 13 | R10 | R10 | $\text{cytoplasm\_Ins\_2\_InR\_P} \xrightarrow{\text{PTP1B, PTP1B, cytoplasm\_Ins\_2\_InR\_P}} \text{cytoplasm\_InR}$ | |
| 14 | R11 | R11 | $\text{cytoplasm\_Ins\_InR\_P} \xrightarrow{\text{PTP1B, PTP1B, cytoplasm\_Ins\_InR\_P}} \text{cytoplasm\_InR}$ | |
| 15 | R14f | R14f | $\text{PIP2} \xrightarrow{\text{IRS1\_TyrP\_PI3K, IRS1\_TyrP\_PI3K, PIP2}} \text{PI345P3}$ | |
| 16 | R14r | R14r | $\text{PI345P3} \xrightarrow{\text{PTEN, PI345P3, PTEN}} \text{PIP2}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|-----|------|-------------------|-----|
| 17 | R16f | R16f | Akt $\xrightarrow{\text{PI345P3, Akt, PI345P3}}$ Akt_P2 | |
| 18 | R16r | R16r | Akt_P2 $\xrightarrow{\text{PP2A, Akt\_P2, PP2A}}$ Akt | |
| 19 | R16a_f | R16a_f | AS160 $\xrightarrow{\text{Akt\_P2, AS160, Akt\_P2}}$ AS160_P | |
| 20 | R16a_r | R16a_r | AS160_P $\xrightarrow{\text{PP2A, AS160\_P, PP2A}}$ AS160 | |
| 21 | R17f | R17f | PKC $\xrightarrow{\text{PI345P3, PI345P3, PKC}}$ PKC_P | |
| 22 | R17r | R17r | PKC_P $\xrightarrow{\text{PP2A, PKC\_P, PP2A}}$ PKC | |
| 23 | R20f | R20f | cytoplasm_GLUT4 $\xrightarrow{\text{AS160\_P, AS160\_P, cytoplasm\_GLUT4}}$ cellsurface_GLUT4 | |
| 24 | R20r | R20r | cellsurface_GLUT4 $\xrightarrow{\text{cellsurface\_GLUT4}}$ cytoplasm_GLUT4 | |
| 25 | R30f | R30f | PTP1B + ROS $\xrightarrow{\text{PTP1B, ROS}}$ PTP1B_ox + ROS | |
| 26 | R30r | R30r | PTP1B_ox + GSH $\xrightarrow{\text{GSH, PTP1B\_ox}}$ PTP1B + GSH | |
| 27 | R31f | R31f | PTEN + ROS $\xrightarrow{\text{PTEN, ROS}}$ PTEN_ox + ROS | |
| 28 | R31r | R31r | PTEN_ox + GSH $\xrightarrow{\text{GSH, PTEN\_ox}}$ PTEN + GSH | |
| 29 | R34f | R34f | NOX_inact + Ins $\xrightarrow{\text{Ins, NOX\_inact}}$ NOX + Ins | |
| 30 | R34r1 | R34r1 | NOX $\xrightarrow{\text{NOX}}$ NOX_deact | |
| 31 | R34r2 | R34r2 | NOX $\xrightarrow{\text{NOX}}$ NOX_inact | |
| 32 | R34r3 | R34r3 | NOX_deact $\xrightarrow{\text{NOX\_deact}}$ NOX_inact | |
| 33 | R35f | R35f | NOX $\xrightarrow{\text{NOX}}$ ROS + NOX | |
| 34 | R35r | R35r | ROS + cytoplasm_SOD2 $\xrightarrow{\text{ROS, cytoplasm\_SOD2}}$ cytoplasm_SOD2 | |
| 35 | R36f | R36f | Mt $\xrightarrow{\text{Mt}}$ Mt + ROS | |
| 36 | R37f | R37f | extracellular_ROS $\xrightarrow{\text{extracellular\_ROS}}$ ROS | |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 37 | R37r | R37r | ROS $\xrightarrow{\text{ROS}}$ extracellular_ROS | |
| 38 | R38f | R38f | GSH $\xrightarrow{\text{ROS, GSH, ROS}}$ GSSG | |
| 39 | R38r | R38r | GSSG $\xrightarrow{\text{GSSG}}$ GSH | |
| 40 | R12f | R12f | IRS1 $\xrightarrow{\text{Ins\_2\_InR\_P, Ins\_InR\_P, IRS1, Ins\_2\_InR\_P, Ins\_InR\_P}}$ IRS1_TyrP | |
| 41 | R12r | R12r | IRS1_TyrP $\xrightarrow{\text{PTP1B, IRS1\_TyrP, PTP1B}}$ IRS1 | |
| 42 | R12_a_f | R12_a_f | IRS1 $\xrightarrow{\text{PKC\_P, IRS1, PKC\_P}}$ IRS1_PolySerP | |
| 43 | R12_a_r | R12_a_r | IRS1_PolySerP $\xrightarrow{\text{PP2A, IRS1\_PolySerP, PP2A}}$ IRS1 | |
| 44 | R12_b_f | R12_b_f | IRS1_TyrP $\xrightarrow{\text{PKC\_P, IRS1\_TyrP, PKC\_P}}$ IRS1_TyrP_PolySerP | |
| 45 | R12_b_r | R12_b_r | IRS1_TyrP_PolySerP $\xrightarrow{\text{PP2A, IRS1\_TyrP\_PolySerP, PP2A}}$ IRS1_TyrP | |
| 46 | R13f | R13f | PI3K+IRS1_TyrP $\xrightarrow{\text{IRS1\_TyrP, PI3K}}$ IRS1_TyrP_PI3K | |
| 47 | R13r | R13r | IRS1_TyrP_PI3K $\xrightarrow{\text{IRS1\_TyrP\_PI3K}}$ PI3K $+$ IRS1_TyrP | |
| 48 | R50f | R50f | NULL $\longrightarrow$ IRS1 | |
| 49 | R50r1 | R50r1 | IRS1 $\xrightarrow{\text{IRS1}}$ NULL | |
| 50 | R50r2 | R50r2 | IRS1_TyrP $\xrightarrow{\text{IRS1\_TyrP}}$ NULL | |
| 51 | R50r3 | R50r3 | IRS1_PolySerP $\xrightarrow{\text{IRS1\_PolySerP}}$ NULL | |
| 52 | R50r4 | R50r4 | IRS1_TyrP_PolySerP $\xrightarrow{\text{IRS1\_TyrP\_PolySerP}}$ NULL | |
| 53 | R51f | R51f | IRS1 $\xrightarrow{\text{IKK\_P, IKK\_P, IRS1}}$ IRS1_PolySerP | |
| 54 | R52f | R52f | IRS1 $\xrightarrow{\text{JNK\_P, IRS1, JNK\_P}}$ IRS1_PolySerP | |
| 55 | R42f | R42f | JNK $\xrightarrow{\text{ROS, JNK, ROS}}$ JNK_P | |
| 56 | R42r | R42r | JNK_P $\xrightarrow{\text{DUSP, DUSP, JNK\_P}}$ JNK | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 57 | R43f | R43f | IKK $\xrightarrow{\text{ROS, IKK, ROS}}$ IKK_P | |
| 58 | R43r | R43r | IKK_P $\xrightarrow{\text{DUSP, DUSP, IKK\_P}}$ IKK | |
| 59 | R32f | R32f | DUSP + ROS $\xrightarrow{\text{DUSP, ROS}}$ DUSP_ox + ROS | |
| 60 | R32r | R32r | DUSP_ox + GSH $\xrightarrow{\text{DUSP\_ox, GSH}}$ DUSP + GSH | |
| 61 | R100 | Synthesis | null $\xrightarrow{\text{E2F1, E2F1}}$ cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |
| 62 | R101 | transport cytoplasm_Foxo1_Pa0_Pd0_Pe0-_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 $\xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}}$ nucleus_ | |
| 63 | R102 | transport nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}}$ cytoplasm_Fo | |
| 64 | R103 | transport nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}}$ dnabound_Fo | |
| 65 | R104 | transport dnabound_Foxo1_Pa0_Pd0_Pe0-_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 $\xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}}$ nucleus_ | |
| 66 | R105 | transport cytoplasm_Foxo1_Pa0_Pd0_Pe0-_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 $\xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}}$ nucleus_ | |
| 67 | R106 | transport nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}}$ cytoplasm_Fo | |
| 68 | R107 | transport nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}}$ dnabound_Fo | |
| 69 | R108 | transport dnabound_Foxo1_Pa0_Pd0_Pe0-_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 $\xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}}$ nucleus_ | |
| 70 | R109 | transport cytoplasm_Foxo1_Pa0_Pd0_Pe1-_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 $\xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}}$ nucleus_ | |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 71 | R110 | transport nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}}$ cytoplasm_Fo | |
| 72 | R111 | transport nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}}$ dnabound_Fo | |
| 73 | R112 | transport dnabound_Foxo1_Pa0_Pd0_Pe1-_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 $\xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}}$ nucleus_ | |
| 74 | R113 | transport cytoplasm_Foxo1_Pa0_Pd0_Pe1-_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 $\xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}}$ nucleus_ | |
| 75 | R114 | transport nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}}$ cytoplasm_Fo | |
| 76 | R115 | transport nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}}$ dnabound_Fo | |
| 77 | R116 | transport dnabound_Foxo1_Pa0_Pd0_Pe1-_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 $\xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}}$ nucleus_ | |
| 78 | R117 | transport cytoplasm_Foxo1_Pa0_Pd1_Pe0-_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 $\xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}}$ nucleus_ | |
| 79 | R118 | transport nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}}$ cytoplasm_Fo | |
| 80 | R119 | transport nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}}$ dnabound_Fo | |
| 81 | R120 | transport dnabound_Foxo1_Pa0_Pd1_Pe0-_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 $\xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}}$ nucleus_ | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 82 | R121 | transport cytoplasm_Foxo1_Pa0_Pd1_Pe0-_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 $\xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}}$ nucleus_ | |
| 83 | R122 | transport nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}}$ cytoplasm_Fo | |
| 84 | R123 | transport nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}}$ dnabound_Fo | |
| 85 | R124 | transport dnabound_Foxo1_Pa0_Pd1_Pe0-_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 $\xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}}$ nucleus_ | |
| 86 | R125 | transport cytoplasm_Foxo1_Pa0_Pd1_Pe1-_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}}$ nucleus_ | |
| 87 | R126 | transport nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}}$ cytoplasm_Fo | |
| 88 | R127 | transport nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}}$ dnabound_Fo | |
| 89 | R128 | transport dnabound_Foxo1_Pa0_Pd1_Pe1-_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}}$ nucleus_ | |
| 90 | R129 | transport cytoplasm_Foxo1_Pa0_Pd1_Pe1-_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 $\xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}}$ nucleus_ | |
| 91 | R130 | transport nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}}$ cytoplasm_Fo | |
| 92 | R131 | transport nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}}$ dnabound_Fo | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 93 | R132 | transport dnabound_Foxo1_Pa0_Pd1_Pe1-_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 $\xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}}$ nucleus_ | |
| 94 | R133 | transport cytoplasm_Foxo1_Pa1_Pd0_Pe0-_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 $\xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}}$ nucleus_ | |
| 95 | R134 | transport nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 $\xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}}$ cytoplasm_Fo | |
| 96 | R135 | transport nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 $\xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}}$ dnabound_Fo | |
| 97 | R136 | transport dnabound_Foxo1_Pa1_Pd0_Pe0-_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}}$ nucleus_ | |
| 98 | R137 | transport cytoplasm_Foxo1_Pa1_Pd0_Pe0-_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 $\xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}}$ nucleus_ | |
| 99 | R138 | transport nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}}$ cytoplasm_Fo | |
| 100 | R139 | transport nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}}$ dnabound_Fo | |
| 101 | R140 | transport dnabound_Foxo1_Pa1_Pd0_Pe0-_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}}$ nucleus_ | |
| 102 | R141 | transport cytoplasm_Foxo1_Pa1_Pd0_Pe1-_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 $\xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}}$ nucleus_ | |
| 103 | R142 | transport nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 $\xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}}$ cytoplasm_Fo | |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 104 | R143 | transport nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | $\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{dnabound\_Fo}$ | |
| 105 | R144 | transport dnabound_Foxo1_Pa1_Pd0_Pe1-_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | $\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{nucleus\_l}$ | |
| 106 | R145 | transport cytoplasm_Foxo1_Pa1_Pd0_Pe1-_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | $\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{nucleus\_}$ | |
| 107 | R146 | transport nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | $\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{cytoplasm\_Fo}$ | |
| 108 | R147 | transport nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | $\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{dnabound\_Fo}$ | |
| 109 | R148 | transport dnabound_Foxo1_Pa1_Pd0_Pe1-_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | $\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{nucleus\_l}$ | |
| 110 | R149 | transport cytoplasm_Foxo1_Pa1_Pd1_Pe0-_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | $\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{nucleus\_}$ | |
| 111 | R150 | transport nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | $\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{cytoplasm\_Fo}$ | |
| 112 | R151 | transport nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | $\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{dnabound\_Fo}$ | |
| 113 | R152 | transport dnabound_Foxo1_Pa1_Pd1_Pe0-_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | $\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{nucleus\_l}$ | |
| 114 | R153 | transport cytoplasm_Foxo1_Pa1_Pd1_Pe0-_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | $\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{nucleus\_}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 115 | R154 | transport nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}}$ cytoplasm_Fo | |
| 116 | R155 | transport nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}}$ dnabound_Fo | |
| 117 | R156 | transport dnabound_Foxo1_Pa1_Pd1_Pe0-_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}}$ nucleus_I | |
| 118 | R157 | transport cytoplasm_Foxo1_Pa1_Pd1_Pe1-_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}}$ nucleus_ | |
| 119 | R158 | transport nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}}$ cytoplasm_Fo | |
| 120 | R159 | transport nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}}$ dnabound_Fo | |
| 121 | R160 | transport dnabound_Foxo1_Pa1_Pd1_Pe1-_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}}$ nucleus_I | |
| 122 | R161 | transport cytoplasm_Foxo1_Pa1_Pd1_Pe1-_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 $\xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}}$ nucleus_ | |
| 123 | R162 | transport nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}}$ cytoplasm_Fo | |
| 124 | R163 | transport nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 $\xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}}$ dnabound_Fo | |
| 125 | R164 | transport dnabound_Foxo1_Pa1_Pd1_Pe1-_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}}$ nucleus_I | |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 126 | R165 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb0 by Akt_P2 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 $\dfrac{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe}}{}$ | |
| 127 | R166 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe0-_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 by Akt_P2 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 $\dfrac{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pU}}{}$ | |
| 128 | R167 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb0 by Akt_P2 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 $\dfrac{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd0\_Pe}}{}$ | |
| 129 | R168 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb1 by Akt_P2 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 $\dfrac{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe}}{}$ | |
| 130 | R169 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe0-_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 by Akt_P2 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 $\dfrac{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pU}}{}$ | |
| 131 | R170 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb1 by Akt_P2 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 $\dfrac{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd0\_Pe}}{}$ | |
| 132 | R171 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb0 by Akt_P2 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 $\dfrac{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe}}{}$ | |
| 133 | R172 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe1-_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 by Akt_P2 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 $\dfrac{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pU}}{}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 134 | R173 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb0 by Akt_P2 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 $\frac{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd0\_Pe}}{}$ | |
| 135 | R174 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb1 by Akt_P2 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 $\frac{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe}}{}$ | |
| 136 | R175 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe1-_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 by Akt_P2 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 $\frac{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pU}}{}$ | |
| 137 | R176 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb1 by Akt_P2 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 $\frac{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd0\_Pe}}{}$ | |
| 138 | R177 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb0 by Akt_P2 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 $\frac{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe}}{}$ | |
| 139 | R178 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe0-_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 by Akt_P2 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 $\frac{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pU}}{}$ | |
| 140 | R179 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb0 by Akt_P2 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 $\frac{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0}}{}$ | |
| 141 | R180 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb1 by Akt_P2 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 $\frac{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe}}{}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 142 | R181 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe0-_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 by Akt_P2 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 $\xrightarrow{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pU}}$ | |
| 143 | R182 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb1 by Akt_P2 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 $\xrightarrow{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0}}$ | |
| 144 | R183 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb0 by Akt_P2 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe}}$ | |
| 145 | R184 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe1-_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 by Akt_P2 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pU}}$ | |
| 146 | R185 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb0 by Akt_P2 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1}}$ | |
| 147 | R186 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb1 by Akt_P2 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 $\xrightarrow{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe}}$ | |
| 148 | R187 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe1-_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 by Akt_P2 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 $\xrightarrow{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pU}}$ | |
| 149 | R188 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb1 by Akt_P2 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 $\xrightarrow{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1}}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 150 | R189 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb0 by SGK | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 $\xrightarrow{\text{SGK, SGK, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pU}}$ | |
| 151 | R190 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe0-_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 by SGK | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 $\xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}}$ n | |
| 152 | R191 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb0 by SGK | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 $\xrightarrow{\text{SGK, SGK, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pU}}$ | |
| 153 | R192 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb1 by SGK | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 $\xrightarrow{\text{SGK, SGK, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pU}}$ | |
| 154 | R193 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe0-_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 by SGK | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 $\xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}}$ n | |
| 155 | R194 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb1 by SGK | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 $\xrightarrow{\text{SGK, SGK, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pU}}$ | |
| 156 | R195 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb0 by SGK | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 $\xrightarrow{\text{SGK, SGK, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pU}}$ | |
| 157 | R196 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe1-_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 by SGK | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 $\xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}}$ n | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 158 | R197 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb0 by SGK | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 $\xrightarrow{}$ | SGK, SGK, dnabound_Foxo1_Pa0_Pd0_Pe1_pU |
| 159 | R198 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb1 by SGK | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 $\xrightarrow{}$ | SGK, SGK, cytoplasm_Foxo1_Pa0_Pd0_Pe1_pU |
| 160 | R199 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe1-_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 by SGK | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 $\xrightarrow{}$ n | SGK, SGK, nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 |
| 161 | R200 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb1 by SGK | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 $\xrightarrow{}$ | SGK, SGK, dnabound_Foxo1_Pa0_Pd0_Pe1_pU |
| 162 | R201 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb0 by SGK | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 $\xrightarrow{}$ | SGK, SGK, cytoplasm_Foxo1_Pa0_Pd1_Pe0_pU |
| 163 | R202 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe0-_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 by SGK | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 $\xrightarrow{}$ n | SGK, SGK, nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 |
| 164 | R203 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb0 by SGK | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 $\xrightarrow{}$ | SGK, SGK, dnabound_Foxo1_Pa0_Pd1_Pe0_pU |
| 165 | R204 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb1 by SGK | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 $\xrightarrow{}$ | SGK, SGK, cytoplasm_Foxo1_Pa0_Pd1_Pe0_pU |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 166 | R205 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe0-_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 by SGK | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 $\xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}}$ n | |
| 167 | R206 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb1 by SGK | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 $\xrightarrow{\text{SGK, SGK, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pU}}$ | |
| 168 | R207 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb0 by SGK | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{SGK, SGK, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pU}}$ | |
| 169 | R208 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe1-_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 by SGK | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}}$ n | |
| 170 | R209 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb0 by SGK | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{SGK, SGK, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pU}}$ | |
| 171 | R210 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb1 by SGK | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 $\xrightarrow{\text{SGK, SGK, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pU}}$ | |
| 172 | R211 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe1-_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 by SGK | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 $\xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}}$ n | |
| 173 | R212 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb1 by SGK | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 $\xrightarrow{\text{SGK, SGK, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pU}}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 174 | R213 | conversion of cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb0 by PP2A | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_}}$ |  |
| 175 | R214 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe0-_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 by PP2A | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}}$ |  |
| 176 | R215 | conversion of dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb0 by PP2A | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_}}$ |  |
| 177 | R216 | conversion of cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb1 by PP2A | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_}}$ |  |
| 178 | R217 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe0-_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 by PP2A | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}}$ |  |
| 179 | R218 | conversion of dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb1 by PP2A | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_}}$ |  |
| 180 | R219 | conversion of cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb0 by PP2A | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_}}$ |  |
| 181 | R220 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe1-_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 by PP2A | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}}$ |  |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 182 | R221 | conversion of dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb0 by PP2A | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_p}}$ |  |
| 183 | R222 | conversion of cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb1 by PP2A | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_p}}$ |  |
| 184 | R223 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe1-_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 by PP2A | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}}$ |  |
| 185 | R224 | conversion of dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb1 by PP2A | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_p}}$ |  |
| 186 | R225 | conversion of cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb0 by PP2A | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_p}}$ |  |
| 187 | R226 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe0-_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 by PP2A | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}}$ |  |
| 188 | R227 | conversion of dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb0 by PP2A | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_p}}$ |  |
| 189 | R228 | conversion of cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb1 by PP2A | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_p}}$ |  |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 190 | R229 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe0-_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 by PP2A | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}}$ | |
| 191 | R230 | conversion of dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb1 by PP2A | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_p}}$ | |
| 192 | R231 | conversion of cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb0 by PP2A | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_}}$ | |
| 193 | R232 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe1-_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 by PP2A | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}}$ | |
| 194 | R233 | conversion of dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb0 by PP2A | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_p}}$ | |
| 195 | R234 | conversion of cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb1 by PP2A | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_}}$ | |
| 196 | R235 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe1-_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 by PP2A | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}}$ | |
| 197 | R236 | conversion of dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb1 by PP2A | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_p}}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|----|----|----|
| 198 | R237 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb0 by IKK_P | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | $\dfrac{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0}}{}$ |
| 199 | R238 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe0-_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 by IKK_P | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | $\dfrac{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb}}{}$ |
| 200 | R239 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb0 by IKK_P | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | $\dfrac{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0}}{}$ |
| 201 | R240 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb1 by IKK_P | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | $\dfrac{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0}}{}$ |
| 202 | R241 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe0-_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 by IKK_P | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | $\dfrac{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb}}{}$ |
| 203 | R242 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb1 by IKK_P | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | $\dfrac{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0}}{}$ |
| 204 | R243 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb0 by IKK_P | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | $\dfrac{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1}}{}$ |
| 205 | R244 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe1-_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 by IKK_P | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | $\dfrac{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb}}{}$ |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 206 | R245 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb0 by IKK_P | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 $\dfrac{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1}}{}$ | |
| 207 | R246 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb1 by IKK_P | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 $\dfrac{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1}}{}$ | |
| 208 | R247 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe1-_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 by IKK_P | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 $\dfrac{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb}}{}$ | |
| 209 | R248 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb1 by IKK_P | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 $\dfrac{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1}}{}$ | |
| 210 | R249 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb0 by PP2A | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 $\dfrac{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0}}{}$ | |
| 211 | R250 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe0-_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 by PP2A | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 $\dfrac{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}}{\longrightarrow}$ | |
| 212 | R251 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb0 by PP2A | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 $\dfrac{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_p}}{}$ | |
| 213 | R252 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb1 by PP2A | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 $\dfrac{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_p}}{}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 214 | R253 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe0-_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 by PP2A | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}}$ | |
| 215 | R254 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb1 by PP2A | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_p}}$ | |
| 216 | R255 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb0 by PP2A | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_p}}$ | |
| 217 | R256 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe1-_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 by PP2A | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}}$ | |
| 218 | R257 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb0 by PP2A | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_p}}$ | |
| 219 | R258 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb1 by PP2A | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_p}}$ | |
| 220 | R259 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe1-_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 by PP2A | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}}$ | |
| 221 | R260 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb1 by PP2A | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_p}}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 222 | R261 | conversion of cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb0 by IKK_P | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 $\dfrac{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0}}{}$ | |
| 223 | R262 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe0-_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 by IKK_P | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 $\dfrac{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb}}{}$ | |
| 224 | R263 | conversion of dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb0 by IKK_P | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 $\dfrac{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0}}{}$ | |
| 225 | R264 | conversion of cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb1 by IKK_P | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 $\dfrac{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0}}{}$ | |
| 226 | R265 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe0-_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 by IKK_P | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 $\dfrac{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb}}{}$ | |
| 227 | R266 | conversion of dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb1 by IKK_P | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 $\dfrac{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0}}{}$ | |
| 228 | R267 | conversion of cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb0 by IKK_P | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 $\dfrac{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1}}{}$ | |
| 229 | R268 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe1-_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 by IKK_P | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 $\dfrac{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb}}{}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 230 | R269 | conversion of dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb0 by IKK_P | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 $\xrightarrow{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1}}$ | |
| 231 | R270 | conversion of cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb1 by IKK_P | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 $\xrightarrow{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1}}$ | |
| 232 | R271 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe1-_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 by IKK_P | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 $\xrightarrow{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb}}$ | |
| 233 | R272 | conversion of dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb1 by IKK_P | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 $\xrightarrow{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1}}$ | |
| 234 | R273 | conversion of cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb0 by PP2A | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0}}$ | |
| 235 | R274 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe0-_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 by PP2A | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}}$ | |
| 236 | R275 | conversion of dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb0 by PP2A | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_p}}$ | |
| 237 | R276 | conversion of cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb1 by PP2A | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_p}}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 238 | R277 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe0-_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 by PP2A | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}}$ | |
| 239 | R278 | conversion of dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb1 by PP2A | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_p}}$ | |
| 240 | R279 | conversion of cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb0 by PP2A | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_}}$ | |
| 241 | R280 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe1-_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 by PP2A | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}}$ | |
| 242 | R281 | conversion of dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb0 by PP2A | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_p}}$ | |
| 243 | R282 | conversion of cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb1 by PP2A | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_}}$ | |
| 244 | R283 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe1-_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 by PP2A | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}}$ | |
| 245 | R284 | conversion of dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb1 by PP2A | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_p}}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 246 | R285 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb0 by JNK_P | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 $\xrightarrow{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0}}$ |  |
| 247 | R286 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe0-_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 by JNK_P | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 $\xrightarrow{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pU}}$ |  |
| 248 | R287 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb0 by JNK_P | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 $\xrightarrow{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0}}$ |  |
| 249 | R288 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb1 by JNK_P | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 $\xrightarrow{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0}}$ |  |
| 250 | R289 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe0-_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 by JNK_P | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 $\xrightarrow{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pU}}$ |  |
| 251 | R290 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb1 by JNK_P | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 $\xrightarrow{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0}}$ |  |
| 252 | R291 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb0 by PP2A | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_}}$ |  |
| 253 | R292 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe1-_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 by PP2A | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}}$ |  |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 254 | R293 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb0 by PP2A | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_p}}$ | |
| 255 | R294 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb1 by PP2A | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_p}}$ | |
| 256 | R295 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe1-_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 by PP2A | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}}$ | |
| 257 | R296 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb1 by PP2A | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_p}}$ | |
| 258 | R297 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb0 by JNK_P | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 $\xrightarrow{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0}}$ | |
| 259 | R298 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe0-_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 by JNK_P | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 $\xrightarrow{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb}}$ | |
| 260 | R299 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb0 by JNK_P | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 $\xrightarrow{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0}}$ | |
| 261 | R300 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb1 by JNK_P | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 $\xrightarrow{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0}}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 262 | R301 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe0-_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 by JNK_P | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 $\dfrac{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pU}}{}$ | |
| 263 | R302 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb1 by JNK_P | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 $\dfrac{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0}}{}$ | |
| 264 | R303 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb0 by PP2A | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 $\dfrac{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_}}{}$ | |
| 265 | R304 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe1-_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 by PP2A | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 $\dfrac{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}}{}$ | |
| 266 | R305 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb0 by PP2A | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 $\dfrac{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_p}}{}$ | |
| 267 | R306 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb1 by PP2A | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 $\dfrac{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_}}{}$ | |
| 268 | R307 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe1-_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 by PP2A | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 $\dfrac{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}}{}$ | |
| 269 | R308 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb1 by PP2A | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 $\dfrac{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_p}}{}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 270 | R309 | conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 by JNK_P | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 $\dfrac{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe}}{}$ | |
| 271 | R310 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 by JNK_P | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 $\dfrac{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb}}{}$ | |
| 272 | R311 | conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 by JNK_P | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 $\dfrac{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0}}{}$ | |
| 273 | R312 | conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 by JNK_P | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 $\dfrac{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe}}{}$ | |
| 274 | R313 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 by JNK_P | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 $\dfrac{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb}}{}$ | |
| 275 | R314 | conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 by JNK_P | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 $\dfrac{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0}}{}$ | |
| 276 | R315 | conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 by PP2A | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 $\dfrac{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_}}{}$ | |
| 277 | R316 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 by PP2A | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 $\dfrac{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}}{\longrightarrow}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 278 | R317 | conversion of dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb0 by PP2A | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 $\dfrac{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_p}}{}$ | |
| 279 | R318 | conversion of cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb1 by PP2A | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 $\dfrac{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_p}}{}$ | |
| 280 | R319 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe1-_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 by PP2A | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 $\dfrac{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}}{}$ | |
| 281 | R320 | conversion of dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb1 by PP2A | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 $\dfrac{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_p}}{}$ | |
| 282 | R321 | conversion of cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb0 by JNK_P | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 $\dfrac{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe(}}{}$ | |
| 283 | R322 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe0-_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 by JNK_P | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 $\dfrac{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUl}}{}$ | |
| 284 | R323 | conversion of dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb0 by JNK_P | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 $\dfrac{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0}}{}$ | |
| 285 | R324 | conversion of cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb1 by JNK_P | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 $\dfrac{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe(}}{}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 286 | R325 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 by JNK_P | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 $\xrightarrow{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUk}}$ | |
| 287 | R326 | conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 by JNK_P | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 $\xrightarrow{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0}}$ | |
| 288 | R327 | conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 by PP2A | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1}}$ | |
| 289 | R328 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 by PP2A | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}}$ | |
| 290 | R329 | conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 by PP2A | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_p}}$ | |
| 291 | R330 | conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 by PP2A | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1}}$ | |
| 292 | R331 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 by PP2A | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}}$ | |
| 293 | R332 | conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 by PP2A | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 $\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_p}}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 294 | R333 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb1 by SCF | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 $\xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pU}}$ | |
| 295 | R334 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe0-_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 by SCF | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 $\xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}}$ nu | |
| 296 | R335 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd0-_Pe0_pUb1 by SCF | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 $\xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb}}$ | |
| 297 | R336 | conversion of cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb1 by SCF | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 $\xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pU}}$ | |
| 298 | R337 | conversion of nucleus_Foxo1_Pa0_Pd0_Pe1-_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 by SCF | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 $\xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}}$ nu | |
| 299 | R338 | conversion of dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd0-_Pe1_pUb1 by SCF | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 $\xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb}}$ | |
| 300 | R339 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb1 by SCF | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 $\xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pU}}$ | |
| 301 | R340 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe0-_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 by SCF | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 $\xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}}$ nu | |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 302 | R341 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd1-_Pe0_pUb1 by SCF | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 $\xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb}}$ | |
| 303 | R342 | conversion of cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb1 by SCF | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pU}}$ | |
| 304 | R343 | conversion of nucleus_Foxo1_Pa0_Pd1_Pe1-_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 by SCF | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}}$ n | |
| 305 | R344 | conversion of dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd1-_Pe1_pUb1 by SCF | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 $\xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb}}$ | |
| 306 | R345 | conversion of cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb1 by SCF | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 $\xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pU}}$ | |
| 307 | R346 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe0-_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 by SCF | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 $\xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}}$ n | |
| 308 | R347 | conversion of dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd0-_Pe0_pUb1 by SCF | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 $\xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb}}$ | |
| 309 | R348 | conversion of cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb1 by SCF | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 $\xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pU}}$ | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 310 | R349 | conversion of nucleus_Foxo1_Pa1_Pd0_Pe1-_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 by SCF | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 $\xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}}$ nu |
| 311 | R350 | conversion of dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd0-_Pe1_pUb1 by SCF | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 $\xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pU}}$ |
| 312 | R351 | conversion of cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb1 by SCF | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 $\xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pU}}$ |
| 313 | R352 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe0-_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 by SCF | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 $\xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}}$ nu |
| 314 | R353 | conversion of dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd1-_Pe0_pUb1 by SCF | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 $\xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb}}$ |
| 315 | R354 | conversion of cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb1 by SCF | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pU}}$ |
| 316 | R355 | conversion of nucleus_Foxo1_Pa1_Pd1_Pe1-_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 by SCF | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}}$ nu |
| 317 | R356 | conversion of dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd1-_Pe1_pUb1 by SCF | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 $\xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb}}$ |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 318 | R357 | degradation of cytoplasm_Foxo1_Pa0_Pd0-_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 $\dfrac{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa0}}{}$ |  |
| 319 | R358 | degradation of cytoplasm_Foxo1_Pa0_Pd0-_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 $\dfrac{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa0}}{}$ |  |
| 320 | R359 | degradation of cytoplasm_Foxo1_Pa0_Pd1-_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 $\dfrac{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa0}}{}$ |  |
| 321 | R360 | degradation of cytoplasm_Foxo1_Pa0_Pd1-_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 $\dfrac{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa0}}{}$ |  |
| 322 | R361 | degradation of cytoplasm_Foxo1_Pa1_Pd0-_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 $\dfrac{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa}}{}$ |  |
| 323 | R362 | degradation of cytoplasm_Foxo1_Pa1_Pd0-_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 $\dfrac{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa}}{}$ |  |
| 324 | R363 | degradation of cytoplasm_Foxo1_Pa1_Pd1-_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 $\dfrac{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa}}{}$ |  |
| 325 | R364 | degradation of cytoplasm_Foxo1_Pa1_Pd1-_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 $\dfrac{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa}}{}$ |  |
| 326 | R365 | transcription of InR by dnabound_Foxo1_Pa0-_Pd0_Pe0_pUb0 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}}$ nuc |  |
| 327 | R366 | transcription of SOD2 by dnabound_Foxo1-_Pa0_Pd0_Pe0_pUb0 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}}$ nuc |  |
| 328 | R367 | transcription of InR by dnabound_Foxo1_Pa0-_Pd0_Pe0_pUb1 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}}$ nuc |  |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 329 | R368 | transcription of SOD2 by dnabound_Foxo1-_Pa0_Pd0_Pe0_pUb1 | $\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}}$ nucl | |
| 330 | R369 | transcription of InR by dnabound_Foxo1_Pa0-_Pd0_Pe1_pUb0 | $\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}}$ nucl | |
| 331 | R370 | transcription of SOD2 by dnabound_Foxo1-_Pa0_Pd0_Pe1_pUb0 | $\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}}$ nucl | |
| 332 | R371 | transcription of InR by dnabound_Foxo1_Pa0-_Pd0_Pe1_pUb1 | $\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}}$ nucl | |
| 333 | R372 | transcription of SOD2 by dnabound_Foxo1-_Pa0_Pd0_Pe1_pUb1 | $\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}}$ nucl | |
| 334 | R373 | transcription of InR by dnabound_Foxo1_Pa0-_Pd1_Pe0_pUb0 | $\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}}$ nucl | |
| 335 | R374 | transcription of SOD2 by dnabound_Foxo1-_Pa0_Pd1_Pe0_pUb0 | $\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}}$ nucl | |
| 336 | R375 | transcription of InR by dnabound_Foxo1_Pa0-_Pd1_Pe0_pUb1 | $\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}}$ nucl | |
| 337 | R376 | transcription of SOD2 by dnabound_Foxo1-_Pa0_Pd1_Pe0_pUb1 | $\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}}$ nucl | |
| 338 | R377 | transcription of InR by dnabound_Foxo1_Pa0-_Pd1_Pe1_pUb0 | $\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}}$ nucl | |
| 339 | R378 | transcription of SOD2 by dnabound_Foxo1-_Pa0_Pd1_Pe1_pUb0 | $\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}}$ nucl | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 340 | R379 | transcription of InR by dnabound_Foxo1_Pa0-_Pd1_Pe1_pUb1 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}}$ nucl | |
| 341 | R380 | transcription of SOD2 by dnabound_Foxo1-_Pa0_Pd1_Pe1_pUb1 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}}$ nucl | |
| 342 | R381 | transcription of InR by dnabound_Foxo1_Pa1-_Pd0_Pe0_pUb0 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}}$ nucl | |
| 343 | R382 | transcription of SOD2 by dnabound_Foxo1-_Pa1_Pd0_Pe0_pUb0 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}}$ nucl | |
| 344 | R383 | transcription of InR by dnabound_Foxo1_Pa1-_Pd0_Pe0_pUb1 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}}$ nucl | |
| 345 | R384 | transcription of SOD2 by dnabound_Foxo1-_Pa1_Pd0_Pe0_pUb1 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}}$ nucl | |
| 346 | R385 | transcription of InR by dnabound_Foxo1_Pa1-_Pd0_Pe1_pUb0 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}}$ nucl | |
| 347 | R386 | transcription of SOD2 by dnabound_Foxo1-_Pa1_Pd0_Pe1_pUb0 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}}$ nucl | |
| 348 | R387 | transcription of InR by dnabound_Foxo1_Pa1-_Pd0_Pe1_pUb1 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}}$ nucl | |
| 349 | R388 | transcription of SOD2 by dnabound_Foxo1-_Pa1_Pd0_Pe1_pUb1 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}}$ nucl | |
| 350 | R389 | transcription of InR by dnabound_Foxo1_Pa1-_Pd1_Pe0_pUb0 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}}$ nucl | |

| № | Id | Name | Reaction Equation | SBO |
|---|----|------|-------------------|-----|
| 351 | R390 | transcription of SOD2 by dnabound_Foxo1-_Pa1_Pd1_Pe0_pUb0 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}}$ nuc] | |
| 352 | R391 | transcription of InR by dnabound_Foxo1_Pa1-_Pd1_Pe0_pUb1 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}}$ nuc] | |
| 353 | R392 | transcription of SOD2 by dnabound_Foxo1-_Pa1_Pd1_Pe0_pUb1 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}}$ nuc] | |
| 354 | R393 | transcription of InR by dnabound_Foxo1_Pa1-_Pd1_Pe1_pUb0 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}}$ nuc] | |
| 355 | R394 | transcription of SOD2 by dnabound_Foxo1-_Pa1_Pd1_Pe1_pUb0 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}}$ nuc] | |
| 356 | R395 | transcription of InR by dnabound_Foxo1_Pa1-_Pd1_Pe1_pUb1 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}}$ nuc] | |
| 357 | R396 | transcription of SOD2 by dnabound_Foxo1-_Pa1_Pd1_Pe1_pUb1 | null $\xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}}$ nuc] | |
| 358 | R397 | basal transcription of InR | null $\longrightarrow$ nucleus_RNA_InR | |
| 359 | R398 | export of InR RNA | nucleus_RNA_InR $\xrightarrow{\text{nucleus\_RNA\_InR}}$ cytoplasm_RNA_InR | |
| 360 | R399 | cyto degr of InR RNA | cytoplasm_RNA_InR $\xrightarrow{\text{cytoplasm\_RNA\_InR}}$ null | |
| 361 | R400 | translation of InR | null $\xrightarrow{\text{cytoplasm\_RNA\_InR, cytoplasm\_RNA\_InR}}$ cytoplasm_InR | |
| 362 | R401 | degradation of InR protein | cytoplasm_InR $\xrightarrow{\text{cytoplasm\_InR}}$ null | |
| 363 | R402 | basal transcription of SOD2 | null $\longrightarrow$ nucleus_RNA_SOD2 | |
| 364 | R403 | export of SOD2 RNA | nucleus_RNA_SOD2 $\xrightarrow{\text{nucleus\_RNA\_SOD2}}$ cytoplasm_RNA_SOD2 | |
| 365 | R404 | cyto degr of SOD2 RNA | cytoplasm_RNA_SOD2 $\xrightarrow{\text{cytoplasm\_RNA\_SOD2}}$ null | |

| № | Id | Name | Reaction Equation | SBO |
|---|---|---|---|---|
| 366 | R405 | translation of SOD2 | null $\xrightarrow{\text{cytoplasm\_RNA\_SOD2, cytoplasm\_RNA\_SOD2}}$ cytoplasm\_SOD2 | |
| 367 | R406 | degradation of SOD2 protein | cytoplasm\_SOD2 $\xrightarrow{\text{cytoplasm\_SOD2}}$ null | |

## 8.1 Reaction `R1f`

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

**Name** R1f

**Reaction equation**

$$\text{Ins} + \text{InR} \xrightarrow{\text{InR, Ins}} \text{Ins\_InR} \tag{396}$$

**Reactants**

Table 6: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| Ins | Ins | |
| InR | InR | |

**Modifiers**

Table 7: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| InR | InR | |
| Ins | Ins | |

**Product**

Table 8: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| Ins_InR | Ins_InR | |

**Kinetic Law**

**Derived unit**  contains undeclared units

$$v_1 = \text{function\_1}\left([\text{InR}], [\text{Ins}], \text{vol}\left(\text{cellsurface}\right), \text{vol}\left(\text{extracellular}\right), \text{k1}\right) \tag{397}$$

$$\begin{aligned}
&\text{function\_1}\left([\text{InR}], [\text{Ins}], \text{vol}\left(\text{cellsurface}\right), \text{vol}\left(\text{extracellular}\right), \text{k1}\right) \\
&= \text{k1} \cdot [\text{Ins}] \cdot \text{vol}\left(\text{extracellular}\right) \cdot [\text{InR}] \cdot \text{vol}\left(\text{cellsurface}\right)
\end{aligned} \tag{398}$$

## 8.2 Reaction `R1r`

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

**Name** R1r

### Reaction equation

$$\text{Ins\_InR} \xrightarrow{\text{Ins\_InR}} \text{InR} + \text{Ins} \tag{399}$$

### Reactant

Table 9: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| Ins_InR | Ins_InR | |

### Modifier

Table 10: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Ins_InR | Ins_InR | |

### Products

Table 11: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| InR | InR | |
| Ins | Ins | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_2 = \text{function\_2}\left([\text{Ins\_InR}], \text{vol}\left(\text{cellsurface}\right), \text{kminus1}\right) \tag{400}$$

$$\text{function\_2}\left([\text{Ins\_InR}], \text{vol}\left(\text{cellsurface}\right), \text{kminus1}\right) = \text{kminus1} \cdot [\text{Ins\_InR}] \cdot \text{vol}\left(\text{cellsurface}\right) \tag{401}$$

## 8.3 Reaction R2

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R2

### Reaction equation

$$\text{Ins\_InR} \xrightarrow{\text{Ins\_InR}} \text{Ins\_InR\_P} \tag{402}$$

### Reactant

Table 12: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| Ins_InR | Ins_InR | |

### Modifier

Table 13: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Ins_InR | Ins_InR | |

### Product

Table 14: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| Ins_InR_P | Ins_InR_P | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_3 = \text{vol}\left(\text{cellsurface}\right) \cdot \text{function\_3}\left([\text{Ins\_InR}], \text{vol}\left(\text{cellsurface}\right), k3\right) \tag{403}$$

$$\text{function\_3}\left([\text{Ins\_InR}], \text{vol}\left(\text{cellsurface}\right), k3\right) = \frac{k3 \cdot [\text{Ins\_InR}] \cdot \text{vol}\left(\text{cellsurface}\right)}{\text{vol}\left(\text{cellsurface}\right)} \tag{404}$$

$$\text{function\_3}\left([\text{Ins\_InR}], \text{vol}\left(\text{cellsurface}\right), k3\right) = \frac{k3 \cdot [\text{Ins\_InR}] \cdot \text{vol}\left(\text{cellsurface}\right)}{\text{vol}\left(\text{cellsurface}\right)} \tag{405}$$

## 8.4 Reaction `R3f`

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

**Name** R3f

### Reaction equation

$$\text{Ins} + \text{Ins\_InR\_P} \xrightarrow{\text{Ins, Ins\_InR\_P}} \text{Ins\_2\_InR\_P} \tag{406}$$

### Reactants

Table 15: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| Ins | Ins | |
| Ins_InR_P | Ins_InR_P | |

### Modifiers

Table 16: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| Ins | Ins | |
| Ins_InR_P | Ins_InR_P | |

### Product

Table 17: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| Ins_2_InR_P | Ins_2_InR_P | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_4 = \text{function\_4}\left([\text{Ins}], [\text{Ins\_InR\_P}], \text{vol}\left(\text{cellsurface}\right), \text{vol}\left(\text{extracellular}\right), k2\right) \tag{407}$$

$$\begin{aligned}\text{function\_4}&\left([\text{Ins}], [\text{Ins\_InR\_P}], \text{vol}\left(\text{cellsurface}\right), \text{vol}\left(\text{extracellular}\right), k2\right) \\ &= k2 \cdot [\text{Ins}] \cdot \text{vol}\left(\text{extracellular}\right) \cdot [\text{Ins\_InR\_P}] \cdot \text{vol}\left(\text{cellsurface}\right)\end{aligned} \tag{408}$$

## 8.5 Reaction `R3r`

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

**Name** R3r

### Reaction equation

$$\text{Ins\_2\_InR\_P} \xrightarrow{\text{Ins\_2\_InR\_P}} \text{Ins\_InR\_P} + \text{Ins} \tag{409}$$

### Reactant

Table 18: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| Ins_2_InR_P | Ins_2_InR_P | |

### Modifier

Table 19: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Ins_2_InR_P | Ins_2_InR_P | |

### Products

Table 20: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| Ins_InR_P | Ins_InR_P | |
| Ins | Ins | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_5 = \text{function\_5}\left([\text{Ins\_2\_InR\_P}], \text{vol}\left(\text{cellsurface}\right), \text{kminus2}\right) \tag{410}$$

$$\begin{aligned} &\text{function\_5}\left([\text{Ins\_2\_InR\_P}], \text{vol}\left(\text{cellsurface}\right), \text{kminus2}\right) \\ &= \text{kminus2} \cdot [\text{Ins\_2\_InR\_P}] \cdot \text{vol}\left(\text{cellsurface}\right) \end{aligned} \tag{411}$$

## 8.6  Reaction R4

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R4

### Reaction equation

$$\text{Ins\_InR\_P} \xrightarrow{\text{PTP1B, Ins\_InR\_P, PTP1B}} \text{InR} \tag{412}$$

### Reactant

Table 21: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| Ins_InR_P | Ins_InR_P | |

### Modifiers

Table 22: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PTP1B | PTP1B | |
| Ins_InR_P | Ins_InR_P | |
| PTP1B | PTP1B | |

### Product

Table 23: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| InR | InR | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$
\begin{aligned}
v_6 = {}& \text{vol}\,(\text{cellsurface}) \\
& \cdot \text{function\_6}\,([\text{Ins\_InR\_P}], [\text{PTP1B}], \text{vol}\,(\text{cellsurface})\,, \text{vol}\,(\text{cytoplasm})\,, \text{kminus3})
\end{aligned} \tag{413}
$$

$$\text{function\_6}\left([\text{Ins\_InR\_P}], [\text{PTP1B}], \text{vol}\left(\text{cellsurface}\right), \text{vol}\left(\text{cytoplasm}\right), \text{kminus3}\right)$$
$$= \frac{\text{kminus3} \cdot [\text{PTP1B}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{Ins\_InR\_P}] \cdot \text{vol}\left(\text{cellsurface}\right)}{\text{vol}\left(\text{cellsurface}\right)} \quad (414)$$

$$\text{function\_6}\left([\text{Ins\_InR\_P}], [\text{PTP1B}], \text{vol}\left(\text{cellsurface}\right), \text{vol}\left(\text{cytoplasm}\right), \text{kminus3}\right)$$
$$= \frac{\text{kminus3} \cdot [\text{PTP1B}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{Ins\_InR\_P}] \cdot \text{vol}\left(\text{cellsurface}\right)}{\text{vol}\left(\text{cellsurface}\right)} \quad (415)$$

## 8.7 Reaction `R5f`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R5f

**Reaction equation**

$$\text{InR} \xrightarrow{\text{InR}} \text{cytoplasm\_InR} \quad (416)$$

**Reactant**

Table 24: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| InR | InR | |

**Modifier**

Table 25: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| InR | InR | |

**Product**

Table 26: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_InR | cytoplasm_InR | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_7 = \text{function\_7}\left([\text{InR}], \text{vol}\left(\text{cellsurface}\right), \text{k4}\right) \tag{417}$$

$$\text{function\_7}\left([\text{InR}], \text{vol}\left(\text{cellsurface}\right), \text{k4}\right) = \text{k4} \cdot [\text{InR}] \cdot \text{vol}\left(\text{cellsurface}\right) \tag{418}$$

## 8.8 Reaction `R5r`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R5r

**Reaction equation**

$$\text{cytoplasm\_InR} \xrightarrow{\text{cytoplasm\_InR}} \text{InR} \tag{419}$$
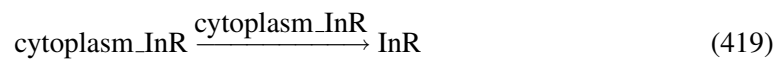
**Reactant**

Table 27: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_InR | cytoplasm_InR | |

**Modifier**

Table 28: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_InR | cytoplasm_InR | |

**Product**

Table 29: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| InR | InR | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_8 = \text{function\_8} \left( \text{vol} \left( \text{cytoplasm} \right), \left[ \text{cytoplasm\_InR} \right], \text{kminus4} \right) \tag{420}$$

$$\begin{aligned} \text{function\_8} &\left( \text{vol} \left( \text{cytoplasm} \right), \left[ \text{cytoplasm\_InR} \right], \text{kminus4} \right) \\ &= \text{kminus4} \cdot \left[ \text{cytoplasm\_InR} \right] \cdot \text{vol} \left( \text{cytoplasm} \right) \end{aligned} \tag{421}$$

## 8.9 Reaction R6f

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R6f

**Reaction equation**

$$\text{Ins\_2\_InR\_P} \xrightarrow{\text{Ins\_2\_InR\_P}} \text{cytoplasm\_Ins\_2\_InR\_P} \tag{422}$$

**Reactant**

Table 30: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| Ins_2_InR_P | Ins_2_InR_P | |

**Modifier**

Table 31: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Ins_2_InR_P | Ins_2_InR_P | |

**Product**

Table 32: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Ins_2_InR_P | cytoplasm_Ins_2_InR_P | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_9 = \text{function\_9}\left([\text{Ins\_2\_InR\_P}], \text{vol}\left(\text{cellsurface}\right), \text{k4prime}\right) \tag{423}$$

$$\text{function\_9}\left([\text{Ins\_2\_InR\_P}], \text{vol}\left(\text{cellsurface}\right), \text{k4prime}\right) = \text{k4prime} \cdot [\text{Ins\_2\_InR\_P}] \cdot \text{vol}\left(\text{cellsurface}\right) \tag{424}$$

## 8.10 Reaction `R6r`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R6r

**Reaction equation**

$$\text{cytoplasm\_Ins\_2\_InR\_P} \xrightarrow{\text{cytoplasm\_Ins\_2\_InR\_P}} \text{Ins\_2\_InR\_P} \tag{425}$$
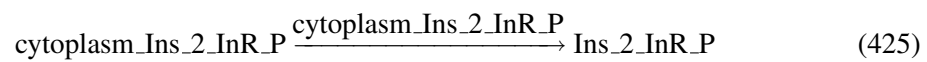
**Reactant**

Table 33: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| `cytoplasm_Ins_2_InR_P` | cytoplasm_Ins_2_InR_P | |

**Modifier**

Table 34: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| `cytoplasm_Ins_2_InR_P` | cytoplasm_Ins_2_InR_P | |

**Product**

Table 35: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| `Ins_2_InR_P` | Ins_2_InR_P | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{10} = \text{function\_10}\left(\text{vol}\left(\text{cytoplasm}\right), \left[\text{cytoplasm\_Ins\_2\_InR\_P}\right], \text{kminus4prime}\right) \quad (426)$$

$$\begin{aligned}
&\text{function\_10}\left(\text{vol}\left(\text{cytoplasm}\right), \left[\text{cytoplasm\_Ins\_2\_InR\_P}\right], \text{kminus4prime}\right) \\
&= \text{kminus4prime} \cdot \left[\text{cytoplasm\_Ins\_2\_InR\_P}\right] \cdot \text{vol}\left(\text{cytoplasm}\right)
\end{aligned} \quad (427)$$

## 8.11 Reaction `R7f`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R7f

### Reaction equation

$$\text{Ins\_InR\_P} \xrightarrow{\text{Ins\_InR\_P}} \text{cytoplasm\_Ins\_InR\_P} \quad (428)$$
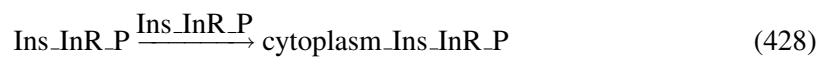
### Reactant

Table 36: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| Ins_InR_P | Ins_InR_P | |

### Modifier

Table 37: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Ins_InR_P | Ins_InR_P | |

### Product

Table 38: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Ins_InR_P | cytoplasm_Ins_InR_P | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{11} = \text{function\_11} \left( [\text{Ins\_InR\_P}], \text{vol} \left( \text{cellsurface} \right), \text{k4prime} \right) \tag{429}$$

$$\text{function\_11} \left( [\text{Ins\_InR\_P}], \text{vol} \left( \text{cellsurface} \right), \text{k4prime} \right) = \text{k4prime} \cdot [\text{Ins\_InR\_P}] \cdot \text{vol} \left( \text{cellsurface} \right) \tag{430}$$

## 8.12 Reaction `R7r`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R7r

**Reaction equation**

$$\text{cytoplasm\_Ins\_InR\_P} \xrightarrow{\text{cytoplasm\_Ins\_InR\_P}} \text{Ins\_InR\_P} \tag{431}$$
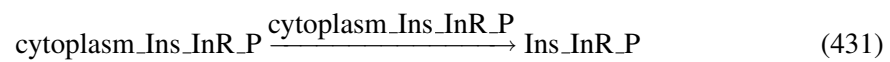
**Reactant**

Table 39: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Ins_InR_P | cytoplasm_Ins_InR_P | |

**Modifier**

Table 40: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Ins_InR_P | cytoplasm_Ins_InR_P | |

**Product**

Table 41: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| Ins_InR_P | Ins_InR_P | |

**Kinetic Law**

**Derived unit**  contains undeclared units

$$v_{12} = \text{function\_12} \left( \text{vol} \left( \text{cytoplasm} \right), \left[ \text{cytoplasm\_Ins\_InR\_P} \right], \text{kminus4prime} \right) \tag{432}$$

$$\begin{aligned} \text{function\_12} &\left( \text{vol} \left( \text{cytoplasm} \right), \left[ \text{cytoplasm\_Ins\_InR\_P} \right], \text{kminus4prime} \right) \\ &= \text{kminus4prime} \cdot \left[ \text{cytoplasm\_Ins\_InR\_P} \right] \cdot \text{vol} \left( \text{cytoplasm} \right) \end{aligned} \tag{433}$$

## 8.13 Reaction R10

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  R10

**Reaction equation**

$$\text{cytoplasm\_Ins\_2\_InR\_P} \xrightarrow{\text{PTP1B, PTP1B, cytoplasm\_Ins\_2\_InR\_P}} \text{cytoplasm\_InR} \tag{434}$$
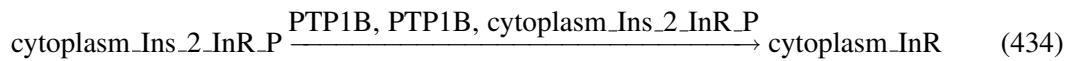
**Reactant**

Table 42: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Ins_2_InR_P | cytoplasm_Ins_2_InR_P | |

**Modifiers**

Table 43: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PTP1B | PTP1B | |
| PTP1B | PTP1B | |
| cytoplasm_Ins_2_InR_P | cytoplasm_Ins_2_InR_P | |

**Product**

Table 44: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_InR | cytoplasm_InR | |

*Produced by SBML2LATEX*

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{13} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_13}\,([\text{PTP1B}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Ins\_2\_InR\_P}], \text{k6}) \tag{435}$$

$$\begin{aligned} &\text{function\_13}\,([\text{PTP1B}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Ins\_2\_InR\_P}], \text{k6}) \\ &= \frac{\text{k6} \cdot [\text{PTP1B}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{cytoplasm\_Ins\_2\_InR\_P}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \end{aligned} \tag{436}$$

$$\begin{aligned} &\text{function\_13}\,([\text{PTP1B}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Ins\_2\_InR\_P}], \text{k6}) \\ &= \frac{\text{k6} \cdot [\text{PTP1B}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{cytoplasm\_Ins\_2\_InR\_P}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \end{aligned} \tag{437}$$

## 8.14 Reaction R11

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R11

**Reaction equation**

$$\text{cytoplasm\_Ins\_InR\_P} \xrightarrow{\text{PTP1B, PTP1B, cytoplasm\_Ins\_InR\_P}} \text{cytoplasm\_InR} \tag{438}$$
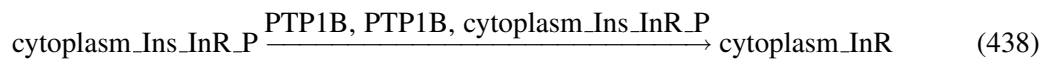
**Reactant**

Table 45: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Ins_InR_P | cytoplasm_Ins_InR_P | |

**Modifiers**

Table 46: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PTP1B | PTP1B | |
| PTP1B | PTP1B | |
| cytoplasm_Ins_InR_P | cytoplasm_Ins_InR_P | |

**Product**

Table 47: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_InR | cytoplasm_InR | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{14} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_14}\,([\text{PTP1B}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Ins\_InR\_P}], k6) \tag{439}$$

$$
\begin{aligned}
&\text{function\_14}\,([\text{PTP1B}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Ins\_InR\_P}], k6) \\
&= \frac{k6 \cdot [\text{PTP1B}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{cytoplasm\_Ins\_InR\_P}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \tag{440}
$$

$$
\begin{aligned}
&\text{function\_14}\,([\text{PTP1B}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Ins\_InR\_P}], k6) \\
&= \frac{k6 \cdot [\text{PTP1B}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{cytoplasm\_Ins\_InR\_P}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \tag{441}
$$

## 8.15 Reaction `R14f`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R14f

**Reaction equation**

$$\text{PIP2} \xrightarrow{\text{IRS1\_TyrP\_PI3K, IRS1\_TyrP\_PI3K, PIP2}} \text{PI345P3} \tag{442}$$

**Reactant**

Table 48: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| PIP2 | PIP2 | |

**Modifiers**

*Produced by SBML2LATEX*

Table 49: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP_PI3K | IRS1_TyrP_PI3K | |
| IRS1_TyrP_PI3K | IRS1_TyrP_PI3K | |
| PIP2 | PIP2 | |

**Product**

Table 50: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| PI345P3 | PI345P3 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{15} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_15}\,([\text{IRS1\_TyrP\_PI3K}], [\text{PIP2}], \text{vol}\,(\text{cytoplasm})\,, k9, k9\_\text{basal}) \tag{443}$$

$$\text{function\_15}\,([\text{IRS1\_TyrP\_PI3K}], [\text{PIP2}], \text{vol}\,(\text{cytoplasm})\,, k9, k9\_\text{basal})$$
$$= \frac{(k9\_\text{basal} + k9 \cdot [\text{IRS1\_TyrP\_PI3K}] \cdot \text{vol}\,(\text{cytoplasm})) \cdot [\text{PIP2}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{444}$$

$$\text{function\_15}\,([\text{IRS1\_TyrP\_PI3K}], [\text{PIP2}], \text{vol}\,(\text{cytoplasm})\,, k9, k9\_\text{basal})$$
$$= \frac{(k9\_\text{basal} + k9 \cdot [\text{IRS1\_TyrP\_PI3K}] \cdot \text{vol}\,(\text{cytoplasm})) \cdot [\text{PIP2}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{445}$$

## 8.16 Reaction `R14r`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R14r

**Reaction equation**

$$\text{PI345P3} \xrightarrow{\text{PTEN, PI345P3, PTEN}} \text{PIP2} \tag{446}$$

**Reactant**

Table 51: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| PI345P3 | PI345P3 | |

**Modifiers**

Table 52: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PTEN | PTEN | |
| PI345P3 | PI345P3 | |
| PTEN | PTEN | |

**Product**

Table 53: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| PIP2 | PIP2 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$v_{16}$
$$= \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_16}\left([\text{PI345P3}], [\text{PTEN}], \text{vol}\left(\text{cytoplasm}\right), \text{kminus9}, \text{kminus9\_basal}\right)$$
$$(447)$$

$$\text{function\_16}\left([\text{PI345P3}], [\text{PTEN}], \text{vol}\left(\text{cytoplasm}\right), \text{kminus9}, \text{kminus9\_basal}\right)$$
$$= \frac{\left(\text{kminus9\_basal} + \text{kminus9} \cdot [\text{PTEN}] \cdot \text{vol}\left(\text{cytoplasm}\right)\right) \cdot [\text{PI345P3}] \cdot \text{vol}\left(\text{cytoplasm}\right)}{\text{vol}\left(\text{cytoplasm}\right)}$$
$$(448)$$

$$\text{function\_16}\left([\text{PI345P3}], [\text{PTEN}], \text{vol}\left(\text{cytoplasm}\right), \text{kminus9}, \text{kminus9\_basal}\right)$$
$$= \frac{\left(\text{kminus9\_basal} + \text{kminus9} \cdot [\text{PTEN}] \cdot \text{vol}\left(\text{cytoplasm}\right)\right) \cdot [\text{PI345P3}] \cdot \text{vol}\left(\text{cytoplasm}\right)}{\text{vol}\left(\text{cytoplasm}\right)}$$
$$(449)$$

## 8.17 Reaction `R16f`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R16f

## Reaction equation

$$\text{Akt} \xrightarrow{\text{PI345P3, Akt, PI345P3}} \text{Akt\_P2} \qquad (450)$$

## Reactant

Table 54: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| Akt | Akt | |

## Modifiers

Table 55: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PI345P3 | PI345P3 | |
| Akt | Akt | |
| PI345P3 | PI345P3 | |

## Product

Table 56: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| Akt_P2 | Akt_P2 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{17} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_17}\,([\text{Akt}], [\text{PI345P3}], \text{vol}\,(\text{cytoplasm}), \text{k11}, \text{pip3\_basal}) \qquad (451)$$

$$\text{function\_17}\,([\text{Akt}], [\text{PI345P3}], \text{vol}\,(\text{cytoplasm}), \text{k11}, \text{pip3\_basal}) \qquad (452)$$

$$= \frac{\text{k11} \cdot [\text{Akt}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \begin{cases} [\text{PI345P3}] \cdot \text{vol}\,(\text{cytoplasm}) - \text{pip3\_basal} & \text{if } [\text{PI345P3}] \cdot \text{vol}\,(\text{cytoplasm}) > \text{pip3\_} \\ 0 & \text{otherwise} \end{cases}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_17}\,([\text{Akt}], [\text{PI345P3}], \text{vol}\,(\text{cytoplasm}), \text{k11}, \text{pip3\_basal}) \qquad (453)$$

$$= \frac{\text{k11} \cdot [\text{Akt}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \begin{cases} [\text{PI345P3}] \cdot \text{vol}\,(\text{cytoplasm}) - \text{pip3\_basal} & \text{if } [\text{PI345P3}] \cdot \text{vol}\,(\text{cytoplasm}) > \text{pip3\_} \\ 0 & \text{otherwise} \end{cases}}{\text{vol}\,(\text{cytoplasm})}$$

## 8.18 Reaction `R16r`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R16r

### Reaction equation

$$\text{Akt\_P2} \xrightarrow{\text{PP2A, Akt\_P2, PP2A}} \text{Akt} \tag{454}$$

### Reactant

Table 57: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |

### Modifiers

Table 58: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| Akt_P2 | Akt_P2 | |
| PP2A | PP2A | |

### Product

Table 59: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| Akt | Akt | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{18} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_18}\,([\text{Akt\_P2}], [\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kminus11}) \tag{455}$$

$$
\begin{aligned}
&\text{function\_18}\,([\text{Akt\_P2}], [\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kminus11}) \\
&= \frac{\text{kminus11} \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned}
\tag{456}
$$

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$$\begin{aligned} & \text{function\_18}\left([\text{Akt\_P2}], [\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kminus11}\right) \\ & = \frac{\text{kminus11} \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \end{aligned} \tag{457}$$

## 8.19 Reaction `R16a_f`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R16a_f

**Reaction equation**

$$\text{AS160} \xrightarrow{\text{Akt\_P2, AS160, Akt\_P2}} \text{AS160\_P} \tag{458}$$

**Reactant**

Table 60: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| AS160 | AS160 | |

**Modifiers**

Table 61: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| AS160 | AS160 | |
| Akt_P2 | Akt_P2 | |

**Product**

Table 62: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| AS160_P | AS160_P | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{19} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_19}\left([\text{AS160}], [\text{Akt\_P2}], \text{vol}\left(\text{cytoplasm}\right), \text{kr16a}\right) \quad (459)$$

$$\begin{aligned} &\text{function\_19}\left([\text{AS160}], [\text{Akt\_P2}], \text{vol}\left(\text{cytoplasm}\right), \text{kr16a}\right) \\ &= \frac{\text{kr16a} \cdot [\text{Akt\_P2}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{AS160}] \cdot \text{vol}\left(\text{cytoplasm}\right)}{\text{vol}\left(\text{cytoplasm}\right)} \end{aligned} \quad (460)$$

$$\begin{aligned} &\text{function\_19}\left([\text{AS160}], [\text{Akt\_P2}], \text{vol}\left(\text{cytoplasm}\right), \text{kr16a}\right) \\ &= \frac{\text{kr16a} \cdot [\text{Akt\_P2}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{AS160}] \cdot \text{vol}\left(\text{cytoplasm}\right)}{\text{vol}\left(\text{cytoplasm}\right)} \end{aligned} \quad (461)$$

## 8.20 Reaction `R16a_r`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R16a_r

**Reaction equation**

$$\text{AS160\_P} \xrightarrow{\text{PP2A, AS160\_P, PP2A}} \text{AS160} \quad (462)$$
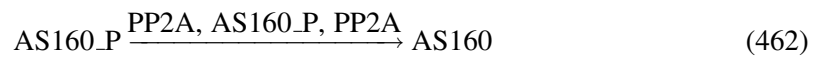
**Reactant**

Table 63: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| AS160_P | AS160_P | |

**Modifiers**

Table 64: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| AS160_P | AS160_P | |
| PP2A | PP2A | |

**Product**

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Table 65: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| AS160 | AS160 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{20} = \text{vol}(\text{cytoplasm}) \cdot \text{function\_20}([\text{AS160\_P}], [\text{PP2A}], \text{vol}(\text{cytoplasm}), \text{kminusr16a}) \quad (463)$$

$$
\begin{aligned}
&\text{function\_20}([\text{AS160\_P}], [\text{PP2A}], \text{vol}(\text{cytoplasm}), \text{kminusr16a}) \\
&= \frac{\text{kminusr16a} \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{AS160\_P}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})}
\end{aligned}
\quad (464)
$$

$$
\begin{aligned}
&\text{function\_20}([\text{AS160\_P}], [\text{PP2A}], \text{vol}(\text{cytoplasm}), \text{kminusr16a}) \\
&= \frac{\text{kminusr16a} \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{AS160\_P}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})}
\end{aligned}
\quad (465)
$$

## 8.21 Reaction `R17f`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R17f

## Reaction equation

$$\text{PKC} \xrightarrow{\text{PI345P3, PI345P3, PKC}} \text{PKC\_P} \quad (466)$$

## Reactant

Table 66: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| PKC | PKC | |

## Modifiers

Table 67: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PI345P3 | PI345P3 | |
| PI345P3 | PI345P3 | |
| PKC | PKC | |

## Product

Table 68: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| PKC_P | PKC_P | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{21} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_21}\,([\text{PI345P3}], [\text{PKC}], \text{vol}\,(\text{cytoplasm}), \text{k12}, \text{pip3\_basal}) \quad (467)$$

$$\text{function\_21}\,([\text{PI345P3}], [\text{PKC}], \text{vol}\,(\text{cytoplasm}), \text{k12}, \text{pip3\_basal}) \quad (468)$$
$$= \frac{\text{k12} \cdot [\text{PKC}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \begin{cases} [\text{PI345P3}] \cdot \text{vol}\,(\text{cytoplasm}) - \text{pip3\_basal} & \text{if } [\text{PI345P3}] \cdot \text{vol}\,(\text{cytoplasm}) > \text{pip3} \\ 0 & \text{otherwise} \end{cases}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_21}\,([\text{PI345P3}], [\text{PKC}], \text{vol}\,(\text{cytoplasm}), \text{k12}, \text{pip3\_basal}) \quad (469)$$
$$= \frac{\text{k12} \cdot [\text{PKC}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \begin{cases} [\text{PI345P3}] \cdot \text{vol}\,(\text{cytoplasm}) - \text{pip3\_basal} & \text{if } [\text{PI345P3}] \cdot \text{vol}\,(\text{cytoplasm}) > \text{pip3} \\ 0 & \text{otherwise} \end{cases}}{\text{vol}\,(\text{cytoplasm})}$$

## 8.22 Reaction `R17r`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R17r

## Reaction equation

$$\text{PKC\_P} \xrightarrow{\text{PP2A, PKC\_P, PP2A}} \text{PKC} \quad (470)$$

## Reactant

Table 69: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| PKC_P | PKC_P | |

## Modifiers

Table 70: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PKC_P | PKC_P | |
| PP2A | PP2A | |

## Product

Table 71: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| PKC | PKC | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{22} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_22}\,([\text{PKC\_P}],[\text{PP2A}],\text{vol}\,(\text{cytoplasm}),\text{kminus12}) \quad (471)$$

$$
\begin{aligned}
&\text{function\_22}\,([\text{PKC\_P}],[\text{PP2A}],\text{vol}\,(\text{cytoplasm}),\text{kminus12}) \\
&= \frac{\text{kminus12} \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PKC\_P}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (472)
$$

$$
\begin{aligned}
&\text{function\_22}\,([\text{PKC\_P}],[\text{PP2A}],\text{vol}\,(\text{cytoplasm}),\text{kminus12}) \\
&= \frac{\text{kminus12} \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PKC\_P}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (473)
$$

## 8.23 Reaction R20f

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  R20f

## Reaction equation

$$\text{cytoplasm\_GLUT4} \xrightarrow{\text{AS160\_P, AS160\_P, cytoplasm\_GLUT4}} \text{cellsurface\_GLUT4} \qquad (474)$$

## Reactant

Table 72: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_GLUT4 | cytoplasm_GLUT4 | |

## Modifiers

Table 73: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| AS160_P | AS160_P | |
| AS160_P | AS160_P | |
| cytoplasm_GLUT4 | cytoplasm_GLUT4 | |

## Product

Table 74: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cellsurface_GLUT4 | cellsurface_GLUT4 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{23} = \text{function\_23}\left([\text{AS160\_P}], \text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_GLUT4}], \text{k13}, \text{k13\_basal}\right) \qquad (475)$$

$$\begin{aligned}
&\text{function\_23}\left([\text{AS160\_P}], \text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_GLUT4}], \text{k13}, \text{k13\_basal}\right) \\
&= \left(\text{k13\_basal} + \text{k13} \cdot [\text{AS160\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right)\right) \cdot [\text{cytoplasm\_GLUT4}] \cdot \text{vol}\left(\text{cytoplasm}\right)
\end{aligned}$$
$$(476)$$

## 8.24 Reaction `R20r`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R20r

### Reaction equation

$$\text{cellsurface\_GLUT4} \xrightarrow{\text{cellsurface\_GLUT4}} \text{cytoplasm\_GLUT4} \tag{477}$$
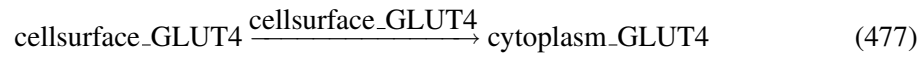
### Reactant

Table 75: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cellsurface_GLUT4 | cellsurface_GLUT4 | |

### Modifier

Table 76: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cellsurface_GLUT4 | cellsurface_GLUT4 | |

### Product

Table 77: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_GLUT4 | cytoplasm_GLUT4 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{24} = \text{function\_24}\left(\text{vol}\left(\text{cellsurface}\right), [\text{cellsurface\_GLUT4}], \text{kminus13}\right) \tag{478}$$

$$\begin{aligned}
\text{function\_24}&\left(\text{vol}\left(\text{cellsurface}\right), [\text{cellsurface\_GLUT4}], \text{kminus13}\right) \\
&= \text{kminus13} \cdot [\text{cellsurface\_GLUT4}] \cdot \text{vol}\left(\text{cellsurface}\right)
\end{aligned} \tag{479}$$

## 8.25 Reaction R30f

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

**Name** R30f

### Reaction equation

$$\text{PTP1B} + \text{ROS} \xrightarrow{\text{PTP1B, ROS}} \text{PTP1B\_ox} + \text{ROS} \tag{480}$$

### Reactants

Table 78: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| PTP1B | PTP1B | |
| ROS | ROS | |

### Modifiers

Table 79: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PTP1B | PTP1B | |
| ROS | ROS | |

### Products

Table 80: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| PTP1B_ox | PTP1B_ox | |
| ROS | ROS | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{25} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_25}\,([\text{PTP1B}], [\text{ROS}], \text{vol}\,(\text{cytoplasm}), \text{k30f}) \tag{481}$$

$$\begin{aligned} &\text{function\_25}\,([\text{PTP1B}], [\text{ROS}], \text{vol}\,(\text{cytoplasm}), \text{k30f}) \\ &= \frac{\text{k30f} \cdot [\text{PTP1B}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \end{aligned} \tag{482}$$

$$\begin{aligned} &\text{function\_25}\,([\text{PTP1B}], [\text{ROS}], \text{vol}\,(\text{cytoplasm}), \text{k30f}) \\ &= \frac{\text{k30f} \cdot [\text{PTP1B}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \end{aligned} \tag{483}$$

## 8.26 Reaction `R30r`

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

**Name** R30r

**Reaction equation**

$$PTP1B\_ox + GSH \xrightarrow{\text{GSH, PTP1B\_ox}} PTP1B + GSH \tag{484}$$
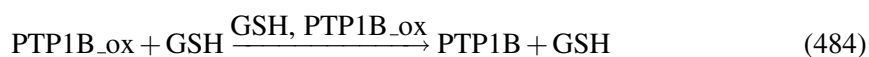
**Reactants**

Table 81: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| PTP1B_ox | PTP1B_ox | |
| GSH | GSH | |

**Modifiers**

Table 82: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| GSH | GSH | |
| PTP1B_ox | PTP1B_ox | |

**Products**

Table 83: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| PTP1B | PTP1B | |
| GSH | GSH | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{26} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_26}\left([\text{GSH}], [\text{PTP1B\_ox}], \text{vol}\left(\text{cytoplasm}\right), k30r\right) \tag{485}$$

$$
\begin{aligned}
&\text{function\_26}\left(\left[\text{GSH}\right],\left[\text{PTP1B\_ox}\right],\text{vol}\left(\text{cytoplasm}\right),\text{k30r}\right) \\
&= \frac{\text{k30r} \cdot \left[\text{PTP1B\_ox}\right] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \left[\text{GSH}\right] \cdot \text{vol}\left(\text{cytoplasm}\right)}{\text{vol}\left(\text{cytoplasm}\right)}
\end{aligned}
\tag{486}
$$

$$
\begin{aligned}
&\text{function\_26}\left(\left[\text{GSH}\right],\left[\text{PTP1B\_ox}\right],\text{vol}\left(\text{cytoplasm}\right),\text{k30r}\right) \\
&= \frac{\text{k30r} \cdot \left[\text{PTP1B\_ox}\right] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \left[\text{GSH}\right] \cdot \text{vol}\left(\text{cytoplasm}\right)}{\text{vol}\left(\text{cytoplasm}\right)}
\end{aligned}
\tag{487}
$$

## 8.27 Reaction `R31f`

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

**Name** R31f

**Reaction equation**

$$
\text{PTEN} + \text{ROS} \xrightarrow{\text{PTEN, ROS}} \text{PTEN\_ox} + \text{ROS}
\tag{488}
$$

**Reactants**

Table 84: Properties of each reactant.

| Id   | Name | SBO |
|------|------|-----|
| PTEN | PTEN |     |
| ROS  | ROS  |     |

**Modifiers**

Table 85: Properties of each modifier.

| Id   | Name | SBO |
|------|------|-----|
| PTEN | PTEN |     |
| ROS  | ROS  |     |

**Products**

Table 86: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| PTEN_ox | PTEN_ox | |
| ROS | ROS | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{27} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_27}\,([\text{PTEN}], [\text{ROS}], \text{vol}\,(\text{cytoplasm}), \text{k31f}) \tag{489}$$

$$\begin{aligned}
&\text{function\_27}\,([\text{PTEN}], [\text{ROS}], \text{vol}\,(\text{cytoplasm}), \text{k31f}) \\
&= \frac{\text{k31f} \cdot [\text{PTEN}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \tag{490}$$

$$\begin{aligned}
&\text{function\_27}\,([\text{PTEN}], [\text{ROS}], \text{vol}\,(\text{cytoplasm}), \text{k31f}) \\
&= \frac{\text{k31f} \cdot [\text{PTEN}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \tag{491}$$

## 8.28 Reaction R31r

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

**Name** R31r

### Reaction equation

$$\text{PTEN\_ox} + \text{GSH} \xrightarrow{\text{GSH, PTEN\_ox}} \text{PTEN} + \text{GSH} \tag{492}$$

### Reactants

Table 87: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| PTEN_ox | PTEN_ox | |
| GSH | GSH | |

### Modifiers

Table 88: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| GSH | GSH | |
| PTEN_ox | PTEN_ox | |

**Products**

Table 89: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| PTEN | PTEN | |
| GSH | GSH | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{28} = \text{vol} \,(\text{cytoplasm}) \cdot \text{function\_28} \,([\text{GSH}], [\text{PTEN\_ox}], \text{vol} \,(\text{cytoplasm}), \text{k31r}) \quad (493)$$

$$\begin{aligned}
&\text{function\_28} \,([\text{GSH}], [\text{PTEN\_ox}], \text{vol} \,(\text{cytoplasm}), \text{k31r}) \\
&= \frac{\text{k31r} \cdot [\text{PTEN\_ox}] \cdot \text{vol} \,(\text{cytoplasm}) \cdot [\text{GSH}] \cdot \text{vol} \,(\text{cytoplasm})}{\text{vol} \,(\text{cytoplasm})}
\end{aligned} \quad (494)$$

$$\begin{aligned}
&\text{function\_28} \,([\text{GSH}], [\text{PTEN\_ox}], \text{vol} \,(\text{cytoplasm}), \text{k31r}) \\
&= \frac{\text{k31r} \cdot [\text{PTEN\_ox}] \cdot \text{vol} \,(\text{cytoplasm}) \cdot [\text{GSH}] \cdot \text{vol} \,(\text{cytoplasm})}{\text{vol} \,(\text{cytoplasm})}
\end{aligned} \quad (495)$$

## 8.29 Reaction `R34f`

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

**Name** R34f

**Reaction equation**

$$\text{NOX\_inact} + \text{Ins} \xrightarrow{\text{Ins, NOX\_inact}} \text{NOX} + \text{Ins} \quad (496)$$
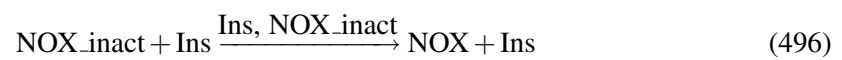
**Reactants**

Table 90: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| NOX_inact | NOX_inact | |
| Ins | Ins | |

**Modifiers**

Table 91: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| Ins | Ins | |
| NOX_inact | NOX_inact | |

**Products**

Table 92: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| NOX | NOX | |
| Ins | Ins | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{29} = \text{function\_29}([\text{Ins}], [\text{NOX\_inact}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{extracellular}), \text{k34f}) \quad (497)$$

$$
\begin{aligned}
&\text{function\_29}([\text{Ins}], [\text{NOX\_inact}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{extracellular}), \text{k34f}) \\
&= \text{k34f} \cdot [\text{NOX\_inact}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{Ins}] \cdot \text{vol}(\text{extracellular})
\end{aligned}
\quad (498)
$$

## 8.30 Reaction R34r1

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R34r1

**Reaction equation**

$$\text{NOX} \xrightarrow{\text{NOX}} \text{NOX\_deact} \quad (499)$$

**Reactant**

Table 93: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| NOX | NOX | |

**Modifier**

Table 94: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| NOX | NOX | |

**Product**

Table 95: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| NOX_deact | NOX_deact | |

**Kinetic Law**

**Derived unit**  contains undeclared units

$$v_{30} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_30}\,([\text{NOX}], \text{vol}\,(\text{cytoplasm}), \text{k34r1}) \tag{500}$$

$$
\begin{aligned}
&\text{function\_30}\,([\text{NOX}], \text{vol}\,(\text{cytoplasm}), \text{k34r1}) \\
&= \frac{\text{k34r1} \cdot [\text{NOX}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{NOX}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned}
\tag{501}
$$

$$
\begin{aligned}
&\text{function\_30}\,([\text{NOX}], \text{vol}\,(\text{cytoplasm}), \text{k34r1}) \\
&= \frac{\text{k34r1} \cdot [\text{NOX}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{NOX}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned}
\tag{502}
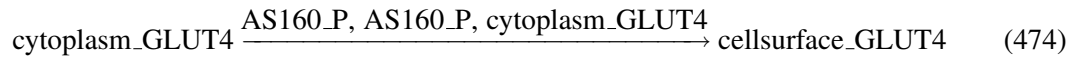$$

## 8.31 Reaction `R34r2`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name**  R34r2

**Reaction equation**

$$\text{NOX} \xrightarrow{\text{NOX}} \text{NOX\_inact} \tag{503}$$

**Reactant**

Table 96: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| NOX | NOX | |

**Modifier**

Table 97: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| NOX | NOX | |

**Product**

Table 98: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| NOX_inact | NOX_inact | |

**Kinetic Law**

**Derived unit**  contains undeclared units

$$v_{31} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_31}\,([\text{NOX}], \text{vol}\,(\text{cytoplasm}), \text{k34r2}) \tag{504}$$

$$\text{function\_31}\,([\text{NOX}], \text{vol}\,(\text{cytoplasm}), \text{k34r2}) = \frac{\text{k34r2} \cdot [\text{NOX}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{505}$$

$$\text{function\_31}\,([\text{NOX}], \text{vol}\,(\text{cytoplasm}), \text{k34r2}) = \frac{\text{k34r2} \cdot [\text{NOX}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{506}$$

## 8.32  Reaction R34r3

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name**  R34r3

**Reaction equation**

$$\text{NOX\_deact} \xrightarrow{\text{NOX\_deact}} \text{NOX\_inact} \tag{507}$$
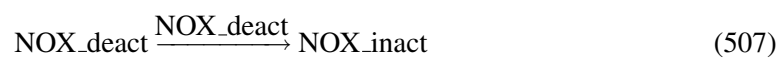
**Reactant**

Table 99: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| NOX_deact | NOX_deact | |

**Modifier**

Table 100: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| NOX_deact | NOX_deact | |

**Product**

Table 101: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| NOX_inact | NOX_inact | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{32} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_32}\,([\text{NOX\_deact}], \text{vol}\,(\text{cytoplasm}), \text{k34r3}) \qquad (508)$$

$$\text{function\_32}\,([\text{NOX\_deact}], \text{vol}\,(\text{cytoplasm}), \text{k34r3})$$
$$= \frac{\text{k34r3} \cdot [\text{NOX\_deact}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{NOX\_deact}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \qquad (509)$$

$$\text{function\_32}\,([\text{NOX\_deact}], \text{vol}\,(\text{cytoplasm}), \text{k34r3})$$
$$= \frac{\text{k34r3} \cdot [\text{NOX\_deact}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{NOX\_deact}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \qquad (510)$$

## 8.33 Reaction R35f

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

**Name** R35f

**Reaction equation**

$$\text{NOX} \xrightarrow{\text{NOX}} \text{ROS} + \text{NOX} \tag{511}$$

**Reactant**

Table 102: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| NOX | NOX | |

**Modifier**

Table 103: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| NOX | NOX | |

**Products**

Table 104: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| ROS | ROS | |
| NOX | NOX | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{33} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_33}\,([\text{NOX}], \text{vol}\,(\text{cytoplasm}), \text{k35f}) \tag{512}$$

$$\text{function\_33}\,([\text{NOX}], \text{vol}\,(\text{cytoplasm}), \text{k35f}) = \frac{\text{k35f} \cdot [\text{NOX}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{513}$$

$$\text{function\_33}\,([\text{NOX}], \text{vol}\,(\text{cytoplasm}), \text{k35f}) = \frac{\text{k35f} \cdot [\text{NOX}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{514}$$

## 8.34 Reaction `R35r`

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

**Name** R35r

## Reaction equation

$$\text{ROS} + \text{cytoplasm\_SOD2} \xrightarrow{\text{ROS, cytoplasm\_SOD2}} \text{cytoplasm\_SOD2} \tag{515}$$
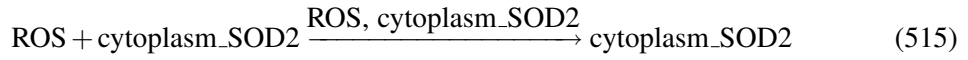
## Reactants

Table 105: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| ROS | ROS | |
| cytoplasm_SOD2 | cytoplasm_SOD2 | |

## Modifiers

Table 106: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| ROS | ROS | |
| cytoplasm_SOD2 | cytoplasm_SOD2 | |

## Product

Table 107: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_SOD2 | cytoplasm_SOD2 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{34} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_34}\,([\text{ROS}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_SOD2}], \text{k35r}) \tag{516}$$

$$\begin{aligned} &\text{function\_34}\,([\text{ROS}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_SOD2}], \text{k35r}) \\ &= \frac{\text{k35r} \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{cytoplasm\_SOD2}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \end{aligned} \tag{517}$$

$$\begin{aligned} &\text{function\_34}\,([\text{ROS}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_SOD2}], \text{k35r}) \\ &= \frac{\text{k35r} \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{cytoplasm\_SOD2}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \end{aligned} \tag{518}$$

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## 8.35 Reaction `R36f`

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

**Name** R36f

**Reaction equation**

$$Mt \xrightarrow{\text{Mt}} Mt + ROS \tag{519}$$

**Reactant**

Table 108: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| Mt | Mt   |     |

**Modifier**

Table 109: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| Mt | Mt   |     |

**Products**

Table 110: Properties of each product.

| Id  | Name | SBO |
|-----|------|-----|
| Mt  | Mt   |     |
| ROS | ROS  |     |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{35} = \text{vol}(\text{cytoplasm}) \cdot \text{function\_35}([\text{Mt}], \text{vol}(\text{cytoplasm}), \text{k36f}) \tag{520}$$

$$\text{function\_35}([\text{Mt}], \text{vol}(\text{cytoplasm}), \text{k36f}) = \frac{\text{k36f} \cdot [\text{Mt}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})} \tag{521}$$

$$\text{function\_35}([\text{Mt}], \text{vol}(\text{cytoplasm}), \text{k36f}) = \frac{\text{k36f} \cdot [\text{Mt}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})} \tag{522}$$

## 8.36 Reaction `R37f`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R37f

### Reaction equation

$$\text{extracellular\_ROS} \xrightarrow{\text{extracellular\_ROS}} \text{ROS} \tag{523}$$

### Reactant

Table 111: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| extracellular_ROS | extracellular_ROS | |

### Modifier

Table 112: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| extracellular_ROS | extracellular_ROS | |

### Product

Table 113: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| ROS | ROS | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{36} = \text{function\_36}\left(\text{vol}\left(\text{extracellular}\right), [\text{extracellular\_ROS}], \text{k\_ros\_perm}\right) \tag{524}$$

$$\begin{aligned}
\text{function\_36}&\left(\text{vol}\left(\text{extracellular}\right), [\text{extracellular\_ROS}], \text{k\_ros\_perm}\right) \\
&= \text{k\_ros\_perm} \cdot [\text{extracellular\_ROS}] \cdot \text{vol}\left(\text{extracellular}\right)
\end{aligned} \tag{525}$$

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## 8.37 Reaction `R37r`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R37r

**Reaction equation**

$$\text{ROS} \xrightarrow{\text{ROS}} \text{extracellular\_ROS} \tag{526}$$

**Reactant**

Table 114: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| ROS | ROS | |

**Modifier**

Table 115: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| ROS | ROS | |

**Product**

Table 116: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| extracellular_ROS | extracellular_ROS | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{37} = \text{function\_37}\left([\text{ROS}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{extracellular}\right), \text{k\_ros\_perm}\right) \tag{527}$$

$$\text{function\_37}\left([\text{ROS}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{extracellular}\right), \text{k\_ros\_perm}\right)$$
$$= \text{k\_ros\_perm} \cdot \frac{\text{vol}\left(\text{extracellular}\right)}{\text{vol}\left(\text{cytoplasm}\right)} \cdot [\text{ROS}] \cdot \text{vol}\left(\text{cytoplasm}\right) \tag{528}$$

## 8.38 Reaction `R38f`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R38f

### Reaction equation

$$GSH \xrightarrow{\text{ROS, GSH, ROS}} GSSG \tag{529}$$

### Reactant

Table 117: Properties of each reactant.

| Id  | Name | SBO |
|-----|------|-----|
| GSH | GSH  |     |

### Modifiers

Table 118: Properties of each modifier.

| Id  | Name | SBO |
|-----|------|-----|
| ROS | ROS  |     |
| GSH | GSH  |     |
| ROS | ROS  |     |

### Product

Table 119: Properties of each product.

| Id   | Name | SBO |
|------|------|-----|
| GSSG | GSSG |     |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{38} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_38}\,([\text{GSH}], [\text{ROS}], \text{vol}\,(\text{cytoplasm}), \text{k38f}) \tag{530}$$

$$\begin{aligned} &\text{function\_38}\,([\text{GSH}], [\text{ROS}], \text{vol}\,(\text{cytoplasm}), \text{k38f}) \\ &= \frac{\text{k38f} \cdot [\text{GSH}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \end{aligned} \tag{531}$$

$$\begin{aligned} \text{function\_38} & \left([\text{GSH}], [\text{ROS}], \text{vol}\,(\text{cytoplasm}), \text{k38f}\right) \\ & = \frac{\text{k38f} \cdot [\text{GSH}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \end{aligned} \tag{532}$$

## 8.39 Reaction `R38r`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R38r

**Reaction equation**

$$\text{GSSG} \xrightarrow{\text{GSSG}} \text{GSH} \tag{533}$$

**Reactant**

Table 120: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| GSSG | GSSG | |

**Modifier**

Table 121: Properties of each modifier.

| Id | Name | SBO |
|------|------|-----|
| GSSG | GSSG | |

**Product**

Table 122: Properties of each product.

| Id | Name | SBO |
|-----|------|-----|
| GSH | GSH | |

**Kinetic Law**

**Derived unit**  contains undeclared units

$$v_{39} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_39}\,([\text{GSSG}], \text{vol}\,(\text{cytoplasm}), \text{k38r}) \tag{534}$$

$$\text{function\_39}\left([\text{GSSG}], \text{vol}(\text{cytoplasm}), \text{k38r}\right) = \frac{\text{k38r} \cdot [\text{GSSG}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})} \quad (535)$$

$$\text{function\_39}\left([\text{GSSG}], \text{vol}(\text{cytoplasm}), \text{k38r}\right) = \frac{\text{k38r} \cdot [\text{GSSG}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})} \quad (536)$$

## 8.40 Reaction `R12f`

This is an irreversible reaction of one reactant forming one product influenced by five modifiers.

**Name** R12f

**Reaction equation**

$$\text{IRS1} \xrightarrow{\text{Ins\_2\_InR\_P, Ins\_InR\_P, IRS1, Ins\_2\_InR\_P, Ins\_InR\_P}} \text{IRS1\_TyrP} \quad (537)$$
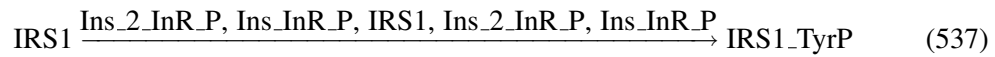
**Reactant**

Table 123: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| IRS1 | IRS1 | |

**Modifiers**

Table 124: Properties of each modifier.

| Id | Name | SBO |
|-------------|-------------|-----|
| Ins_2_InR_P | Ins_2_InR_P | |
| Ins_InR_P | Ins_InR_P | |
| IRS1 | IRS1 | |
| Ins_2_InR_P | Ins_2_InR_P | |
| Ins_InR_P | Ins_InR_P | |

**Product**

Table 125: Properties of each product.

| Id | Name | SBO |
|-----------|-----------|-----|
| IRS1_TyrP | IRS1_TyrP | |

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## Kinetic Law

**Derived unit** contains undeclared units

$$v_{40} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_40}\,([\text{IRS1}], \text{IRp}, [\text{Ins\_2\_InR\_P}], [\text{Ins\_InR\_P}], \\ \text{vol}\,(\text{cellsurface})\,, \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm})\,, \text{k7}) \tag{538}$$

$$\text{function\_40}\,([\text{IRS1}], \text{IRp}, [\text{Ins\_2\_InR\_P}], [\text{Ins\_InR\_P}], \\ \text{vol}\,(\text{cellsurface})\,, \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm})\,, \\ \text{k7}) = \frac{\text{cyto\_vol} \cdot \frac{\text{k7} \cdot [\text{IRS1}] \cdot \text{vol(cytoplasm)} \cdot ([\text{Ins\_2\_InR\_P}] \cdot \text{vol(cellsurface)} + [\text{Ins\_InR\_P}] \cdot \text{vol(cellsurface)})}{\text{IRp}}}{\text{vol}\,(\text{cytoplasm})} \tag{539}$$

$$\text{function\_40}\,([\text{IRS1}], \text{IRp}, [\text{Ins\_2\_InR\_P}], [\text{Ins\_InR\_P}], \\ \text{vol}\,(\text{cellsurface})\,, \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm})\,, \\ \text{k7}) = \frac{\text{cyto\_vol} \cdot \frac{\text{k7} \cdot [\text{IRS1}] \cdot \text{vol(cytoplasm)} \cdot ([\text{Ins\_2\_InR\_P}] \cdot \text{vol(cellsurface)} + [\text{Ins\_InR\_P}] \cdot \text{vol(cellsurface)})}{\text{IRp}}}{\text{vol}\,(\text{cytoplasm})} \tag{540}$$

## 8.41 Reaction `R12r`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R12r

## Reaction equation

$$\text{IRS1\_TyrP} \xrightarrow{\text{PTP1B, IRS1\_TyrP, PTP1B}} \text{IRS1} \tag{541}$$

## Reactant

Table 126: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP | IRS1_TyrP | |

## Modifiers

Table 127: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PTP1B | PTP1B | |

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP | IRS1_TyrP | |
| PTP1B | PTP1B | |

## Product

Table 128: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| IRS1 | IRS1 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{41} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_41}\,([\text{IRS1\_TyrP}], [\text{PTP1B}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{kminus7a}) \tag{542}$$

$$\begin{aligned}
&\text{function\_41}\,([\text{IRS1\_TyrP}], [\text{PTP1B}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{kminus7a}) \\
&= \frac{\text{cyto\_vol} \cdot \text{kminus7a} \cdot [\text{PTP1B}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IRS1\_TyrP}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \tag{543}$$

$$\begin{aligned}
&\text{function\_41}\,([\text{IRS1\_TyrP}], [\text{PTP1B}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{kminus7a}) \\
&= \frac{\text{cyto\_vol} \cdot \text{kminus7a} \cdot [\text{PTP1B}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IRS1\_TyrP}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \tag{544}$$

## 8.42 Reaction R12_a_f

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  R12_a_f

## Reaction equation

$$\text{IRS1} \xrightarrow{\text{PKC\_P, IRS1, PKC\_P}} \text{IRS1\_PolySerP} \tag{545}$$

## Reactant

Table 129: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| IRS1 | IRS1 | |

**Modifiers**

Table 130: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PKC_P | PKC_P | |
| IRS1 | IRS1 | |
| PKC_P | PKC_P | |

**Product**

Table 131: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| IRS1_PolySerP | IRS1_PolySerP | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{42} = \text{vol}(\text{cytoplasm}) \cdot \text{function\_42}([\text{IRS1}], [\text{PKC\_P}], \text{cyto\_vol}, \text{vol}(\text{cytoplasm}), \text{k2psp}) \quad (546)$$

$$\begin{aligned}
&\text{function\_42}([\text{IRS1}], [\text{PKC\_P}], \text{cyto\_vol}, \text{vol}(\text{cytoplasm}), \text{k2psp}) \\
&= \frac{\text{cyto\_vol} \cdot \text{k2psp} \cdot [\text{IRS1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PKC\_P}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})}
\end{aligned} \quad (547)$$

$$\begin{aligned}
&\text{function\_42}([\text{IRS1}], [\text{PKC\_P}], \text{cyto\_vol}, \text{vol}(\text{cytoplasm}), \text{k2psp}) \\
&= \frac{\text{cyto\_vol} \cdot \text{k2psp} \cdot [\text{IRS1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PKC\_P}] \cdot \text{vol}(\text{cytoplasm})}{\text{vol}(\text{cytoplasm})}
\end{aligned} \quad (548)$$

## 8.43 Reaction R12_a_r

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R12_a_r

## Reaction equation

$$\text{IRS1\_PolySerP} \xrightarrow{\text{PP2A, IRS1\_PolySerP, PP2A}} \text{IRS1} \qquad (549)$$
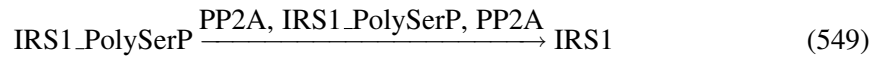
## Reactant

Table 132: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| IRS1_PolySerP | IRS1_PolySerP | |

## Modifiers

Table 133: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| IRS1_PolySerP | IRS1_PolySerP | |
| PP2A | PP2A | |

## Product

Table 134: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| IRS1 | IRS1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{43} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_43}\,([\text{IRS1\_PolySerP}], [\text{PP2A}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \qquad (550)$$
$$\text{kminus7b})$$

$$\text{function\_43}\,([\text{IRS1\_PolySerP}], [\text{PP2A}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{kminus7b})$$
$$= \frac{\text{cyto\_vol} \cdot \text{kminus7b} \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IRS1\_PolySerP}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \qquad (551)$$

$$\text{function\_43}\,([\text{IRS1\_PolySerP}], [\text{PP2A}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{kminus7b})$$
$$= \frac{\text{cyto\_vol} \cdot \text{kminus7b} \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IRS1\_PolySerP}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \qquad (552)$$

## 8.44 Reaction R12_b_f

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R12_b_f

**Reaction equation**

$$\text{IRS1\_TyrP} \xrightarrow{\text{PKC\_P, IRS1\_TyrP, PKC\_P}} \text{IRS1\_TyrP\_PolySerP} \tag{553}$$
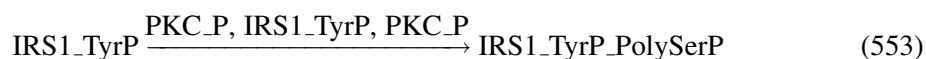
**Reactant**

Table 135: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP | IRS1_TyrP | |

**Modifiers**

Table 136: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PKC_P | PKC_P | |
| IRS1_TyrP | IRS1_TyrP | |
| PKC_P | PKC_P | |

**Product**

Table 137: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP_PolySerP | IRS1_TyrP_PolySerP | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{44} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_44}\,([\text{IRS1\_TyrP}], [\text{PKC\_P}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{k2psp}) \tag{554}$$

$$\begin{aligned}
&\text{function\_44}\,([\text{IRS1\_TyrP}], [\text{PKC\_P}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{k2psp}) \\
&= \frac{\text{cyto\_vol} \cdot \text{k2psp} \cdot [\text{IRS1\_TyrP}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PKC\_P}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \tag{555}$$

$$\text{function\_44}\left([IRS1\_TyrP],[PKC\_P],\text{cyto\_vol},\text{vol}\left(\text{cytoplasm}\right),\text{k2psp}\right)$$
$$= \frac{\text{cyto\_vol} \cdot \text{k2psp} \cdot [IRS1\_TyrP] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [PKC\_P] \cdot \text{vol}\left(\text{cytoplasm}\right)}{\text{vol}\left(\text{cytoplasm}\right)} \quad (556)$$

## 8.45 Reaction `R12_b_r`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R12_b_r

**Reaction equation**

$$\text{IRS1\_TyrP\_PolySerP} \xrightarrow{\text{PP2A, IRS1\_TyrP\_PolySerP, PP2A}} \text{IRS1\_TyrP} \quad (557)$$

**Reactant**

Table 138: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP_PolySerP | IRS1_TyrP_PolySerP | |

**Modifiers**

Table 139: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| IRS1_TyrP_PolySerP | IRS1_TyrP_PolySerP | |
| PP2A | PP2A | |

**Product**

Table 140: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP | IRS1_TyrP | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{45} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_45}\,([\text{IRS1\_TyrP\_PolySerP}], [\text{PP2A}], \text{cyto\_vol}, \\ \text{vol}\,(\text{cytoplasm}), \text{kminus7b}) \qquad (558)$$

$$\text{function\_45}\,([\text{IRS1\_TyrP\_PolySerP}], [\text{PP2A}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{kminus7b}) \\ = \frac{\text{cyto\_vol} \cdot \text{kminus7b} \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IRS1\_TyrP\_PolySerP}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}$$

$$(559)$$

$$\text{function\_45}\,([\text{IRS1\_TyrP\_PolySerP}], [\text{PP2A}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{kminus7b}) \\ = \frac{\text{cyto\_vol} \cdot \text{kminus7b} \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IRS1\_TyrP\_PolySerP}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}$$

$$(560)$$

## 8.46 Reaction `R13f`

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

**Name** R13f

**Reaction equation**

$$\text{PI3K} + \text{IRS1\_TyrP} \xrightarrow{\text{IRS1\_TyrP, PI3K}} \text{IRS1\_TyrP\_PI3K} \qquad (561)$$
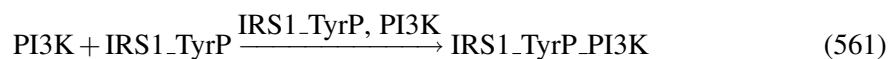
**Reactants**

Table 141: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| PI3K | PI3K | |
| IRS1_TyrP | IRS1_TyrP | |

**Modifiers**

Table 142: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP | IRS1_TyrP | |
| PI3K | PI3K | |

## Product

Table 143: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP_PI3K | IRS1_TyrP_PI3K | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{46} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_46}\,([\text{IRS1\_TyrP}], [\text{PI3K}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{k8}) \quad (562)$$

$$
\begin{aligned}
&\text{function\_46}\,([\text{IRS1\_TyrP}], [\text{PI3K}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{k8}) \\
&= \frac{\text{cyto\_vol} \cdot \text{k8} \cdot [\text{IRS1\_TyrP}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PI3K}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (563)
$$

$$
\begin{aligned}
&\text{function\_46}\,([\text{IRS1\_TyrP}], [\text{PI3K}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{k8}) \\
&= \frac{\text{cyto\_vol} \cdot \text{k8} \cdot [\text{IRS1\_TyrP}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PI3K}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (564)
$$

## 8.47 Reaction `R13r`

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

**Name** R13r

## Reaction equation

$$\text{IRS1\_TyrP\_PI3K} \xrightarrow{\text{IRS1\_TyrP\_PI3K}} \text{PI3K} + \text{IRS1\_TyrP} \quad (565)$$

## Reactant

Table 144: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP_PI3K | IRS1_TyrP_PI3K | |

## Modifier

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Table 145: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP_PI3K | IRS1_TyrP_PI3K | |

**Products**

Table 146: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| PI3K | PI3K | |
| IRS1_TyrP | IRS1_TyrP | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{47} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_47}\,([\text{IRS1\_TyrP\_PI3K}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{kminus8}) \tag{566}$$

$$\text{function\_47}\,([\text{IRS1\_TyrP\_PI3K}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{kminus8})$$
$$= \frac{\text{cyto\_vol} \cdot \text{kminus8} \cdot [\text{IRS1\_TyrP\_PI3K}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{567}$$

$$\text{function\_47}\,([\text{IRS1\_TyrP\_PI3K}], \text{cyto\_vol}, \text{vol}\,(\text{cytoplasm}), \text{kminus8})$$
$$= \frac{\text{cyto\_vol} \cdot \text{kminus8} \cdot [\text{IRS1\_TyrP\_PI3K}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})} \tag{568}$$

## 8.48 Reaction R50f

This is an irreversible reaction of one reactant forming one product.

**Name** R50f

**Reaction equation**

$$\text{NULL} \longrightarrow \text{IRS1} \tag{569}$$

**Reactant**

Table 147: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| NULL | NULL | |

## Product

Table 148: Properties of each product.

| Id | Name | SBO |
|------|------|-----|
| IRS1 | IRS1 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{48} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_48}\,(\text{vol}\,(\text{cytoplasm}),\text{k\_irs1\_basal\_syn}) \tag{570}$$

$$\text{function\_48}\,(\text{vol}\,(\text{cytoplasm}),\text{k\_irs1\_basal\_syn}) = \frac{\text{k\_irs1\_basal\_syn}}{\text{vol}\,(\text{cytoplasm})} \tag{571}$$

$$\text{function\_48}\,(\text{vol}\,(\text{cytoplasm}),\text{k\_irs1\_basal\_syn}) = \frac{\text{k\_irs1\_basal\_syn}}{\text{vol}\,(\text{cytoplasm})} \tag{572}$$

## 8.49 Reaction `R50r1`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name**  R50r1

## Reaction equation

$$\text{IRS1} \xrightarrow{\text{IRS1}} \text{NULL} \tag{573}$$

## Reactant

Table 149: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| IRS1 | IRS1 | |

### Modifier

Table 150: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IRS1 | IRS1 | |

### Product

Table 151: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| NULL | NULL | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{49} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_49}\,([\text{IRS1}], \text{vol}\,(\text{cytoplasm}), \text{k\_irs1\_basal\_degr}) \quad (574)$$

$$
\begin{aligned}
&\text{function\_49}\,([\text{IRS1}], \text{vol}\,(\text{cytoplasm}), \text{k\_irs1\_basal\_degr}) \\
&= \frac{[\text{IRS1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{k\_irs1\_basal\_degr}}{\text{vol}\,(\text{cytoplasm})}
\end{aligned}
\quad (575)
$$

$$
\begin{aligned}
&\text{function\_49}\,([\text{IRS1}], \text{vol}\,(\text{cytoplasm}), \text{k\_irs1\_basal\_degr}) \\
&= \frac{[\text{IRS1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{k\_irs1\_basal\_degr}}{\text{vol}\,(\text{cytoplasm})}
\end{aligned}
\quad (576)
$$

## 8.50  Reaction `R50r2`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name**  R50r2

### Reaction equation

$$\text{IRS1\_TyrP} \xrightarrow{\text{IRS1\_TyrP}} \text{NULL} \quad (577)$$

### Reactant

Table 152: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP | IRS1_TyrP | |

**Modifier**

Table 153: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP | IRS1_TyrP | |

**Product**

Table 154: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| NULL | NULL | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{50} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_50}\,([\text{IRS1\_TyrP}], \text{vol}\,(\text{cytoplasm}), \text{k\_irs1\_basal\_degr}) \quad (578)$$

$$\begin{aligned}
&\text{function\_50}\,([\text{IRS1\_TyrP}], \text{vol}\,(\text{cytoplasm}), \text{k\_irs1\_basal\_degr}) \\
&= \frac{[\text{IRS1\_TyrP}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{k\_irs1\_basal\_degr}}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (579)$$

$$\begin{aligned}
&\text{function\_50}\,([\text{IRS1\_TyrP}], \text{vol}\,(\text{cytoplasm}), \text{k\_irs1\_basal\_degr}) \\
&= \frac{[\text{IRS1\_TyrP}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{k\_irs1\_basal\_degr}}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (580)$$

## 8.51 Reaction R50r3

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R50r3

**Reaction equation**

$$\text{IRS1\_PolySerP} \xrightarrow{\text{IRS1\_PolySerP}} \text{NULL} \quad (581)$$

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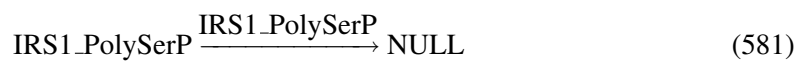
**Reactant**

Table 155: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| IRS1_PolySerP | IRS1_PolySerP | |

**Modifier**

Table 156: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IRS1_PolySerP | IRS1_PolySerP | |

**Product**

Table 157: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| NULL | NULL | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{51} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_51}\left([\text{IRS1\_PolySerP}], \text{vol}\left(\text{cytoplasm}\right), \text{k\_irs1\_polyserp\_degr}\right) \tag{582}$$

$$\begin{aligned} &\text{function\_51}\left([\text{IRS1\_PolySerP}], \text{vol}\left(\text{cytoplasm}\right), \text{k\_irs1\_polyserp\_degr}\right) \\ &= \frac{[\text{IRS1\_PolySerP}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{k\_irs1\_polyserp\_degr}}{\text{vol}\left(\text{cytoplasm}\right)} \end{aligned} \tag{583}$$

$$\begin{aligned} &\text{function\_51}\left([\text{IRS1\_PolySerP}], \text{vol}\left(\text{cytoplasm}\right), \text{k\_irs1\_polyserp\_degr}\right) \\ &= \frac{[\text{IRS1\_PolySerP}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{k\_irs1\_polyserp\_degr}}{\text{vol}\left(\text{cytoplasm}\right)} \end{aligned} \tag{584}$$

## 8.52 Reaction `R50r4`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** R50r4

## Reaction equation

$$\text{IRS1\_TyrP\_PolySerP} \xrightarrow{\text{IRS1\_TyrP\_PolySerP}} \text{NULL} \tag{585}$$
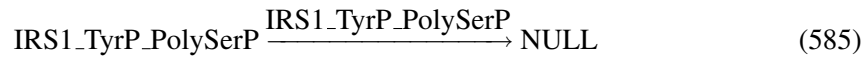
## Reactant

Table 158: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP_PolySerP | IRS1_TyrP_PolySerP | |

## Modifier

Table 159: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IRS1_TyrP_PolySerP | IRS1_TyrP_PolySerP | |

## Product

Table 160: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| NULL | NULL | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$
\begin{aligned}
v_{52} &= \text{vol}\,(\text{cytoplasm}) \\
&\quad \cdot \text{function\_52}\,([\text{IRS1\_TyrP\_PolySerP}], \text{vol}\,(\text{cytoplasm})\,, \text{k\_irs1\_polyserp\_degr})
\end{aligned}
\tag{586}
$$

$$
\begin{aligned}
&\text{function\_52}\,([\text{IRS1\_TyrP\_PolySerP}], \text{vol}\,(\text{cytoplasm})\,, \text{k\_irs1\_polyserp\_degr}) \\
&= \frac{[\text{IRS1\_TyrP\_PolySerP}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{k\_irs1\_polyserp\_degr}}{\text{vol}\,(\text{cytoplasm})}
\end{aligned}
\tag{587}
$$

$$
\begin{aligned}
&\text{function\_52}\,([\text{IRS1\_TyrP\_PolySerP}], \text{vol}\,(\text{cytoplasm})\,, \text{k\_irs1\_polyserp\_degr}) \\
&= \frac{[\text{IRS1\_TyrP\_PolySerP}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{k\_irs1\_polyserp\_degr}}{\text{vol}\,(\text{cytoplasm})}
\end{aligned}
\tag{588}
$$

*Produced by* SBML2LATEX

## 8.53 Reaction `R51f`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R51f

### Reaction equation

$$\text{IRS1} \xrightarrow{\text{IKK\_P, IKK\_P, IRS1}} \text{IRS1\_PolySerP} \tag{589}$$

### Reactant

Table 161: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| IRS1 | IRS1 | |

### Modifiers

Table 162: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| IRS1 | IRS1 | |

### Product

Table 163: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| IRS1_PolySerP | IRS1_PolySerP | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{53} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_53}\,([\text{IKK\_P}], [\text{IRS1}], \text{Km51}, \text{vol}\,(\text{cytoplasm}), \text{kcat51}) \tag{590}$$

$$\text{function\_53}\,([\text{IKK\_P}], [\text{IRS1}], \text{Km51}, \text{vol}\,(\text{cytoplasm}), \text{kcat51})$$
$$= \frac{\frac{\text{kcat51} \cdot [\text{IRS1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}(\text{cytoplasm})}{\text{Km51} + [\text{IRS1}] \cdot \text{vol}(\text{cytoplasm})}}{\text{vol}\,(\text{cytoplasm})} \tag{591}$$

$$\text{function\_53}\left([\text{IKK\_P}],[\text{IRS1}],\text{Km51},\text{vol}\left(\text{cytoplasm}\right),\text{kcat51}\right)$$
$$= \frac{\frac{\text{kcat51}\cdot[\text{IRS1}]\cdot\text{vol(cytoplasm)}\cdot[\text{IKK\_P}]\cdot\text{vol(cytoplasm)}}{\text{Km51}+[\text{IRS1}]\cdot\text{vol(cytoplasm)}}}{\text{vol}\left(\text{cytoplasm}\right)} \tag{592}$$

## 8.54 Reaction `R52f`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R52f

**Reaction equation**

$$\text{IRS1} \xrightarrow{\text{JNK\_P, IRS1, JNK\_P}} \text{IRS1\_PolySerP} \tag{593}$$

**Reactant**

Table 164: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| IRS1 | IRS1 | |

**Modifiers**

Table 165: Properties of each modifier.

| Id | Name | SBO |
|-------|-------|-----|
| JNK_P | JNK_P | |
| IRS1 | IRS1 | |
| JNK_P | JNK_P | |

**Product**

Table 166: Properties of each product.

| Id | Name | SBO |
|----------------|----------------|-----|
| IRS1_PolySerP | IRS1_PolySerP | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{54} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_54}\,([\text{IRS1}], [\text{JNK\_P}], \text{Km52}, \text{vol}\,(\text{cytoplasm}), \text{kcat52}) \quad (594)$$

$$\text{function\_54}\,([\text{IRS1}], [\text{JNK\_P}], \text{Km52}, \text{vol}\,(\text{cytoplasm}), \text{kcat52})$$
$$= \frac{\frac{\text{kcat52}\cdot[\text{IRS1}]\cdot\text{vol(cytoplasm)}\cdot[\text{JNK\_P}]\cdot\text{vol(cytoplasm)}}{\text{Km52}+[\text{IRS1}]\cdot\text{vol(cytoplasm)}}}{\text{vol}\,(\text{cytoplasm})} \quad (595)$$

$$\text{function\_54}\,([\text{IRS1}], [\text{JNK\_P}], \text{Km52}, \text{vol}\,(\text{cytoplasm}), \text{kcat52})$$
$$= \frac{\frac{\text{kcat52}\cdot[\text{IRS1}]\cdot\text{vol(cytoplasm)}\cdot[\text{JNK\_P}]\cdot\text{vol(cytoplasm)}}{\text{Km52}+[\text{IRS1}]\cdot\text{vol(cytoplasm)}}}{\text{vol}\,(\text{cytoplasm})} \quad (596)$$

## 8.55 Reaction `R42f`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R42f

**Reaction equation**

$$\text{JNK} \xrightarrow{\text{ROS, JNK, ROS}} \text{JNK\_P} \quad (597)$$

**Reactant**

Table 167: Properties of each reactant.

| Id | Name | SBO |
|-----|------|-----|
| JNK | JNK | |

**Modifiers**

Table 168: Properties of each modifier.

| Id | Name | SBO |
|-----|------|-----|
| ROS | ROS | |
| JNK | JNK | |
| ROS | ROS | |

**Product**

Table 169: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{55} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_55}\,([\text{JNK}],[\text{ROS}],\text{alpha\_ox},\text{vol}\,(\text{cytoplasm}),\text{k42f}) \quad (598)$$

$$\begin{aligned}
&\text{function\_55}\,([\text{JNK}],[\text{ROS}],\text{alpha\_ox},\text{vol}\,(\text{cytoplasm}),\text{k42f}) \\
&= \frac{\text{k42f} \cdot \text{alpha\_ox} \cdot [\text{JNK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (599)$$

$$\begin{aligned}
&\text{function\_55}\,([\text{JNK}],[\text{ROS}],\text{alpha\_ox},\text{vol}\,(\text{cytoplasm}),\text{k42f}) \\
&= \frac{\text{k42f} \cdot \text{alpha\_ox} \cdot [\text{JNK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{ROS}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (600)$$

## 8.56 Reaction R42r

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R42r

**Reaction equation**

$$\text{JNK\_P} \xrightarrow{\text{DUSP, DUSP, JNK\_P}} \text{JNK} \quad (601)$$

**Reactant**

Table 170: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |

**Modifiers**

Table 171: Properties of each modifier.

| Id | Name | SBO |
|------|------|-----|
| DUSP | DUSP | |
| DUSP | DUSP | |
| JNK_P | JNK_P | |

### Product

Table 172: Properties of each product.

| Id | Name | SBO |
|-----|------|-----|
| JNK | JNK | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{56} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_56}\,([\text{DUSP}], [\text{JNK\_P}], \text{vol}\,(\text{cytoplasm}), \text{k42r}) \quad (602)$$

$$
\begin{aligned}
&\text{function\_56}\,([\text{DUSP}], [\text{JNK\_P}], \text{vol}\,(\text{cytoplasm}), \text{k42r}) \\
&= \frac{\text{k42r} \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{DUSP}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (603)
$$

$$
\begin{aligned}
&\text{function\_56}\,([\text{DUSP}], [\text{JNK\_P}], \text{vol}\,(\text{cytoplasm}), \text{k42r}) \\
&= \frac{\text{k42r} \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{DUSP}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (604)
$$

## 8.57 Reaction `R43f`

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** R43f

### Reaction equation

$$\text{IKK} \xrightarrow{\text{ROS, IKK, ROS}} \text{IKK\_P} \quad (605)$$

### Reactant

Table 173: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| IKK | IKK | |

## Modifiers

Table 174: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| ROS | ROS | |
| IKK | IKK | |
| ROS | ROS | |

## Product

Table 175: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{57} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_57}\,([IKK],[ROS],\text{vol}\,(\text{cytoplasm})\,,k43f) \tag{606}$$

$$\begin{aligned}
&\text{function\_57}\,([IKK],[ROS],\text{vol}\,(\text{cytoplasm})\,,k43f) \\
&= \frac{k43f \cdot [IKK] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [ROS] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \tag{607}$$

$$\begin{aligned}
&\text{function\_57}\,([IKK],[ROS],\text{vol}\,(\text{cytoplasm})\,,k43f) \\
&= \frac{k43f \cdot [IKK] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [ROS] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \tag{608}$$

## 8.58 Reaction R43r

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  R43r

## Reaction equation

$$\text{IKK\_P} \xrightarrow{\text{DUSP, DUSP, IKK\_P}} \text{IKK} \tag{609}$$

## Reactant

Table 176: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |

## Modifiers

Table 177: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| DUSP | DUSP | |
| DUSP | DUSP | |
| IKK_P | IKK_P | |

## Product

Table 178: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| IKK | IKK | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{58} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_58}\,([\text{DUSP}], [\text{IKK\_P}], \text{vol}\,(\text{cytoplasm}), \text{k43r}) \tag{610}$$

$$\begin{aligned}
&\text{function\_58}\,([\text{DUSP}], [\text{IKK\_P}], \text{vol}\,(\text{cytoplasm}), \text{k43r}) \\
&= \frac{\text{k43r} \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{DUSP}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \tag{611}$$

$$\begin{aligned}
&\text{function\_58}\,([\text{DUSP}], [\text{IKK\_P}], \text{vol}\,(\text{cytoplasm}), \text{k43r}) \\
&= \frac{\text{k43r} \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{DUSP}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \tag{612}$$

## 8.59 Reaction R32f

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

**Name** R32f

**Reaction equation**

$$DUSP + ROS \xrightarrow{\text{DUSP, ROS}} DUSP\_ox + ROS \qquad (613)$$

**Reactants**

Table 179: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| DUSP | DUSP | |
| ROS | ROS | |

**Modifiers**

Table 180: Properties of each modifier.

| Id | Name | SBO |
|------|------|-----|
| DUSP | DUSP | |
| ROS | ROS | |

**Products**

Table 181: Properties of each product.

| Id | Name | SBO |
|---------|---------|-----|
| DUSP_ox | DUSP_ox | |
| ROS | ROS | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{59} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_59}\left([DUSP], [ROS], \text{vol}\left(\text{cytoplasm}\right), k32f\right) \qquad (614)$$

$$\text{function\_59}\left([\text{DUSP}],[\text{ROS}],\text{vol}\left(\text{cytoplasm}\right),\text{k32f}\right)$$
$$= \frac{\text{k32f} \cdot [\text{DUSP}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{ROS}] \cdot \text{vol}\left(\text{cytoplasm}\right)}{\text{vol}\left(\text{cytoplasm}\right)} \tag{615}$$

$$\text{function\_59}\left([\text{DUSP}],[\text{ROS}],\text{vol}\left(\text{cytoplasm}\right),\text{k32f}\right)$$
$$= \frac{\text{k32f} \cdot [\text{DUSP}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{ROS}] \cdot \text{vol}\left(\text{cytoplasm}\right)}{\text{vol}\left(\text{cytoplasm}\right)} \tag{616}$$

## 8.60 Reaction R32r

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

**Name** R32r

**Reaction equation**

$$\text{DUSP\_ox} + \text{GSH} \xrightarrow{\text{DUSP\_ox, GSH}} \text{DUSP} + \text{GSH} \tag{617}$$
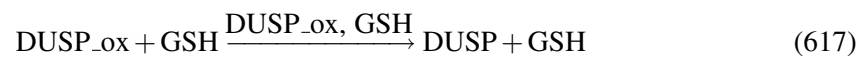
**Reactants**

Table 182: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| DUSP_ox | DUSP_ox | |
| GSH | GSH | |

**Modifiers**

Table 183: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| DUSP_ox | DUSP_ox | |
| GSH | GSH | |

**Products**

Table 184: Properties of each product.

| Id | Name | SBO |
|------|------|-----|
| DUSP | DUSP | |
| GSH | GSH | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{60} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_60}\,([\text{DUSP\_ox}], [\text{GSH}], \text{vol}\,(\text{cytoplasm}), \text{k32r}) \quad (618)$$

$$\begin{aligned}
&\text{function\_60}\,([\text{DUSP\_ox}], [\text{GSH}], \text{vol}\,(\text{cytoplasm}), \text{k32r}) \\
&= \frac{\text{k32r} \cdot [\text{DUSP\_ox}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{GSH}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (619)$$

$$\begin{aligned}
&\text{function\_60}\,([\text{DUSP\_ox}], [\text{GSH}], \text{vol}\,(\text{cytoplasm}), \text{k32r}) \\
&= \frac{\text{k32r} \cdot [\text{DUSP\_ox}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{GSH}] \cdot \text{vol}\,(\text{cytoplasm})}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (620)$$

## 8.61 Reaction R100

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** Synthesis

**Reaction equation**

$$\text{null} \xrightarrow{\text{E2F1, E2F1}} \text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \quad (621)$$
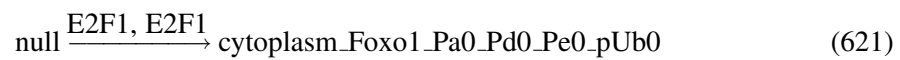
**Reactant**

Table 185: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| null | null | |

**Modifiers**

Table 186: Properties of each modifier.

| Id | Name | SBO |
|------|------|-----|
| E2F1 | E2F1 | |
| E2F1 | E2F1 | |

## Product

Table 187: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{61} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_61}\left([E2F1], \text{vol}\left(\text{cytoplasm}\right), \text{ksynth}\right) \tag{622}$$

$$\text{function\_61}\left([E2F1], \text{vol}\left(\text{cytoplasm}\right), \text{ksynth}\right) = \frac{[E2F1] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ksynth}}{\text{vol}\left(\text{cytoplasm}\right)} \tag{623}$$

$$\text{function\_61}\left([E2F1], \text{vol}\left(\text{cytoplasm}\right), \text{ksynth}\right) = \frac{[E2F1] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ksynth}}{\text{vol}\left(\text{cytoplasm}\right)} \tag{624}$$

Table 188: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|--------|--------|-----|-------|------|----------|
| ksynth | ksynth | | 0.006 | | ☑ |

## 8.62 Reaction R101

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0

## Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \tag{625}$$
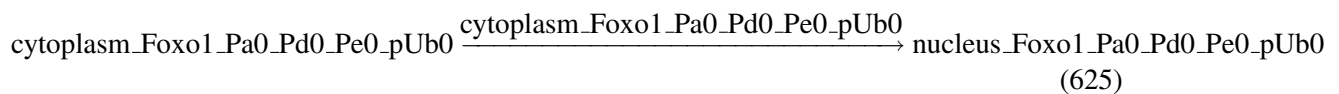
**Reactant**

Table 189: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| `cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0` | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

**Modifier**

Table 190: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| `cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0` | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

**Product**

Table 191: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| `nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0` | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

**Kinetic Law**

**Derived unit**  contains undeclared units

$$v_{62} = \text{function\_62}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{ktr}\right) \quad (626)$$

$$\text{function\_62}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{ktr}\right)$$
$$= [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr} \quad (627)$$

Table 192: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| `ktr` | ktr | | 0.182 | | ☑ |

## 8.63 Reaction `R102`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}$$

$$(628)$$
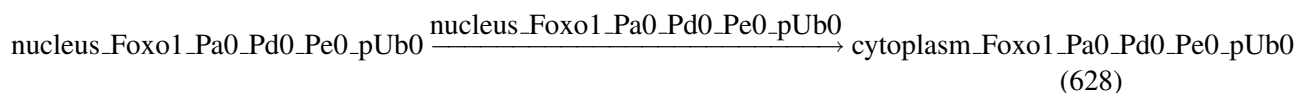
## Reactant

Table 193: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

## Modifier

Table 194: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

## Product

Table 195: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{63} = \text{function\_63}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}\right]\right) \quad (629)$$

$$\begin{aligned} &\text{function\_63}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}\right]\right) \\ &= \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr} \end{aligned} \quad (630)$$

Table 196: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.055 | | ☑ |

## 8.64 Reaction R103

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name**  transport nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}$$

$$(631)$$
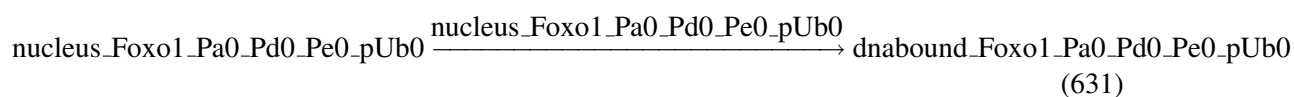
### Reactant

Table 197: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Modifier

Table 198: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

Table 199: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{64} = \text{function\_64} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \right] \right) \quad (632)$$

$$\begin{aligned} & \text{function\_64} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \right] \right) \\ & = \left[ \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \right] \cdot \text{vol} \left( \text{nucleus} \right) \cdot \text{ktr} \end{aligned} \quad (633)$$

Table 200: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.25 | | ☑ |

## 8.65 Reaction R104

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \quad (634)$$
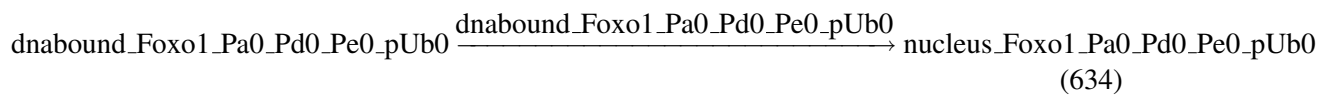
**Reactant**

Table 201: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

**Modifier**

Table 202: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

**Product**

### Table 203: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{65} = \text{function\_65}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{ktr}\right) \quad (635)$$

$$\begin{aligned} \text{function\_65}&\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{ktr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktr} \end{aligned} \quad (636)$$

### Table 204: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.125 | | ☑ |

## 8.66 Reaction R105

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \quad (637)$$
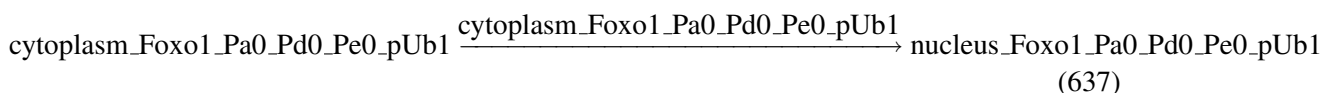
**Reactant**

### Table 205: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

**Modifier**

Table 206: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Product

Table 207: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{66} = \text{function\_66} \left(\text{vol}\left(\text{cytoplasm}\right), \left[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}\right], \text{ktr}\right) \quad (638)$$

$$\begin{aligned}
&\text{function\_66} \left(\text{vol}\left(\text{cytoplasm}\right), \left[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}\right], \text{ktr}\right) \\
&= \left[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}\right] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr}
\end{aligned} \quad (639)$$

Table 208: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.182 | | ☑ |

## 8.67 Reaction R106

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \quad (640)$$
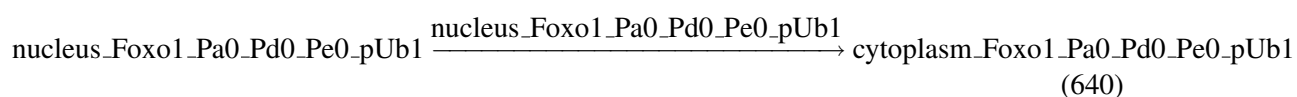
## Reactant

Table 209: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Modifier

Table 210: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Product

Table 211: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{67} = \text{function\_67}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}\right]\right) \tag{641}$$

$$\begin{aligned}&\text{function\_67}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}\right]\right)\\&= \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr}\end{aligned} \tag{642}$$

Table 212: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.055 | | ☑ |

## 8.68 Reaction R107

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}$$

$$(643)$$
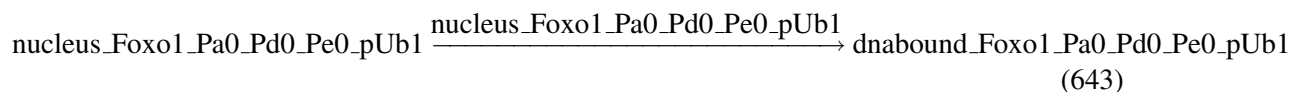
### Reactant

Table 213: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Modifier

Table 214: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Product

Table 215: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{68} = \text{function\_68} \left( \text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}\right] \right) \quad (644)$$

$$\begin{aligned} &\text{function\_68} \left( \text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}\right] \right) \\ &= \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr} \end{aligned} \quad (645)$$

Table 216: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.25 | | ☑ |

## 8.69 Reaction R108

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \tag{646}$$
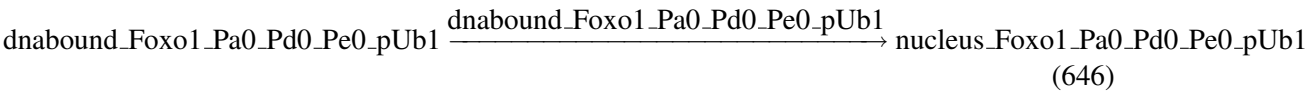
**Reactant**

Table 217: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

**Modifier**

Table 218: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

**Product**

Table 219: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{69} = \text{function\_69}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{ktr}\right) \tag{647}$$

$$\begin{aligned} &\text{function\_69}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{ktr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktr} \end{aligned} \tag{648}$$

Table 220: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.125 | | ☑ |

## 8.70 Reaction R109

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}$$

$$(649)$$
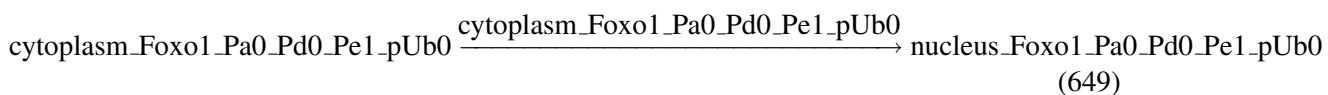
### Reactant

Table 221: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Modifier

Table 222: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Product

Table 223: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{70} = \text{function\_70}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{ktr}\right) \quad (650)$$

$$\begin{aligned}\text{function\_70}&\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{ktr}\right) \\ &= [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr}\end{aligned} \quad (651)$$

Table 224: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 1.818 | | ☑ |

## 8.71 Reaction R110

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \quad (652)$$
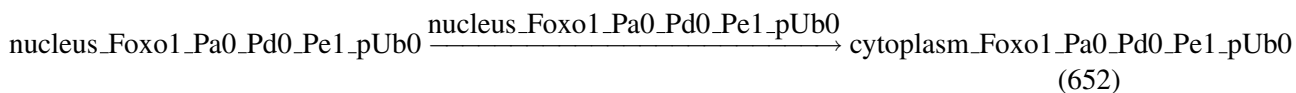
### Reactant

Table 225: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Modifier

Table 226: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Product

*Produced by* SBML2LATEX

Table 227: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{71} = \text{function\_71} \left( ktr, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \right] \right) \tag{653}$$

$$\text{function\_71} \left( ktr, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \right] \right)$$
$$= \left[ \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \right] \cdot \text{vol} \left( \text{nucleus} \right) \cdot ktr \tag{654}$$

Table 228: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.006 | | ☑ |

## 8.72 Reaction R111

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \tag{655}$$
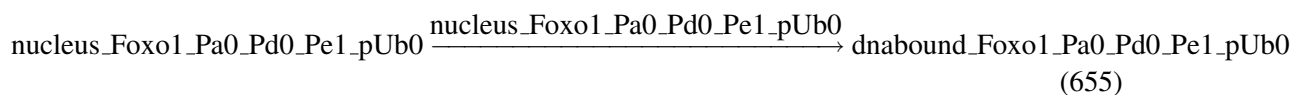
**Reactant**

Table 229: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

**Modifier**

Table 230: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Product

Table 231: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{72} = \text{function\_72}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}\right]\right) \quad (656)$$

$$\begin{aligned}&\text{function\_72}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}\right]\right)\\&= \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr}\end{aligned} \quad (657)$$

Table 232: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.25 | | ☑ |

## 8.73 Reaction R112

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0

## Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \quad (658)$$
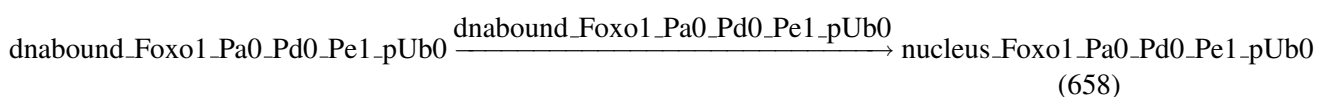
## Reactant

## Table 233: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Modifier

## Table 234: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Product

## Table 235: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{73} = \text{function\_73}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{ktr}\right) \quad (659)$$

$$\begin{aligned} &\text{function\_73}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{ktr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktr} \end{aligned} \quad (660)$$

## Table 236: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.125 | | ☑ |

## 8.74 Reaction R113

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1

## Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}$$

$$(661)$$
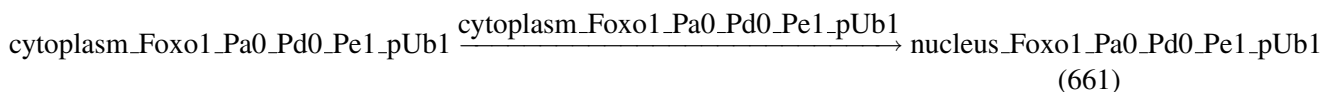
## Reactant

Table 237: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Modifier

Table 238: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Product

Table 239: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{74} = \text{function\_74}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{ktr}\right) \quad (662)$$

$$\begin{aligned} &\text{function\_74}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{ktr}\right) \\ &= [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr} \end{aligned} \quad (663)$$

Table 240: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 1.818 | | ☑ |

## 8.75 Reaction R114

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}$$

$$(664)$$
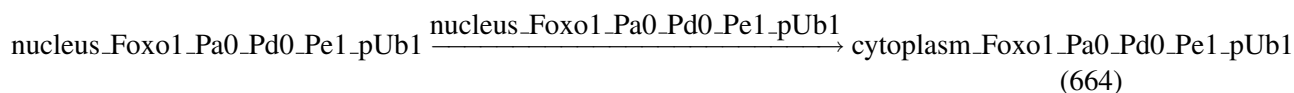
**Reactant**

Table 241: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

**Modifier**

Table 242: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

**Product**

Table 243: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{75} = \text{function\_75}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}\right]\right) \quad (665)$$

$$\begin{aligned} &\text{function\_75}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}\right]\right) \\ &= \left[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr} \end{aligned} \quad (666)$$

Table 244: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.006 | | ☑ |

## 8.76 Reaction R115

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \tag{667}$$
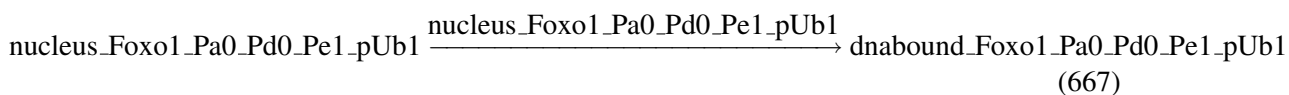
### Reactant

Table 245: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Modifier

Table 246: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Product

Table 247: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{76} = \text{function\_76}\,(\text{ktr}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]) \quad (668)$$

$$
\begin{aligned}
&\text{function\_76}\,(\text{ktr}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]) \\
&= [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr}
\end{aligned}
\quad (669)
$$

Table 248: Properties of each parameter.

| Id  | Name | SBO | Value | Unit | Constant |
|-----|------|-----|-------|------|----------|
| ktr | ktr  |     | 0.25  |      | ☑        |

## 8.77 Reaction R116

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \quad (670)$$
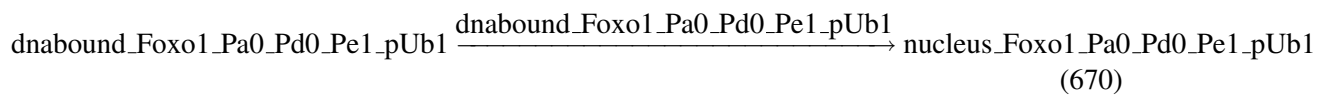
**Reactant**

Table 249: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

**Modifier**

Table 250: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

**Product**

Table 251: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{77} = \text{function\_77}\left(\text{vol}\left(\text{dnabound}\right), \left[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}\right], \text{ktr}\right) \quad (671)$$

$$\begin{aligned} &\text{function\_77}\left(\text{vol}\left(\text{dnabound}\right), \left[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}\right], \text{ktr}\right) \\ &= \left[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}\right] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktr} \end{aligned} \quad (672)$$

Table 252: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.125 | | ☑ |

## 8.78 Reaction R117

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \quad (673)$$
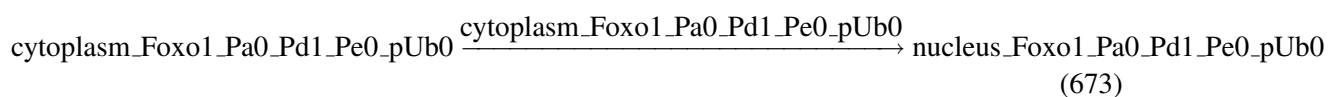
**Reactant**

Table 253: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

**Modifier**

## Table 254: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

**Product**

## Table 255: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

**Kinetic Law**

**Derived unit**  contains undeclared units

$$v_{78} = \text{function\_78} \left( \text{vol} \left( \text{cytoplasm} \right), \left[ \text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \right], \text{ktr} \right) \quad (674)$$

$$\begin{aligned} &\text{function\_78} \left( \text{vol} \left( \text{cytoplasm} \right), \left[ \text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \right], \text{ktr} \right) \\ &= \left[ \text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \right] \cdot \text{vol} \left( \text{cytoplasm} \right) \cdot \text{ktr} \end{aligned} \quad (675)$$

## Table 256: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.091 | | ☑ |

## 8.79 Reaction R118

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name**  transport nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \quad (676)$$
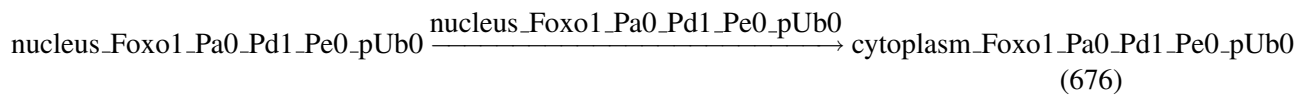
**Reactant**

Table 257: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Modifier

Table 258: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Product

Table 259: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{79} = \text{function\_79} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \right] \right) \tag{677}$$

$$\text{function\_79} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \right] \right) = \left[ \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \right] \cdot \text{vol} \left( \text{nucleus} \right) \cdot \text{ktr} \tag{678}$$

Table 260: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.55 | | ☑ |

## 8.80 Reaction R119

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}$$

$$(679)$$
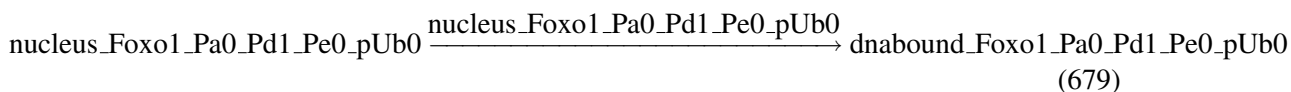
### Reactant

Table 261: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Modifier

Table 262: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Product

Table 263: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{80} = \text{function\_80}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]\right) \quad (680)$$

$$\begin{aligned} &\text{function\_80}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]\right) \\ &= [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr} \end{aligned} \quad (681)$$

Table 264: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.25 | | ☑ |

## 8.81 Reaction R120

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \tag{682}$$
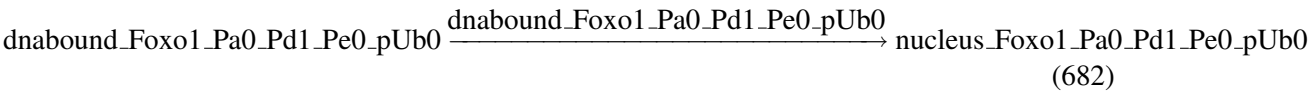
**Reactant**

Table 265: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

**Modifier**

Table 266: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

**Product**

Table 267: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{81} = \text{function\_81}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{ktr}\right) \tag{683}$$

$$\begin{aligned}
&\text{function\_81}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{ktr}\right) \\
&= [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktr}
\end{aligned} \tag{684}$$

Table 268: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.125 | | ☑ |

## 8.82 Reaction R121

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}$$

$$(685)$$
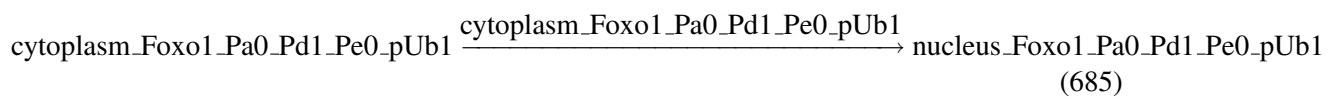
### Reactant

Table 269: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Modifier

Table 270: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Product

Table 271: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{82} = \text{function\_82}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{ktr}\right) \quad (686)$$

$$\begin{aligned}\text{function\_82}&\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{ktr}\right)\\ &= [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr}\end{aligned} \quad (687)$$

Table 272: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.091 | | ☑ |

## 8.83 Reaction R122

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \quad (688)$$
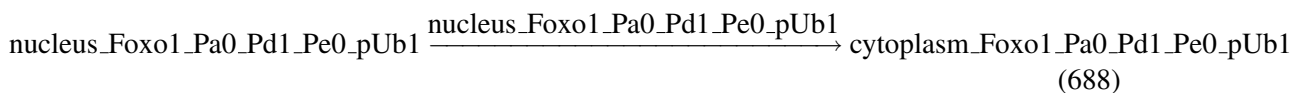
### Reactant

Table 273: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Modifier

Table 274: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Product

Table 275: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| `cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1` | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{83} = \text{function\_83} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \right] \right) \quad (689)$$

$$\begin{aligned} &\text{function\_83} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \right] \right) \\ &= \left[ \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \right] \cdot \text{vol} \left( \text{nucleus} \right) \cdot \text{ktr} \end{aligned} \quad (690)$$

Table 276: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| `ktr` | ktr | | 0.55 | | ☑ |

## 8.84 Reaction R123

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \quad (691)$$
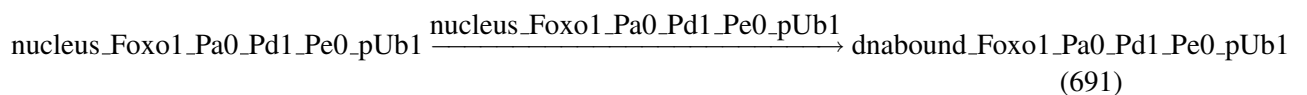
**Reactant**

Table 277: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| `nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1` | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

**Modifier**

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

**Product**

Table 279: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{84} = \text{function\_84}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}\right]\right) \quad (692)$$

$$\begin{aligned} \text{function\_84}&\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}\right]\right) \\ &= \left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr} \end{aligned} \quad (693)$$

Table 280: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.25 | | ☑ |

## 8.85 Reaction R124

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \quad (694)$$
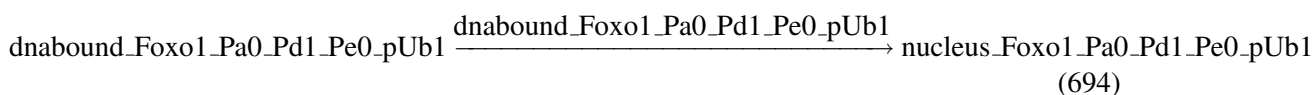
**Reactant**

Table 281: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Modifier

Table 282: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Product

Table 283: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{85} = \text{function\_85}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{ktr}\right) \quad (695)$$

$$\begin{aligned}\text{function\_85}&\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{ktr}\right)\\ &= [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktr}\end{aligned} \quad (696)$$

Table 284: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.125 | | ☑ |

## 8.86 Reaction R125

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0

## Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}$$

(697)
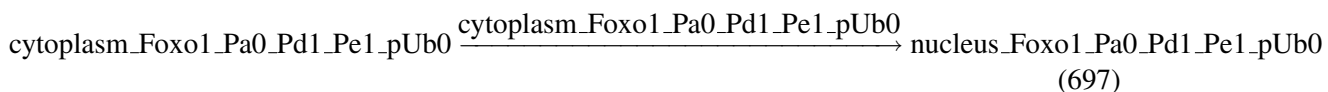
## Reactant

Table 285: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Modifier

Table 286: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Product

Table 287: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{86} = \text{function\_86}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{ktr}\right) \quad (698)$$

$$\begin{aligned}
&\text{function\_86}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{ktr}\right)\\
&= [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr}
\end{aligned} \quad (699)$$

Table 288: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.909 | | ☑ |

## 8.87 Reaction R126

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}$$

(700)
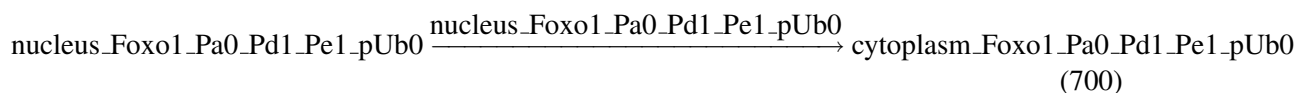
### Reactant

Table 289: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Modifier

Table 290: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Product

Table 291: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{87} = \text{function\_87}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]\right) \quad (701)$$

$$\begin{aligned} &\text{function\_87}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]\right) \\ &= [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr} \end{aligned} \quad (702)$$

Table 292: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.055 | | ☑ |

## 8.88 Reaction R127

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}$$

$$(703)$$
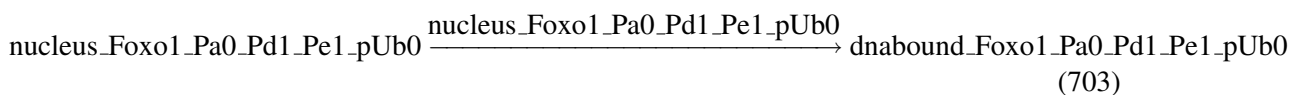
### Reactant

Table 293: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Modifier

Table 294: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Product

Table 295: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{88} = \text{function\_88}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}\right]\right) \quad (704)$$

$$\begin{aligned}
&\text{function\_88}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}\right]\right) \\
&= \left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr}
\end{aligned} \quad (705)$$

Table 296: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.25 | | ☑ |

## 8.89 Reaction R128

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \quad (706)$$
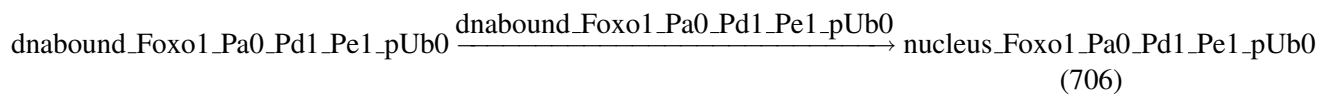
### Reactant

Table 297: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Modifier

Table 298: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Product

Table 299: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{89} = \text{function\_89}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{ktr}\right) \quad (707)$$

$$
\begin{aligned}
&\text{function\_89}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{ktr}\right) \\
&= [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktr}
\end{aligned} \quad (708)
$$

Table 300: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.125 | | ☑ |

## 8.90 Reaction R129

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \quad (709)$$
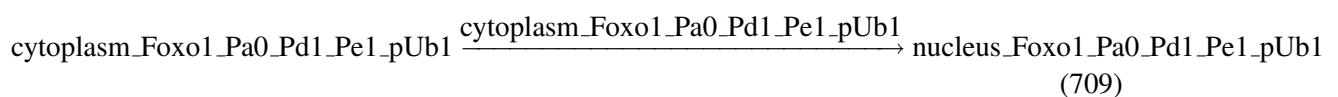
**Reactant**

Table 301: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

**Modifier**

*Produced by* SBML2LATEX

Table 302: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Product

Table 303: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{90} = \text{function\_90} \left( \text{vol} \left( \text{cytoplasm} \right), \left[ \text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \right], \text{ktr} \right) \quad (710)$$

$$\begin{aligned} &\text{function\_90} \left( \text{vol} \left( \text{cytoplasm} \right), \left[ \text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \right], \text{ktr} \right) \\ &= \left[ \text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \right] \cdot \text{vol} \left( \text{cytoplasm} \right) \cdot \text{ktr} \end{aligned} \quad (711)$$

Table 304: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.909 | | ☑ |

## 8.91 Reaction R130

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name**  transport nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \quad (712)$$
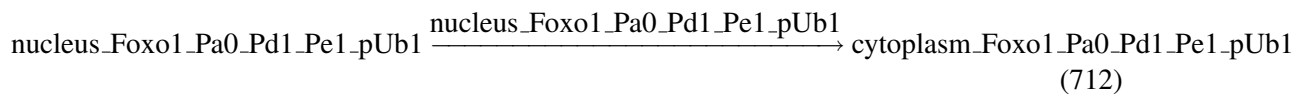
### Reactant

Table 305: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Modifier

Table 306: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Product

Table 307: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{91} = \text{function\_91} \left( \text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}\right] \right) \tag{713}$$

$$\begin{aligned} &\text{function\_91} \left( \text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}\right] \right) \\ &= \left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr} \end{aligned} \tag{714}$$

Table 308: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.055 | | ☑ |

## 8.92 Reaction R131

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}$$

(715)
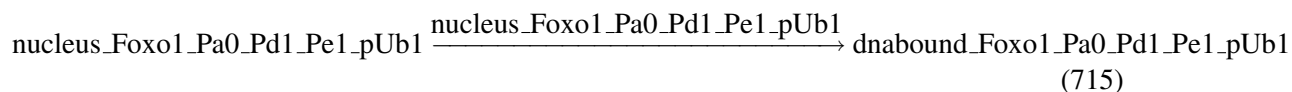
## Reactant

Table 309: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

## Modifier

Table 310: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

## Product

Table 311: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{92} = \text{function\_92} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \right] \right) \quad (716)$$

$$\begin{aligned} &\text{function\_92} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \right] \right) \\ &= \left[ \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \right] \cdot \text{vol} \left( \text{nucleus} \right) \cdot \text{ktr} \end{aligned} \quad (717)$$

Table 312: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.25 | | ☑ |

## 8.93 Reaction R132

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \tag{718}$$
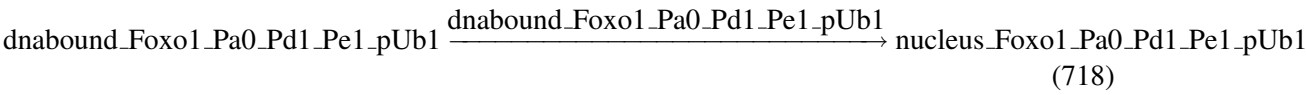
### Reactant

Table 313: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Modifier

Table 314: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Product

Table 315: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{93} = \text{function\_93}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{ktr}\right) \tag{719}$$

$$\begin{aligned} &\text{function\_93}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{ktr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktr} \end{aligned} \tag{720}$$

Table 316: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.125 | | ☑ |

## 8.94 Reaction R133

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \tag{721}$$
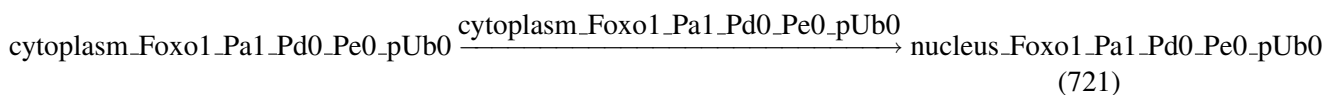
### Reactant

Table 317: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Modifier

Table 318: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Product

Table 319: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{94} = \text{function\_94}\left(\text{vol}\left(\text{cytoplasm}\right), \left[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}\right], \text{ktr}\right) \quad (722)$$

$$\text{function\_94}\left(\text{vol}\left(\text{cytoplasm}\right), \left[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}\right], \text{ktr}\right)$$
$$= \left[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}\right] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr} \quad (723)$$

Table 320: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.018 | | ✓ |

## 8.95 Reaction R134

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}$$
$$(724)$$
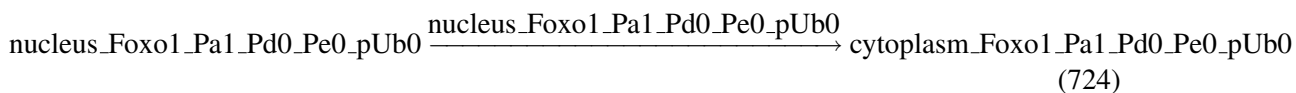
**Reactant**

Table 321: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

**Modifier**

Table 322: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

**Product**

**Table 323: Properties of each product.**

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{95} = \text{function\_95}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}\right]\right) \quad (725)$$

$$\begin{aligned} &\text{function\_95}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}\right]\right) \\ &= \left[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr} \end{aligned} \quad (726)$$

**Table 324: Properties of each parameter.**

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.55 | | ☑ |

## 8.96 Reaction R135

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name**  transport nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \quad (727)$$
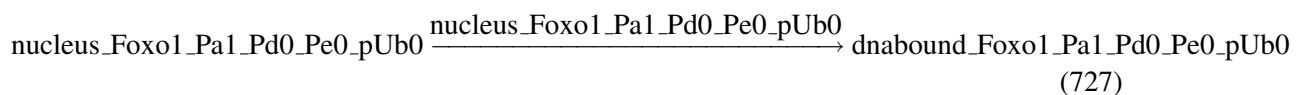
### Reactant

**Table 325: Properties of each reactant.**

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Modifier

Table 326: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

**Product**

Table 327: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{96} = \text{function\_96}\,(\text{ktr}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}]) \quad (728)$$

$$\begin{aligned}
&\text{function\_96}\,(\text{ktr}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}]) \\
&= [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr}
\end{aligned} \quad (729)$$

Table 328: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.125 | | ☑ |

## 8.97 Reaction R136

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \quad (730)$$
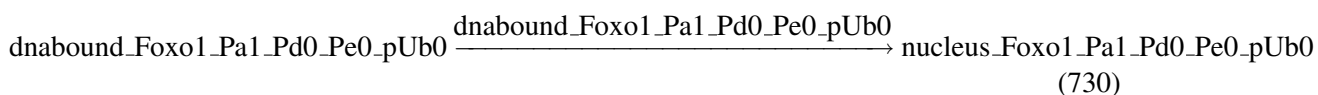
**Reactant**

Table 329: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

## Modifier

Table 330: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

## Product

Table 331: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{97} = \text{function\_97}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{ktr}\right) \quad (731)$$

$$\begin{aligned}\text{function\_97}&\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{ktr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktr}\end{aligned} \quad (732)$$

Table 332: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.125 | | ☑ |

## 8.98 Reaction R137

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1

## Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}$$

(733)
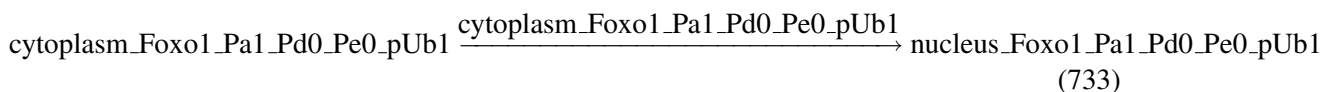
## Reactant

Table 333: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

## Modifier

Table 334: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

## Product

Table 335: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{98} = \text{function\_98}\left(\text{vol}\left(\text{cytoplasm}\right), \left[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}\right], \text{ktr}\right) \quad (734)$$

$$\begin{aligned} &\text{function\_98}\left(\text{vol}\left(\text{cytoplasm}\right), \left[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}\right], \text{ktr}\right) \\ &= \left[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}\right] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr} \end{aligned} \quad (735)$$

Table 336: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.018 | | ☑ |

## 8.99 Reaction R138

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \tag{736}$$
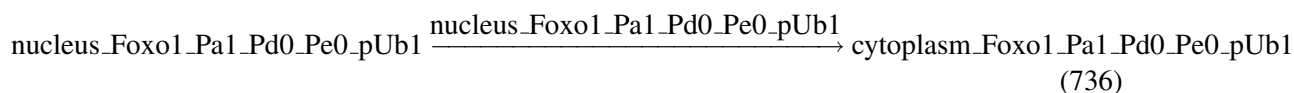
**Reactant**

Table 337: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

**Modifier**

Table 338: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

**Product**

Table 339: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{99} = \text{function\_99}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}\right]\right) \tag{737}$$

$$\begin{aligned} &\text{function\_99}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}\right]\right) \\ &= \left[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr} \end{aligned} \tag{738}$$

Table 340: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| `ktr` | ktr | | 0.55 | | ☑ |

## 8.100 Reaction R139

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}$$

$$(739)$$
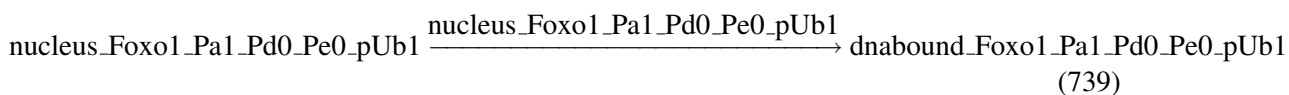
### Reactant

Table 341: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| `nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1` | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Modifier

Table 342: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| `nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1` | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Product

Table 343: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| `dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1` | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{100} = \text{function\_100} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \right] \right) \quad (740)$$

$$\begin{aligned} \text{function\_100} &\left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \right] \right) \\ &= \left[ \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \right] \cdot \text{vol} \left( \text{nucleus} \right) \cdot \text{ktr} \end{aligned} \quad (741)$$

Table 344: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.125 | | ☑ |

## 8.101 Reaction R140

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \quad (742)$$
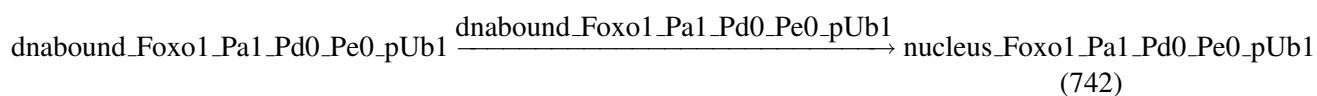
### Reactant

Table 345: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Modifier

Table 346: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Product

Table 347: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{101} = \text{function\_101} \left( \text{vol} \left( \text{dnabound} \right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{ktr} \right) \quad (743)$$

$$\begin{aligned} \text{function\_101} &\left( \text{vol} \left( \text{dnabound} \right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{ktr} \right) \\ &= [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol} \left( \text{dnabound} \right) \cdot \text{ktr} \end{aligned} \quad (744)$$

Table 348: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.125 | | ☑ |

## 8.102 Reaction R141

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \quad (745)$$
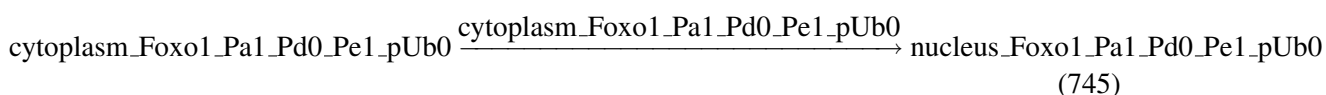
**Reactant**

Table 349: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

**Modifier**

Table 350: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Product

Table 351: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{102} = \text{function\_102}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{ktr}\right) \quad (746)$$

$$\begin{aligned}\text{function\_102}&\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{ktr}\right)\\ &= [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr}\end{aligned} \quad (747)$$

Table 352: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.182 | | ☑ |

## 8.103 Reaction R142

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name**  transport nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \quad (748)$$
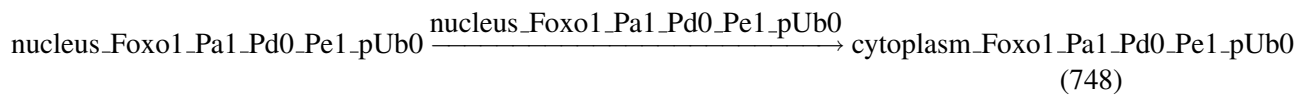
### Reactant

Table 353: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Modifier

Table 354: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Product

Table 355: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{103} = \text{function\_103}\,(\text{ktr}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}]) \quad (749)$$

$$\text{function\_103}\,(\text{ktr}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}]) \\ = [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr} \quad (750)$$

Table 356: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.055 | | ☑ |

## 8.104 Reaction R143

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}$$

$$(751)$$
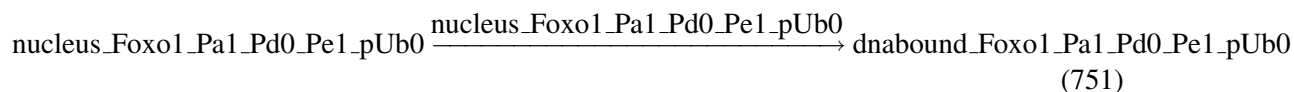
## Reactant

Table 357: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Modifier

Table 358: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Product

Table 359: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{104} = \text{function\_104}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}\right]\right) \quad (752)$$

$$\begin{aligned}
&\text{function\_104}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}\right]\right) \\
&= \left[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr}
\end{aligned} \quad (753)$$

Table 360: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.125 | | ☑ |

## 8.105 Reaction R144

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}$$
$$(754)$$
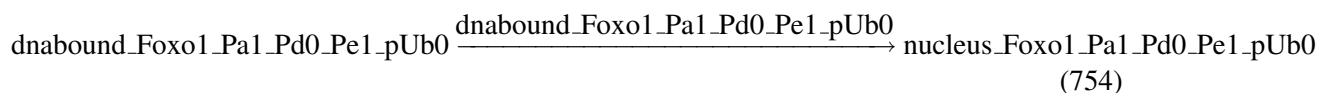
### Reactant

Table 361: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Modifier

Table 362: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Product

Table 363: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{105} = \text{function\_105}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{ktr}\right) \quad (755)$$

$$\begin{aligned}&\text{function\_105}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{ktr}\right)\\ &= [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktr}\end{aligned} \quad (756)$$

Table 364: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.125 | | ☑ |

## 8.106 Reaction R145

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \tag{757}$$
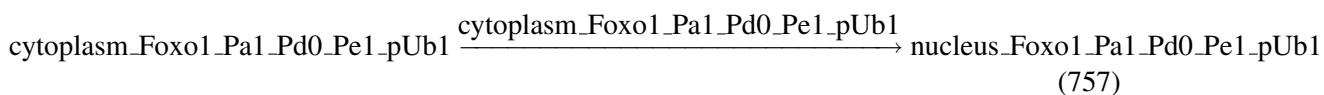
### Reactant

Table 365: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Modifier

Table 366: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Product

Table 367: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{106} = \text{function\_106}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{ktr}\right) \quad (758)$$

$$\begin{aligned}
&\text{function\_106}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{ktr}\right) \\
&= [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr}
\end{aligned} \quad (759)$$

Table 368: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.182 | | ☑ |

## 8.107 Reaction R146

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \quad (760)$$
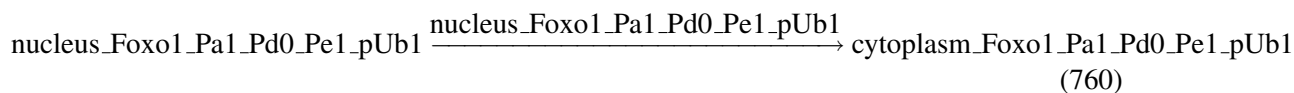
### Reactant

Table 369: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Modifier

Table 370: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Product

*Produced by* SBML2LATEX

Table 371: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{107} = \text{function\_107}\,(\text{ktr}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}]) \quad (761)$$

$$
\begin{aligned}
&\text{function\_107}\,(\text{ktr}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}]) \\
&= [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot \text{ktr}
\end{aligned}
\quad (762)
$$

Table 372: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.055 | | ☑ |

## 8.108 Reaction R147

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name**  transport nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \quad (763)$$
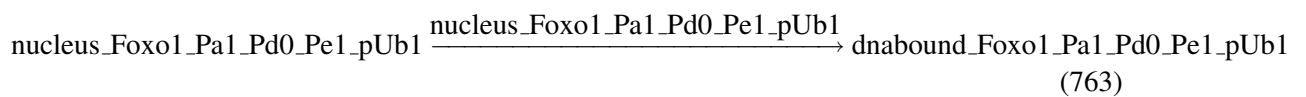
### Reactant

Table 373: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Modifier

Table 374: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

**Product**

Table 375: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{108} = \text{function\_108} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \right] \right) \quad (764)$$

$$\begin{aligned} &\text{function\_108} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \right] \right) \\ &= \left[ \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \right] \cdot \text{vol} \left( \text{nucleus} \right) \cdot \text{ktr} \end{aligned} \quad (765)$$

Table 376: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.125 | | ☑ |

## 8.109 Reaction R148

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \quad (766)$$
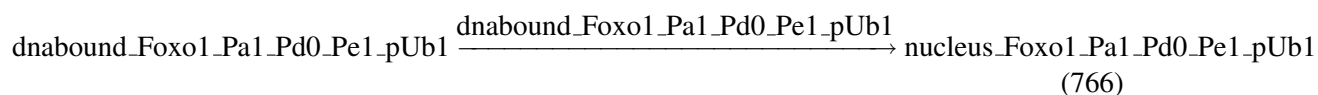
**Reactant**

Table 377: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

## Modifier

Table 378: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

## Product

Table 379: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{109} = \text{function\_109} \left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \right], \text{ktr} \right) \quad (767)$$

$$\begin{aligned} &\text{function\_109} \left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \right], \text{ktr} \right) \\ &= \left[ \text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \right] \cdot \text{vol} \left( \text{dnabound} \right) \cdot \text{ktr} \end{aligned} \quad (768)$$

Table 380: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.125 | | ☑ |

## 8.110 Reaction R149

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}$$
$$(769)$$
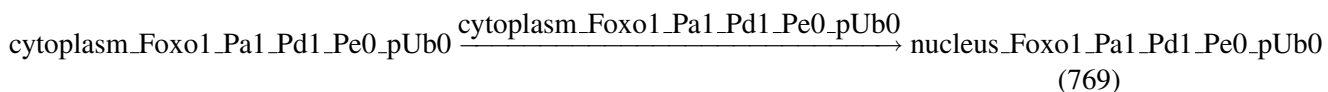
### Reactant

Table 381: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Modifier

Table 382: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

Table 383: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{110} = \text{function\_110}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{ktr}\right) \quad (770)$$

$$\text{function\_110}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{ktr}\right)$$
$$= [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr} \quad (771)$$

Table 384: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.009 | | ☑ |

*Produced by SBML2LATEX*

## 8.111 Reaction R150

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \tag{772}$$
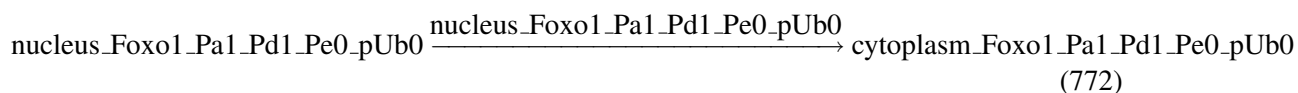
### Reactant

Table 385: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Modifier

Table 386: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

Table 387: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{111} = \text{function\_111} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \right] \right) \tag{773}$$

$$\begin{aligned} &\text{function\_111} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \right] \right) \\ &= \left[ \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \right] \cdot \text{vol} \left( \text{nucleus} \right) \cdot \text{ktr} \end{aligned} \tag{774}$$

Table 388: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 5.5 | | ☑ |

## 8.112 Reaction R151

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}$$

$$(775)$$
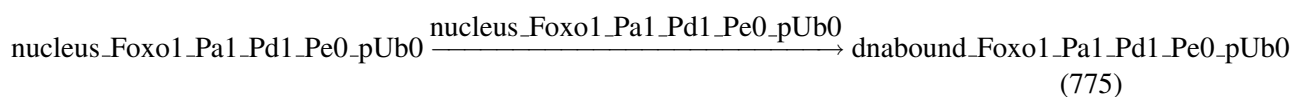
### Reactant

Table 389: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Modifier

Table 390: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

Table 391: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{112} = \text{function\_112}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}\right]\right) \quad (776)$$

$$\begin{aligned}
&\text{function\_112}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}\right]\right) \\
&= \left[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr}
\end{aligned} \quad (777)$$

Table 392: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.125 | | ☑ |

## 8.113 Reaction R152

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \quad (778)$$
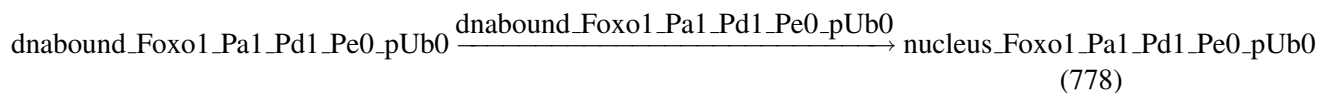
### Reactant

Table 393: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Modifier

Table 394: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

Table 395: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{113} = \text{function\_113} \left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \right], \text{ktr} \right) \quad (779)$$

$$\begin{aligned} \text{function\_113} &\left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \right], \text{ktr} \right) \\ &= \left[ \text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \right] \cdot \text{vol} \left( \text{dnabound} \right) \cdot \text{ktr} \end{aligned} \quad (780)$$

Table 396: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.125 | | ☑ |

## 8.114 Reaction R153

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \quad (781)$$
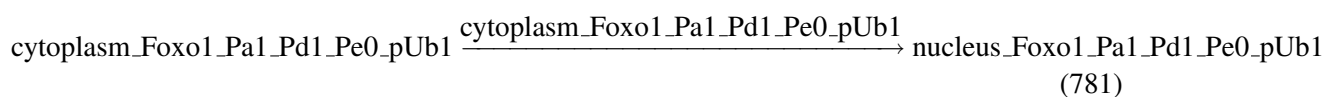
**Reactant**

Table 397: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

**Modifier**

Table 398: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Product

Table 399: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{114} = \text{function\_114}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{ktr}\right) \quad (782)$$

$$\begin{aligned}\text{function\_114}&\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{ktr}\right)\\ &= [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr}\end{aligned} \quad (783)$$

Table 400: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.009 | | ☑ |

## 8.115 Reaction R154

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \quad (784)$$
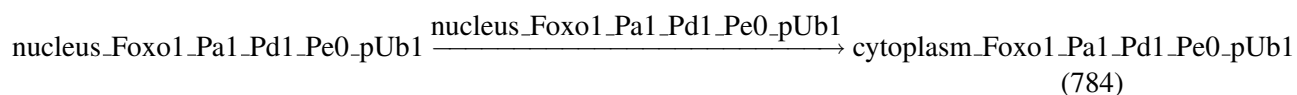
## Reactant

Table 401: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Modifier

Table 402: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Product

Table 403: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{115} = \text{function\_115} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \right] \right) \quad (785)$$

$$\begin{aligned} &\text{function\_115} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \right] \right) \\ &= \left[ \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \right] \cdot \text{vol} \left( \text{nucleus} \right) \cdot \text{ktr} \end{aligned} \quad (786)$$

Table 404: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 5.5 | | ☑ |

## 8.116 Reaction R155

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}$$
(787)
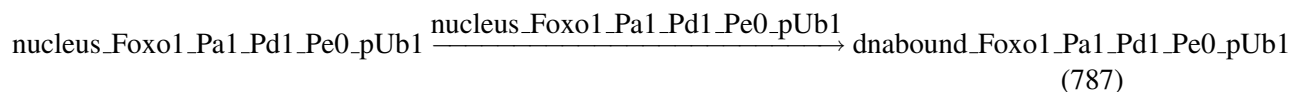
## Reactant

Table 405: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Modifier

Table 406: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Product

Table 407: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{116} = \text{function\_116}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}\right]\right)$$
(788)

$$\begin{aligned}&\text{function\_116}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}\right]\right)\\&= \left[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr}\end{aligned}$$
(789)

Table 408: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.125 | | ☑ |

## 8.117 Reaction R156

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \tag{790}$$
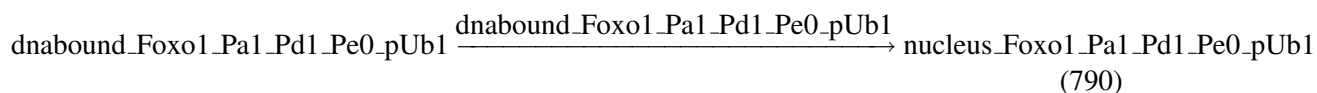
### Reactant

Table 409: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Modifier

Table 410: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Product

Table 411: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{117} = \text{function\_117}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{ktr}\right) \tag{791}$$

$$\begin{aligned} &\text{function\_117}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{ktr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktr} \end{aligned} \tag{792}$$

Table 412: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.125 | | ☑ |

## 8.118 Reaction R157

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \tag{793}$$
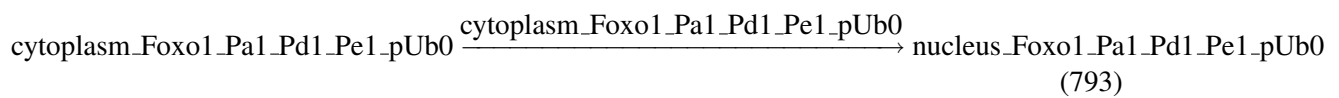
### Reactant

Table 413: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Modifier

Table 414: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Product

Table 415: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{118} = \text{function\_118}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{ktr}\right) \quad (794)$$

$$\begin{aligned}
&\text{function\_118}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{ktr}\right) \\
&= [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr}
\end{aligned} \quad (795)$$

Table 416: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.091 | | ☑ |

## 8.119 Reaction R158

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \quad (796)$$
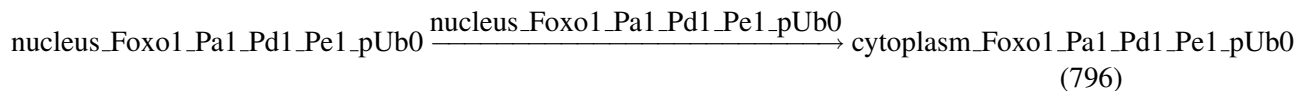
**Reactant**

Table 417: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

**Modifier**

Table 418: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

**Product**

### Table 419: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{119} = \text{function\_119} \left( ktr, \text{vol} \left( nucleus \right), \left[ nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0 \right] \right) \quad (797)$$

$$\begin{aligned} \text{function\_119} \left( ktr, \text{vol} \left( nucleus \right), \left[ nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0 \right] \right) \\ = \left[ nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0 \right] \cdot \text{vol} \left( nucleus \right) \cdot ktr \end{aligned} \quad (798)$$

### Table 420: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.55 | | ☑ |

## 8.120 Reaction R159

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \quad (799)$$
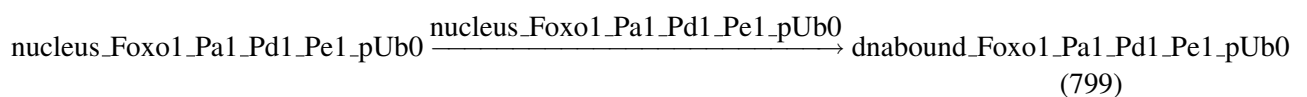
**Reactant**

### Table 421: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

**Modifier**

Table 422: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Product

Table 423: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{120} = \text{function\_120}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}\right]\right) \quad (800)$$

$$\begin{aligned}
&\text{function\_120}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}\right]\right) \\
&= \left[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr}
\end{aligned} \quad (801)$$

Table 424: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.125 | | ☑ |

## 8.121 Reaction R160

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \quad (802)$$
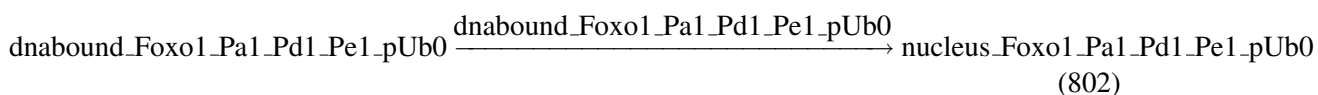
### Reactant

Table 425: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Modifier

Table 426: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Product

Table 427: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{121} = \text{function\_121}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{ktr}\right) \quad (803)$$

$$\begin{aligned} &\text{function\_121}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{ktr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktr} \end{aligned} \quad (804)$$

Table 428: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.125 | | ☑ |

## 8.122 Reaction R161

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1

## Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}$$
$$(805)$$
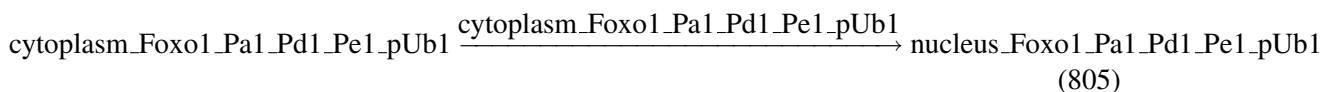
## Reactant

Table 429: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Modifier

Table 430: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Product

Table 431: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{122} = \text{function\_122}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{ktr}\right) \quad (806)$$

$$\text{function\_122}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{ktr}\right) = [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{ktr} \quad (807)$$

Table 432: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.091 | | ☑ |

## 8.123 Reaction R162

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}$$

$$(808)$$
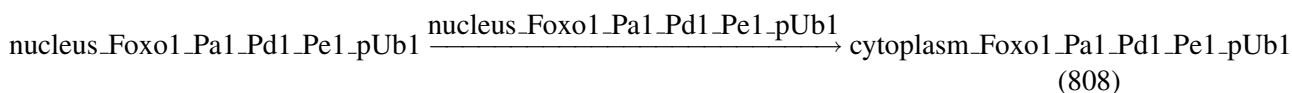
### Reactant

Table 433: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Modifier

Table 434: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Product

Table 435: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{123} = \text{function\_123} \left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \right] \right) \quad (809)$$

$$\begin{aligned} \text{function\_123} &\left( \text{ktr}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \right] \right) \\ &= \left[ \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \right] \cdot \text{vol} \left( \text{nucleus} \right) \cdot \text{ktr} \end{aligned} \quad (810)$$

Table 436: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.55 | | ☑ |

## 8.124 Reaction R163

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}$$

$$(811)$$
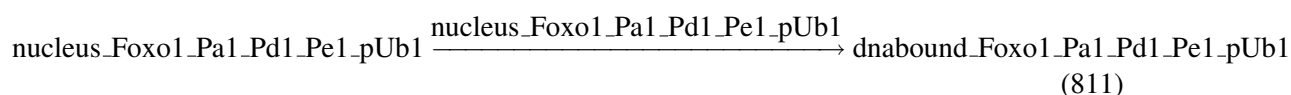
### Reactant

Table 437: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Modifier

Table 438: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Product

Table 439: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{124} = \text{function\_124}\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}\right]\right) \quad (812)$$

$$\begin{aligned} \text{function\_124}&\left(\text{ktr}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}\right]\right) \\ &= \left[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{ktr} \end{aligned} \quad (813)$$

Table 440: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktr | ktr | | 0.125 | | ☑ |

## 8.125 Reaction R164

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** transport dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \quad (814)$$
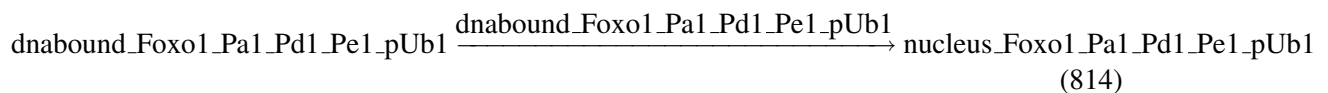
### Reactant

Table 441: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Modifier

Table 442: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Product

## Table 443: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{125} = \text{function\_125}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{ktr}\right) \quad (815)$$

$$\begin{aligned} &\text{function\_125}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{ktr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktr} \end{aligned} \quad (816)$$

## Table 444: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktr | ktr | | 0.125 | | ☑ |

## 8.126 Reaction R165

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe0-_pUb0 by Akt_P2

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa} \quad (817)$$
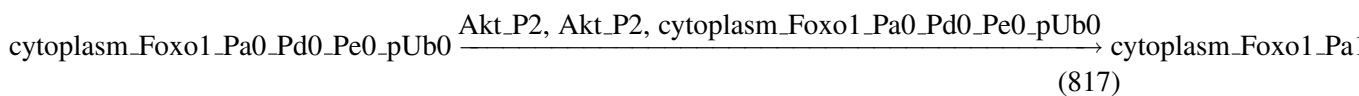
### Reactant

## Table 445: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Modifiers

Table 446: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

Table 447: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{126} = \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{function\_126}\,([\mathrm{Akt\_P2}], \mathrm{vol}\,(\mathrm{cytoplasm}),$$
$$[\mathrm{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \mathrm{kkin}) \tag{818}$$

$$\mathrm{function\_126}\,([\mathrm{Akt\_P2}], \mathrm{vol}\,(\mathrm{cytoplasm}), [\mathrm{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \mathrm{kkin})$$
$$= \frac{[\mathrm{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot [\mathrm{Akt\_P2}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kkin}}{\mathrm{vol}\,(\mathrm{cytoplasm})}$$
$$\tag{819}$$

$$\mathrm{function\_126}\,([\mathrm{Akt\_P2}], \mathrm{vol}\,(\mathrm{cytoplasm}), [\mathrm{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \mathrm{kkin})$$
$$= \frac{[\mathrm{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot [\mathrm{Akt\_P2}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kkin}}{\mathrm{vol}\,(\mathrm{cytoplasm})}$$
$$\tag{820}$$

Table 448: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

### 8.127 Reaction R166

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 by Akt_P2

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_P}$$

(821)
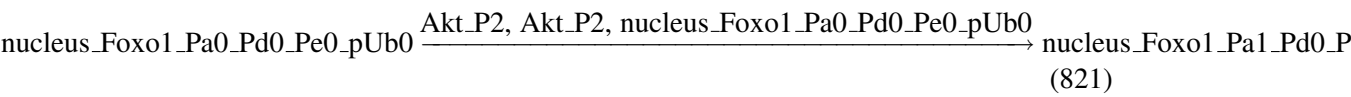
### Reactant

Table 449: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Modifiers

Table 450: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

Table 451: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{127} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_127}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \text{vol}\,(\text{nucleus}),$$

(822)

$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}])$$

*Produced by SBML2LATEX*

$$\begin{aligned} \text{function\_127}\,(&[\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm})\,, \text{kkin}, \\ &\text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]) \\ &= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})} \end{aligned}$$

(823)

$$\begin{aligned} \text{function\_127}\,(&[\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm})\,, \text{kkin}, \\ &\text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]) \\ &= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})} \end{aligned}$$

(824)

Table 452: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.128 Reaction R167

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe0-_pUb0 by Akt_P2

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_}$$

(825)
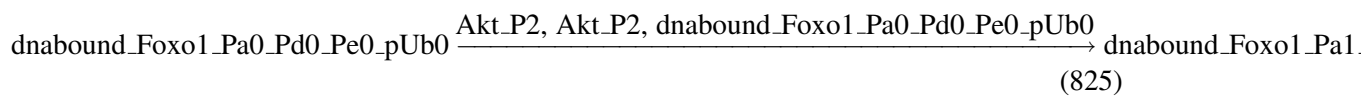
### Reactant

Table 453: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Modifiers

## Table 454: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

## Table 455: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{128} = \text{vol}(\text{dnabound}) \cdot \text{function\_128}([\text{Akt\_P2}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}) \tag{826}$$

$$\text{function\_128}([\text{Akt\_P2}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{dnabound})} \tag{827}$$

$$\text{function\_128}([\text{Akt\_P2}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{dnabound})} \tag{828}$$

## Table 456: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.129 Reaction R168

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd0_Pe0-_pUb1 by Akt_P2

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1}$$

(829)
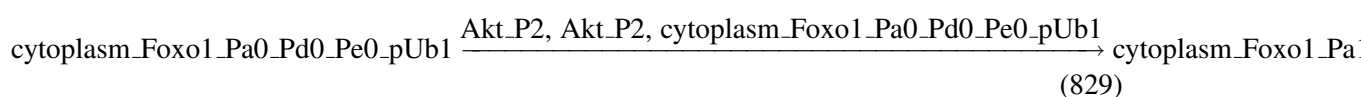
### Reactant

Table 457: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Modifiers

Table 458: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Product

Table 459: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{129} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_129}\left([\text{Akt\_P2}], \text{vol}\left(\text{cytoplasm}\right), \right.$$
$$\left. [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin}\right)$$

(830)

$$\text{function\_129}\left([\text{Akt\_P2}], \text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})}$$
(831)

$$\text{function\_129}\left([\text{Akt\_P2}], \text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})}$$
(832)

Table 460: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|------|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.130 Reaction R169

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 by Akt_P2

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_P}$$
(833)
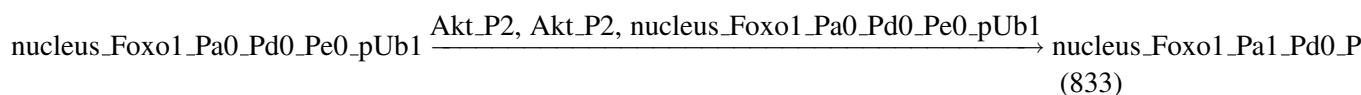
### Reactant

Table 461: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Modifiers

Table 462: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Product

Table 463: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{130} = \text{vol}(\text{nucleus}) \cdot \text{function\_130}([\text{Akt\_P2}], \text{vol}(\text{cytoplasm}), \text{kkin}, \text{vol}(\text{nucleus}), \quad (834)$$
$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}])$$

$$\text{function\_130}([\text{Akt\_P2}], \text{vol}(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{nucleus})}$$
$$(835)$$

$$\text{function\_130}([\text{Akt\_P2}], \text{vol}(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{nucleus})}$$
$$(836)$$

Table 464: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.131 Reaction R170

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 by Akt_P2

## Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_}$$

$$(837)$$
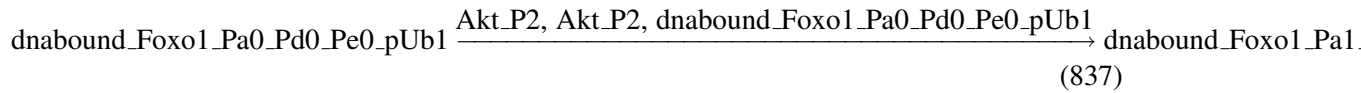
## Reactant

Table 465: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Modifiers

Table 466: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Product

Table 467: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{131} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_131}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin}) \quad (838)$$

$$\text{function\_131}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$(839)$$

*Produced by SBML2LATEX*

$$\begin{aligned}
&\text{function\_131}\left([\text{Akt\_P2}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right),\right.\\
&\left.[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin}\right)\\
&= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{Akt\_P2}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kkin}}{\text{vol}\left(\text{dnabound}\right)}
\end{aligned}$$

$$(840)$$

Table 468: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.132 Reaction R171

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe1-_pUb0 by Akt_P2

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa}$$

$$(841)$$
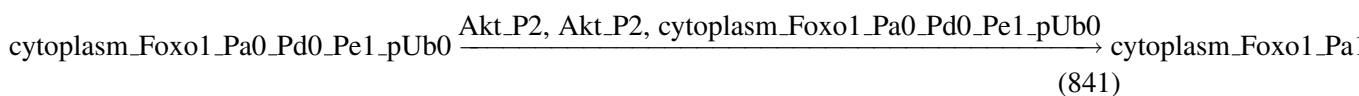
### Reactant

Table 469: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Modifiers

Table 470: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Product

Table 471: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{132} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_132}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \tag{842}$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin})$$

$$\text{function\_132}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \tag{843}$$

$$\text{function\_132}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \tag{844}$$

Table 472: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.133 Reaction R172

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 by Akt_P2

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_P} \tag{845}$$
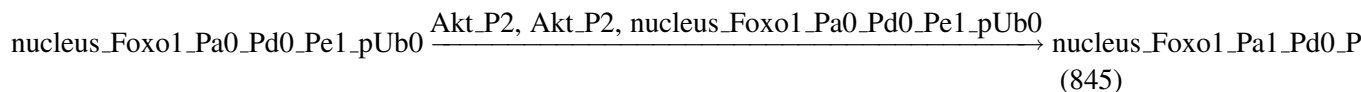
**Reactant**

Table 473: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Modifiers

Table 474: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Product

Table 475: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{133} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_133}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \text{vol}\,(\text{nucleus}),$$
$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]) \quad (846)$$

$$\text{function\_133}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$(847)$$

$$\text{function\_133}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$(848)$$

Table 476: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.134 Reaction R173

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe1-_pUb0 by Akt_P2

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_}$$
$$(849)$$
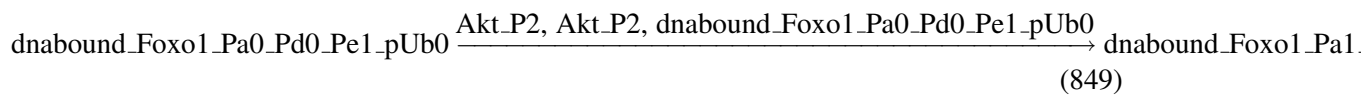
### Reactant

Table 477: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Modifiers

Table 478: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Product

Table 479: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{134} = \text{vol (dnabound)} \cdot \text{function\_134} \left( [\text{Akt\_P2}], \text{vol (cytoplasm)}, \text{vol (dnabound)}, \right.$$
$$\left. [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin} \right) \quad (850)$$

function\_134 ([Akt\_P2], vol (cytoplasm), vol (dnabound),
[dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0], kkin)

$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (dnabound)} \cdot [\text{Akt\_P2}] \cdot \text{vol (cytoplasm)} \cdot \text{kkin}}{\text{vol (dnabound)}}$$

$$(851)$$

function\_134 ([Akt\_P2], vol (cytoplasm), vol (dnabound),
[dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0], kkin)

$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (dnabound)} \cdot [\text{Akt\_P2}] \cdot \text{vol (cytoplasm)} \cdot \text{kkin}}{\text{vol (dnabound)}}$$

$$(852)$$

Table 480: Properties of each parameter.

| Id   | Name | SBO | Value           | Unit | Constant |
|------|------|-----|-----------------|------|----------|
| kkin | kkin |     | $3 \cdot 10^{-4}$ |      | ☑        |

## 8.135 Reaction R174

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1 to cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1-\_pUb1 by Akt\_P2

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa}$$

$$(853)$$
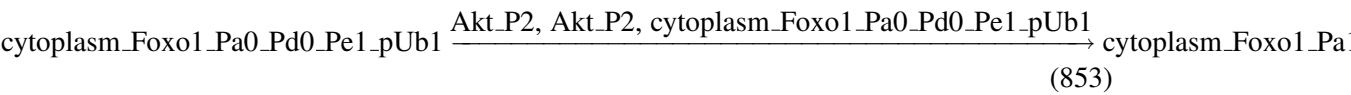
**Reactant**

Table 481: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Modifiers

Table 482: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Product

Table 483: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{135} = \mathrm{vol}\left(\mathrm{cytoplasm}\right) \cdot \mathrm{function\_135}\left([\mathrm{Akt\_P2}], \mathrm{vol}\left(\mathrm{cytoplasm}\right), \right.$$
$$\left. [\mathrm{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \mathrm{kkin}\right) \tag{854}$$

$$\mathrm{function\_135}\left([\mathrm{Akt\_P2}], \mathrm{vol}\left(\mathrm{cytoplasm}\right), [\mathrm{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \mathrm{kkin}\right)$$
$$= \frac{[\mathrm{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \mathrm{vol}\left(\mathrm{cytoplasm}\right) \cdot [\mathrm{Akt\_P2}] \cdot \mathrm{vol}\left(\mathrm{cytoplasm}\right) \cdot \mathrm{kkin}}{\mathrm{vol}\left(\mathrm{cytoplasm}\right)} \tag{855}$$

$$\mathrm{function\_135}\left([\mathrm{Akt\_P2}], \mathrm{vol}\left(\mathrm{cytoplasm}\right), [\mathrm{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \mathrm{kkin}\right)$$
$$= \frac{[\mathrm{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \mathrm{vol}\left(\mathrm{cytoplasm}\right) \cdot [\mathrm{Akt\_P2}] \cdot \mathrm{vol}\left(\mathrm{cytoplasm}\right) \cdot \mathrm{kkin}}{\mathrm{vol}\left(\mathrm{cytoplasm}\right)} \tag{856}$$

Table 484: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.136 Reaction R175

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 by Akt_P2

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_P} \tag{857}$$
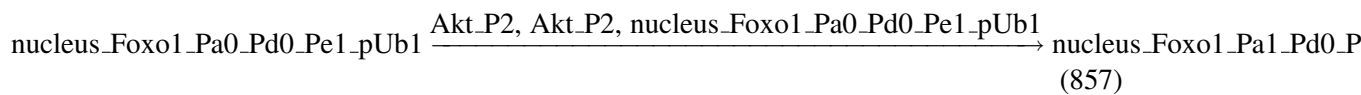
### Reactant

Table 485: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Modifiers

Table 486: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Product

Table 487: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{136} = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{function\_136}\,([\mathrm{Akt\_P2}], \mathrm{vol}\,(\mathrm{cytoplasm}), \mathrm{kkin}, \mathrm{vol}\,(\mathrm{nucleus}),$$
$$[\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]) \tag{858}$$

$$\mathrm{function\_136}\,([\mathrm{Akt\_P2}], \mathrm{vol}\,(\mathrm{cytoplasm}), \mathrm{kkin},$$
$$\mathrm{vol}\,(\mathrm{nucleus}), [\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}])$$
$$= \frac{[\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \mathrm{vol}\,(\mathrm{nucleus}) \cdot [\mathrm{Akt\_P2}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kkin}}{\mathrm{vol}\,(\mathrm{nucleus})}$$
$$\tag{859}$$

$$\mathrm{function\_136}\,([\mathrm{Akt\_P2}], \mathrm{vol}\,(\mathrm{cytoplasm}), \mathrm{kkin},$$
$$\mathrm{vol}\,(\mathrm{nucleus}), [\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}])$$
$$= \frac{[\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \mathrm{vol}\,(\mathrm{nucleus}) \cdot [\mathrm{Akt\_P2}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kkin}}{\mathrm{vol}\,(\mathrm{nucleus})}$$
$$\tag{860}$$

Table 488: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.137 Reaction R176

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd0_Pe1-_pUb1 by Akt_P2

**Reaction equation**

$$\mathrm{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\mathrm{Akt\_P2,\ Akt\_P2,\ dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \mathrm{dnabound\_Foxo1\_Pa1\_} \tag{861}$$
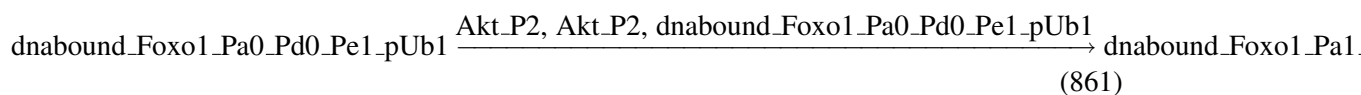
**Reactant**

## Table 489: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Modifiers

## Table 490: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Product

## Table 491: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{137} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_137}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \quad (862)$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kkin})$$

function_137 ([Akt_P2], vol (cytoplasm), vol (dnabound),
[dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1], kkin)

$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$(863)$$

function_137 ([Akt_P2], vol (cytoplasm), vol (dnabound),
[dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1], kkin)

$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$(864)$$

Table 492: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.138 Reaction R177

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe0-_pUb0 by Akt_P2

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUB0} \xrightarrow{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa}$$

$$(865)$$
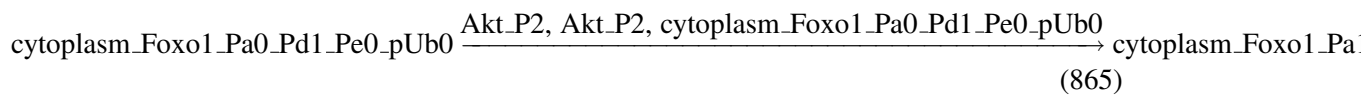
### Reactant

Table 493: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Modifiers

Table 494: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Product

Table 495: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{138} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_138}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin}) \tag{866}$$

$$\text{function\_138}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$
$$\tag{867}$$

$$\text{function\_138}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$
$$\tag{868}$$

Table 496: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.139 Reaction R178

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 by Akt_P2

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_P} \tag{869}$$
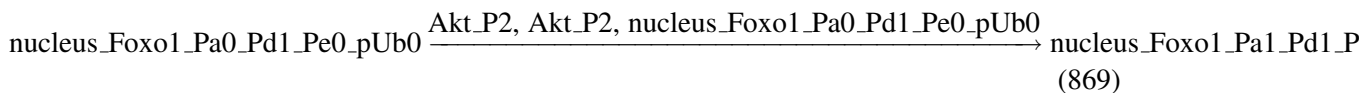
**Reactant**

Table 497: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Modifiers

Table 498: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Product

Table 499: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{139} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_139}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \text{vol}\,(\text{nucleus}), \tag{870}$$
$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}])$$

$$\text{function\_139}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$
$$\tag{871}$$

$$\text{function\_139}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$
$$\tag{872}$$

Table 500: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.140 Reaction R179

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe0-_pUb0 by Akt_P2

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa1}$$

(873)
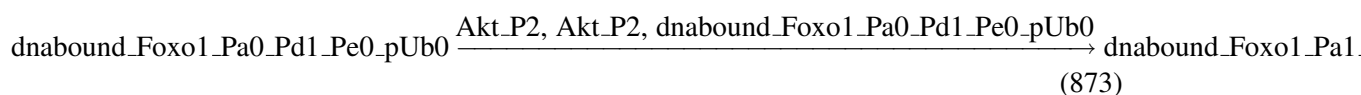
### Reactant

Table 501: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Modifiers

Table 502: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Product

Table 503: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{140} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_140}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin})$$

(874)

$$\text{function\_140} \left( [\text{Akt\_P2}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right), \right.$$
$$\left. [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin} \right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{Akt\_P2}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kkin}}{\text{vol}\left(\text{dnabound}\right)}$$

(875)

$$\text{function\_140} \left( [\text{Akt\_P2}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right), \right.$$
$$\left. [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin} \right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{Akt\_P2}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kkin}}{\text{vol}\left(\text{dnabound}\right)}$$

(876)

Table 504: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.141 Reaction R180

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd1_Pe0-_pUb1 by Akt_P2

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa}$$

(877)
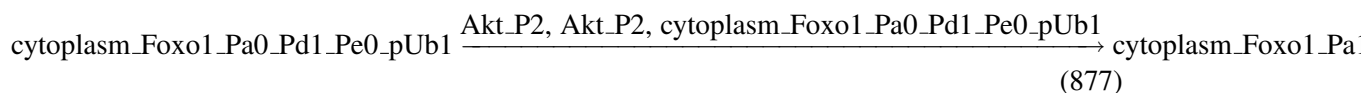
**Reactant**

Table 505: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

**Modifiers**

Table 506: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Product

Table 507: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{141} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_141}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \\ [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin}) \tag{878}$$

$$\text{function\_141}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin}) \\ = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \tag{879}$$

$$\text{function\_141}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin}) \\ = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \tag{880}$$

Table 508: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.142 Reaction R181

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 by Akt_P2

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_P}$$

(881)
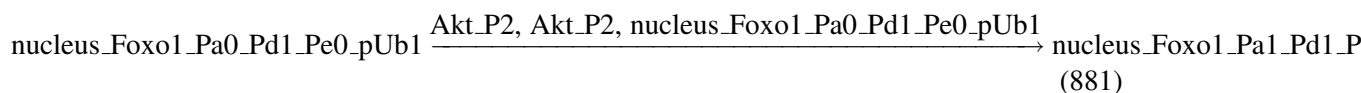
## Reactant

Table 509: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Modifiers

Table 510: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Product

Table 511: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{142} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_142}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \text{vol}\,(\text{nucleus}),$$

(882)

$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}])$$

*Produced by* SBML2LATEX

$$
\begin{aligned}
\text{function\_142} & \left([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin},\right. \\
& \left.\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]\right) \\
& = \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}
\end{aligned}
$$

(883)

$$
\begin{aligned}
\text{function\_142} & \left([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin},\right. \\
& \left.\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]\right) \\
& = \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}
\end{aligned}
$$

(884)

Table 512: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.143 Reaction R182

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe0-_pUb1 by Akt_P2

**Reaction equation**

$$
\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_}
$$

(885)
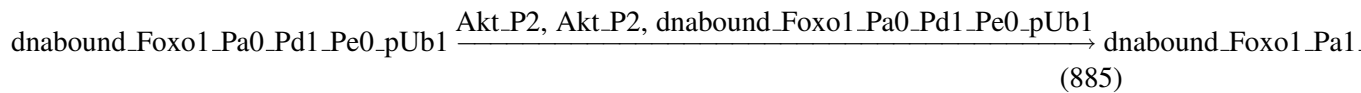
**Reactant**

Table 513: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

**Modifiers**

Table 514: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Product

Table 515: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{143} = \text{vol}(\text{dnabound}) \cdot \text{function\_143}([\text{Akt\_P2}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin}) \quad (886)$$

$$\text{function\_143}([\text{Akt\_P2}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{dnabound})}$$
$$(887)$$

$$\text{function\_143}([\text{Akt\_P2}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{dnabound})}$$
$$(888)$$

Table 516: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.144 Reaction R183

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe1-_pUb0 by Akt_P2

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa}$$

$$(889)$$
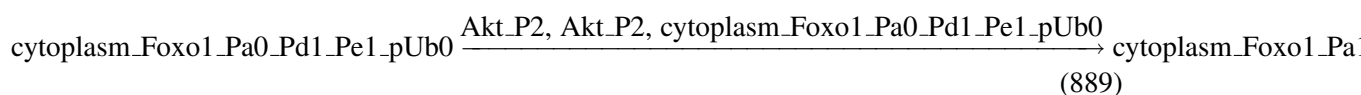
### Reactant

Table 517: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Modifiers

Table 518: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Product

Table 519: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{144} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_144}\left([\text{Akt\_P2}], \text{vol}\left(\text{cytoplasm}\right), \right.$$
$$\left. [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kkin}\right) \quad (890)$$

$$\text{function\_144}\left([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kkin}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

(891)

$$\text{function\_144}\left([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kkin}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

(892)

Table 520: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.145 Reaction R184

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 by Akt_P2

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_P}$$

(893)
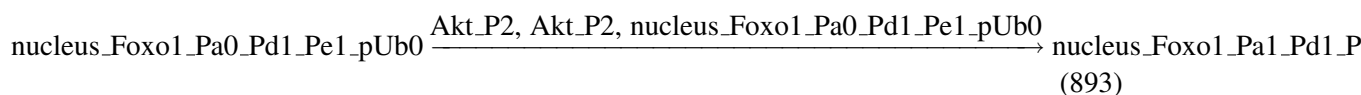
## Reactant

Table 521: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Modifiers

Table 522: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Product

Table 523: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{145} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_145}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \text{vol}\,(\text{nucleus}), \atop [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]) \quad (894)$$

$$\text{function\_145}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \\ \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})} \\ (895)$$

$$\text{function\_145}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \\ \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})} \\ (896)$$

Table 524: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.146 Reaction R185

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe1-_pUb0 by Akt_P2

## Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_}$$

$$(897)$$
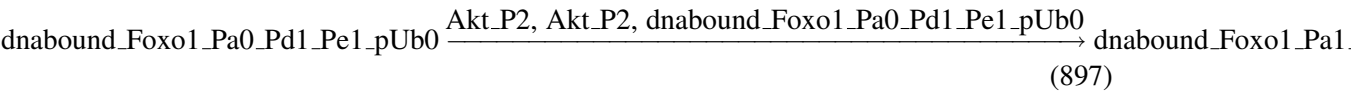
## Reactant

Table 525: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Modifiers

Table 526: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Product

Table 527: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{146} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_146}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kkin}) \quad (898)$$

$$\text{function\_146}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$(899)$$

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$$\text{function\_146}\left([\text{Akt\_P2}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right),\right.$$
$$\left.[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kkin}\right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{Akt\_P2}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kkin}}{\text{vol}\left(\text{dnabound}\right)}$$

$$(900)$$

Table 528: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.147 Reaction R186

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd1_Pe1-_pUb1 by Akt_P2

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{Akt\_P2, Akt\_P2, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1}$$

$$(901)$$
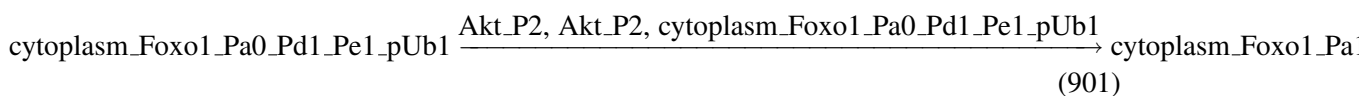
### Reactant

Table 529: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Modifiers

Table 530: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Product

Table 531: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{147} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_147}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kkin}) \tag{902}$$

$$\text{function\_147}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$
$$\tag{903}$$

$$\text{function\_147}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$
$$\tag{904}$$

Table 532: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.148 Reaction R187

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 by Akt_P2

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{Akt\_P2, Akt\_P2, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_P} \tag{905}$$

**Reactant**

*Produced by* SBML2LATEX
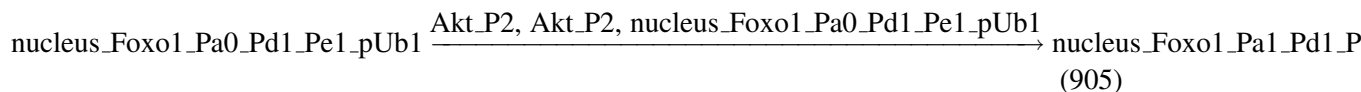
Table 533: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

## Modifiers

Table 534: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

## Product

Table 535: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{148} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_148}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \text{vol}\,(\text{nucleus}), \tag{906}$$
$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}])$$

$$\text{function\_148}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$
$$\tag{907}$$

$$\text{function\_148}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$
$$\tag{908}$$

Table 536: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.149 Reaction R188

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe1-_pUb1 by Akt_P2

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{Akt\_P2, Akt\_P2, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_}$$

(909)
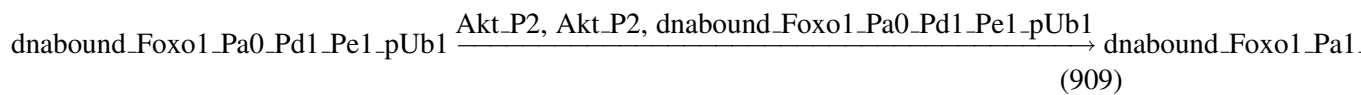
### Reactant

Table 537: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Modifiers

Table 538: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| Akt_P2 | Akt_P2 | |
| Akt_P2 | Akt_P2 | |
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Product

Table 539: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{149} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_149}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \quad (910)$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kkin})$$

$$\text{function\_149}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$(911)$$

$$\text{function\_149}\,([\text{Akt\_P2}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{Akt\_P2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$(912)$$

Table 540: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.150 Reaction R189

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe0-_pUb0 by SGK

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{SGK, SGK, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_Pd}$$
$$(913)$$
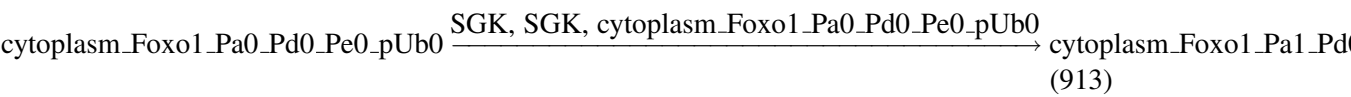
### Reactant

## Table 541: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Modifiers

## Table 542: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

## Table 543: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{150} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_150}\left([SGK], \text{vol}\left(\text{cytoplasm}\right),\right.$$
$$\left.[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}\right) \tag{914}$$

$$\text{function\_150}\left([SGK], \text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [SGK] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kkin}}{\text{vol}\left(\text{cytoplasm}\right)} \tag{915}$$

$$\text{function\_150}\left([SGK], \text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [SGK] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kkin}}{\text{vol}\left(\text{cytoplasm}\right)} \tag{916}$$

Table 544: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.151 Reaction R190

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 by SGK

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_p}$$

(917)
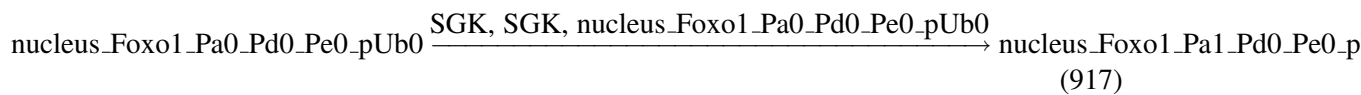
### Reactant

Table 545: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Modifiers

Table 546: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SGK | SGK | |
| SGK | SGK | |
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

Table 547: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{151} = \text{vol}(\text{nucleus}) \cdot \text{function\_151}([\text{SGK}], \text{vol}(\text{cytoplasm}), \text{kkin}, \text{vol}(\text{nucleus}),$$
$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]) \quad (918)$$

$$\begin{aligned}
&\text{function\_151}([\text{SGK}], \text{vol}(\text{cytoplasm}), \text{kkin}, \\
&\quad \text{vol}(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]) \\
&= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{nucleus})}
\end{aligned}$$
$$(919)$$

$$\begin{aligned}
&\text{function\_151}([\text{SGK}], \text{vol}(\text{cytoplasm}), \text{kkin}, \\
&\quad \text{vol}(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]) \\
&= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{nucleus})}
\end{aligned}$$
$$(920)$$

Table 548: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|------|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.152 Reaction R191

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe0-_pUb0 by SGK

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{SGK, SGK, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd0}$$
$$(921)$$

### Reactant

*Produced by* SBML2LATEX
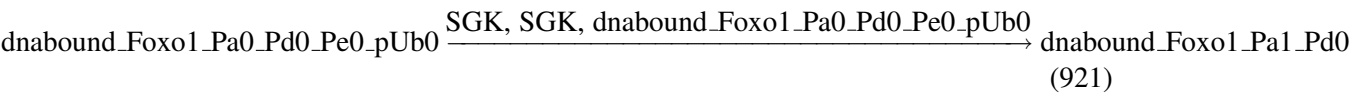
Table 549: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

## Modifiers

Table 550: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

## Product

Table 551: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{152} = \text{vol}\left(\text{dnabound}\right) \cdot \text{function\_152}\left([\text{SGK}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right), \atop [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}\right) \tag{922}$$

$$\text{function\_152}\left([\text{SGK}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right), \atop [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}\right) \atop = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{SGK}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kkin}}{\text{vol}\left(\text{dnabound}\right)} \tag{923}$$

$$\text{function\_152}\left([\text{SGK}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right), \atop [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}\right) \atop = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{SGK}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kkin}}{\text{vol}\left(\text{dnabound}\right)} \tag{924}$$

Table 552: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.153 Reaction R192

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd0_Pe0-_pUb1 by SGK

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{SGK, SGK, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1\_Pd0}$$

$$(925)$$

### Reactant

Table 553: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Modifiers

Table 554: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Product

Table 555: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{153} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_153}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin}) \qquad (926)$$

$$\text{function\_153}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$
$$(927)$$

$$\text{function\_153}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$
$$(928)$$

Table 556: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.154 Reaction R193

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 by SGK

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_p}$$
$$(929)$$
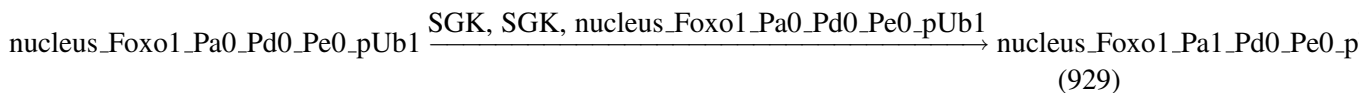
**Reactant**

Table 557: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Modifiers

Table 558: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Product

Table 559: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{154} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_154}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \text{vol}\,(\text{nucleus}), \\ [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]) \quad (930)$$

$$\begin{aligned}
&\text{function\_154}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \\
&\quad \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]) \\
&= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}
\end{aligned}$$

$$(931)$$

$$\begin{aligned}
&\text{function\_154}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \\
&\quad \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]) \\
&= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}
\end{aligned}$$

$$(932)$$

Table 560: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.155 Reaction R194

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd0_Pe0- _pUb1 by SGK

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{SGK, SGK, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_Pd0}$$

(933)
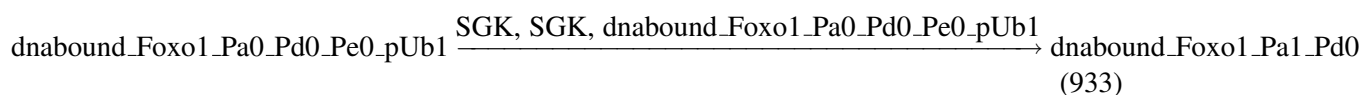
### Reactant

Table 561: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Modifiers

Table 562: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Product

Table 563: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{155} = \text{vol}(\text{dnabound}) \cdot \text{function\_155}([\text{SGK}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin})$$

(934)

$$\text{function\_155}\left([SGK], \text{vol}(cytoplasm), \text{vol}(dnabound),\right.$$
$$\left.[dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1], kkin\right)$$
$$= \frac{[dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1] \cdot \text{vol}(dnabound) \cdot [SGK] \cdot \text{vol}(cytoplasm) \cdot kkin}{\text{vol}(dnabound)}$$

(935)

$$\text{function\_155}\left([SGK], \text{vol}(cytoplasm), \text{vol}(dnabound),\right.$$
$$\left.[dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1], kkin\right)$$
$$= \frac{[dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1] \cdot \text{vol}(dnabound) \cdot [SGK] \cdot \text{vol}(cytoplasm) \cdot kkin}{\text{vol}(dnabound)}$$

(936)

Table 564: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.156 Reaction R195

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe1-_pUb0 by SGK

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{SGK, SGK, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_Pd}$$

(937)
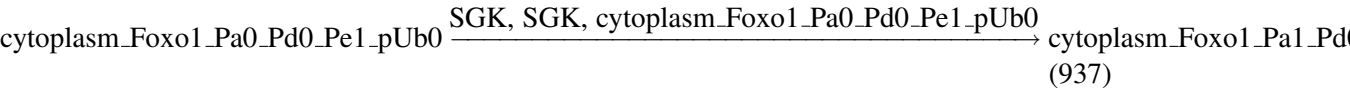
### Reactant

Table 565: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Modifiers

*Produced by* SBML2LATEX

Table 566: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Product

Table 567: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{156} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_156}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \\ [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin}) \tag{938}$$

$$\text{function\_156}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin}) \\ = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \tag{939}$$

$$\text{function\_156}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin}) \\ = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \tag{940}$$

Table 568: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ✓ |

## 8.157 Reaction R196

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 by SGK

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_p}$$

(941)
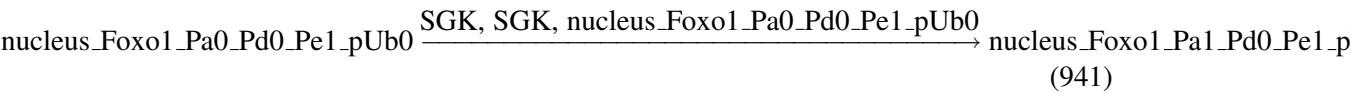
## Reactant

Table 569: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Modifiers

Table 570: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Product

Table 571: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{157} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_157}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \text{vol}\,(\text{nucleus}),$$
$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}])$$

(942)

*Produced by* SBML2LATEX

$$\text{function\_157}([SGK], \text{vol}(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [SGK] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{nucleus})}$$

$$(943)$$

$$\text{function\_157}([SGK], \text{vol}(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [SGK] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{nucleus})}$$

$$(944)$$

Table 572: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|------|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.158 Reaction R197

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe1-_pUb0 by SGK

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{SGK, SGK, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd0}$$

$$(945)$$
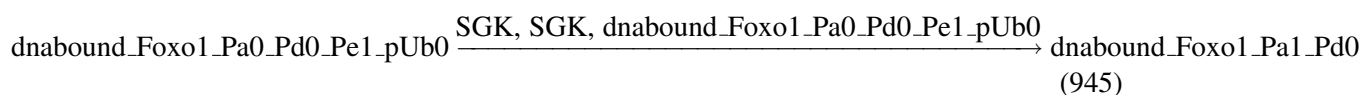
### Reactant

Table 573: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Modifiers

Table 574: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Product

Table 575: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{158} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_158}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), \tag{946}$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin})$$

$$\text{function\_158}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$
$$\tag{947}$$

$$\text{function\_158}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$
$$\tag{948}$$

Table 576: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.159 Reaction R198

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd0_Pe1-_pUb1 by SGK

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{SGK, SGK, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1\_Pd0}$$

(949)
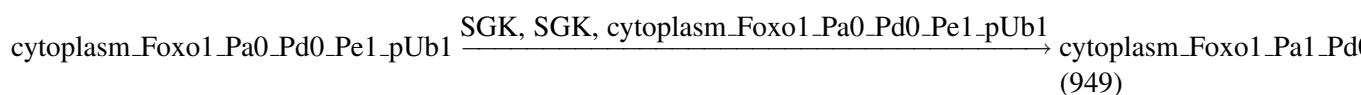
### Reactant

Table 577: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Modifiers

Table 578: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Product

Table 579: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{159} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_159}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kkin})$$

(950)

$$\text{function\_159} \left( [\text{SGK}], \text{vol} \left( \text{cytoplasm} \right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kkin} \right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol} \left( \text{cytoplasm} \right) \cdot [\text{SGK}] \cdot \text{vol} \left( \text{cytoplasm} \right) \cdot \text{kkin}}{\text{vol} \left( \text{cytoplasm} \right)}$$
$$(951)$$

$$\text{function\_159} \left( [\text{SGK}], \text{vol} \left( \text{cytoplasm} \right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kkin} \right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol} \left( \text{cytoplasm} \right) \cdot [\text{SGK}] \cdot \text{vol} \left( \text{cytoplasm} \right) \cdot \text{kkin}}{\text{vol} \left( \text{cytoplasm} \right)}$$
$$(952)$$

Table 580: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.160 Reaction R199

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 by SGK

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_p}$$
$$(953)$$
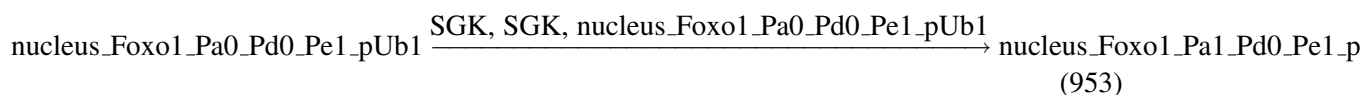
### Reactant

Table 581: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Modifiers

Table 582: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SGK | SGK | |
| SGK | SGK | |

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Product

Table 583: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{160} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_160}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \text{vol}\,(\text{nucleus}),$$
$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]) \quad (954)$$

$$\text{function\_160}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$
$$(955)$$

$$\text{function\_160}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$
$$(956)$$

Table 584: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

### 8.161 Reaction R200

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd0_Pe1-_pUb1 by SGK

## Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{SGK, SGK, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_Pd0}$$

(957)
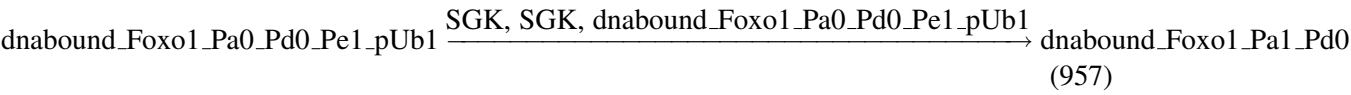
## Reactant

Table 585: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Modifiers

Table 586: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Product

Table 587: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{161} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_161}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kkin})$$

(958)

$$\text{function\_161}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kkin}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

(959)

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$$\text{function\_161}\left([SGK], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}),\right.$$
$$\left.[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kkin}\right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [SGK] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{dnabound})}$$

$$(960)$$

Table 588: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.162 Reaction R201

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe0-_pUb0 by SGK

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{SGK, SGK, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_Pd}$$

$$(961)$$
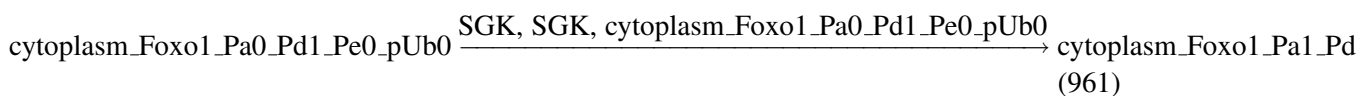
**Reactant**

Table 589: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

**Modifiers**

Table 590: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SGK | SGK | |
| SGK | SGK | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

**Product**

Table 591: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{162} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_162}\left([\text{SGK}], \text{vol}\left(\text{cytoplasm}\right),\right.$$
$$\left.[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin}\right) \quad (962)$$

$$\text{function\_162}\left([\text{SGK}], \text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{SGK}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kkin}}{\text{vol}\left(\text{cytoplasm}\right)} \quad (963)$$

$$\text{function\_162}\left([\text{SGK}], \text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{SGK}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kkin}}{\text{vol}\left(\text{cytoplasm}\right)} \quad (964)$$

Table 592: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.163 Reaction R202

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 by SGK

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_p} \quad (965)$$

**Reactant**

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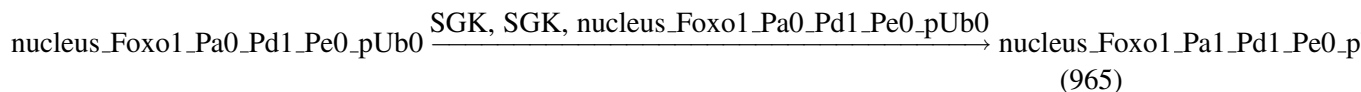
## Table 593: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Modifiers

## Table 594: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Product

## Table 595: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{163} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_163}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \text{vol}\,(\text{nucleus}), \\ [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]) \tag{966}$$

$$\text{function\_163}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \\ \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})} \tag{967}$$

$$\text{function\_163}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \\ \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})} \tag{968}$$

Table 596: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.164 Reaction R203

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe0-_pUb0 by SGK

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{SGK, SGK, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd1}$$

$$(969)$$
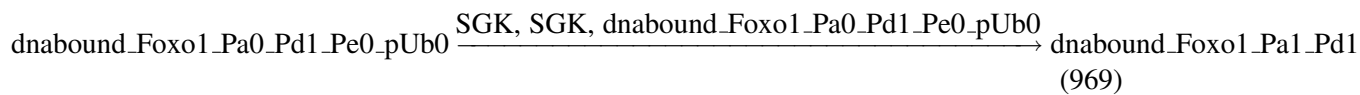
### Reactant

Table 597: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Modifiers

Table 598: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SGK | SGK | |
| SGK | SGK | |
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Product

Table 599: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{164} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_164}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \qquad (970)$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin})$$

$$\text{function\_164}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$
$$(971)$$

$$\text{function\_164}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$
$$(972)$$

Table 600: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|------|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.165 Reaction R204

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd1_Pe0-_pUb1 by SGK

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{SGK, SGK, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1\_Pd}$$
$$(973)$$
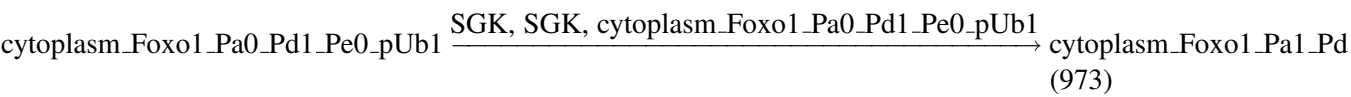
### Reactant

Table 601: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Modifiers

Table 602: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Product

Table 603: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{165} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_165}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin}) \tag{974}$$

$$\text{function\_165}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \tag{975}$$

$$\text{function\_165}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \tag{976}$$

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Table 604: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.166 Reaction R205

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 by SGK

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_p} \tag{977}$$
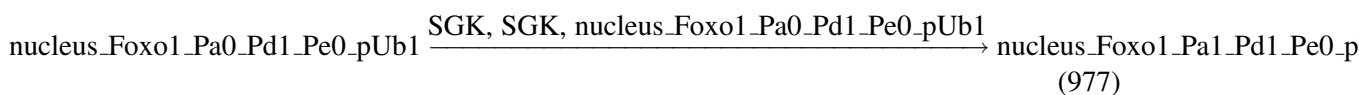
### Reactant

Table 605: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Modifiers

Table 606: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SGK | SGK | |
| SGK | SGK | |
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Product

Table 607: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{166} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_166}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{kkin}, \text{vol}\,(\text{nucleus}), \quad (978)$$
$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}])$$

$$\text{function\_166}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$
$$(979)$$

$$\text{function\_166}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{kkin},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$
$$(980)$$

Table 608: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.167 Reaction R206

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe0-_pUb1 by SGK

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{SGK, SGK, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_Pd1}$$
$$(981)$$

### Reactant

*Produced by* SBML2LATEX
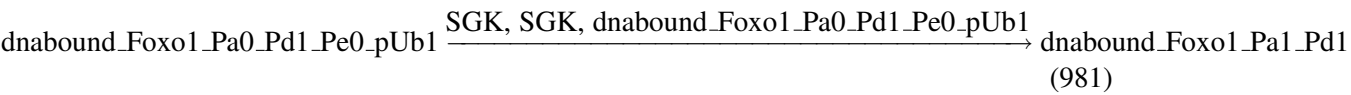
Table 609: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Modifiers

Table 610: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Product

Table 611: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{167} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_167}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin}) \quad (982)$$

$$\text{function\_167}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})} \quad (983)$$

$$\text{function\_167}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})} \quad (984)$$

Table 612: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.168 Reaction R207

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe1-_pUb0 by SGK

### Reaction equation

$$cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0 \xrightarrow{\text{SGK, SGK, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} cytoplasm\_Foxo1\_Pa1\_Pd$$
$$(985)$$

### Reactant

Table 613: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Modifiers

Table 614: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SGK | SGK | |
| SGK | SGK | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Product

Table 615: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{168} = \text{vol}(\text{cytoplasm}) \cdot \text{function\_168}([\text{SGK}], \text{vol}(\text{cytoplasm}), \\ [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kkin}) \tag{986}$$

$$\text{function\_168}([\text{SGK}], \text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kkin}) \\ = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})} \tag{987}$$

$$\text{function\_168}([\text{SGK}], \text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kkin}) \\ = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})} \tag{988}$$

Table 616: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.169 Reaction R208

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 by SGK

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_p} \tag{989}$$
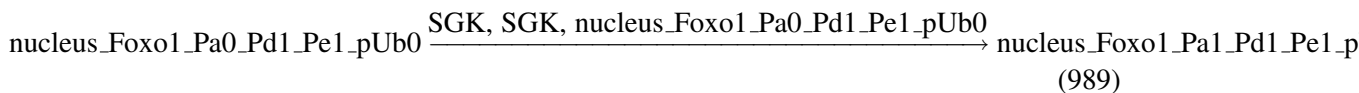
### Reactant

Table 617: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Modifiers

Table 618: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Product

Table 619: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{169} = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{function\_169}\,([\mathrm{SGK}], \mathrm{vol}\,(\mathrm{cytoplasm}), \mathrm{kkin}, \mathrm{vol}\,(\mathrm{nucleus}),$$
$$[\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]) \quad (990)$$

$$\mathrm{function\_169}\,([\mathrm{SGK}], \mathrm{vol}\,(\mathrm{cytoplasm}), \mathrm{kkin},$$
$$\mathrm{vol}\,(\mathrm{nucleus}), [\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}])$$
$$= \frac{[\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \mathrm{vol}\,(\mathrm{nucleus}) \cdot [\mathrm{SGK}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kkin}}{\mathrm{vol}\,(\mathrm{nucleus})}$$
$$(991)$$

$$\mathrm{function\_169}\,([\mathrm{SGK}], \mathrm{vol}\,(\mathrm{cytoplasm}), \mathrm{kkin},$$
$$\mathrm{vol}\,(\mathrm{nucleus}), [\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}])$$
$$= \frac{[\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \mathrm{vol}\,(\mathrm{nucleus}) \cdot [\mathrm{SGK}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kkin}}{\mathrm{vol}\,(\mathrm{nucleus})}$$
$$(992)$$

Table 620: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.170 Reaction R209

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe1-_pUb0 by SGK

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{SGK, SGK, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd1} \tag{993}$$
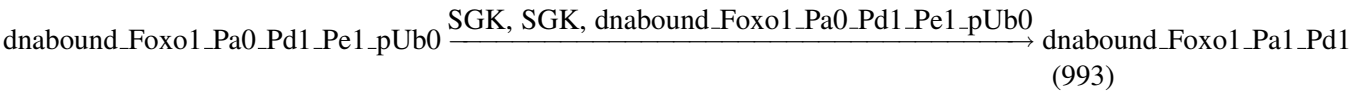
### Reactant

Table 621: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Modifiers

Table 622: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Product

Table 623: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{170} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_170}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kkin}) \tag{994}$$

$$
\begin{aligned}
&\text{function\_170} \left([\text{SGK}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}),\right.\\
&\quad \left.[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kkin}\right)\\
&\quad = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{dnabound})}
\end{aligned}
\tag{995}
$$

$$
\begin{aligned}
&\text{function\_170} \left([\text{SGK}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}),\right.\\
&\quad \left.[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kkin}\right)\\
&\quad = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}(\text{dnabound})}
\end{aligned}
\tag{996}
$$

Table 624: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.171 Reaction R210

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd1_Pe1-_pUb1 by SGK

### Reaction equation

$$
\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{SGK, SGK, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1\_Pd}
\tag{997}
$$
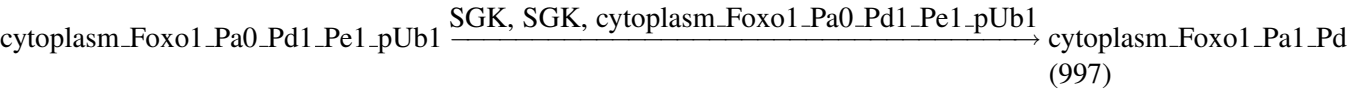
### Reactant

Table 625: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Modifiers

Table 626: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SGK | SGK | |
| SGK | SGK | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

**Product**

Table 627: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{171} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_171}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kkin}) \tag{998}$$

$$\text{function\_171}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

$$\tag{999}$$

$$\text{function\_171}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

$$\tag{1000}$$

Table 628: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.172 Reaction R211

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 by SGK

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{SGK, SGK, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_p}$$
$$(1001)$$
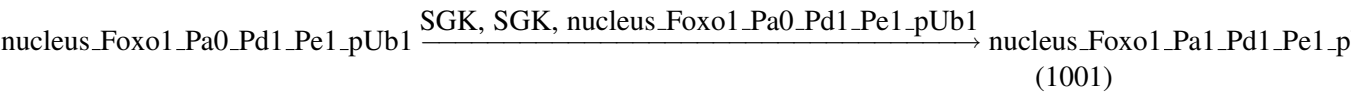
## Reactant

Table 629: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

## Modifiers

Table 630: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SGK | SGK | |
| SGK | SGK | |
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

## Product

Table 631: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{172} = \text{vol}\left(\text{nucleus}\right) \cdot \text{function\_172}\left([\text{SGK}], \text{vol}\left(\text{cytoplasm}\right), \text{kkin}, \text{vol}\left(\text{nucleus}\right),\right.$$
$$(1002)$$
$$\left.[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}]\right)$$

$$\text{function\_172}\left([\text{SGK}], \text{vol}\left(\text{cytoplasm}\right), \text{kkin},\right.$$
$$\left.\text{vol}\left(\text{nucleus}\right), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}]\right)$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\left(\text{nucleus}\right) \cdot [\text{SGK}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kkin}}{\text{vol}\left(\text{nucleus}\right)}$$

(1003)

$$\text{function\_172}\left([\text{SGK}], \text{vol}\left(\text{cytoplasm}\right), \text{kkin},\right.$$
$$\left.\text{vol}\left(\text{nucleus}\right), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}]\right)$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\left(\text{nucleus}\right) \cdot [\text{SGK}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kkin}}{\text{vol}\left(\text{nucleus}\right)}$$

(1004)

Table 632: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.173 Reaction R212

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe1-_pUb1 by SGK

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{SGK, SGK, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_Pd1}$$

(1005)
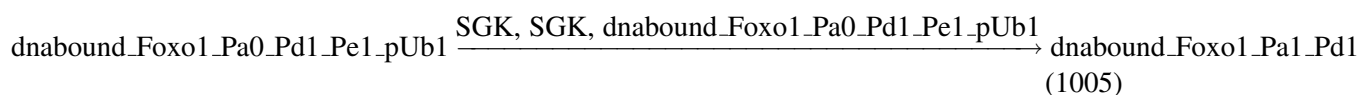
**Reactant**

Table 633: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

**Modifiers**

### Table 634: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SGK | SGK | |
| SGK | SGK | |
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

## Product

### Table 635: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{173} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_173}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kkin}) \quad (1006)$$

$$\text{function\_173}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$
$$(1007)$$

$$\text{function\_173}\,([\text{SGK}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SGK}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$
$$(1008)$$

### Table 636: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $3 \cdot 10^{-4}$ | | ☑ |

## 8.174 Reaction R213

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd0_Pe0-_pUb0 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_P}$$

$$(1009)$$
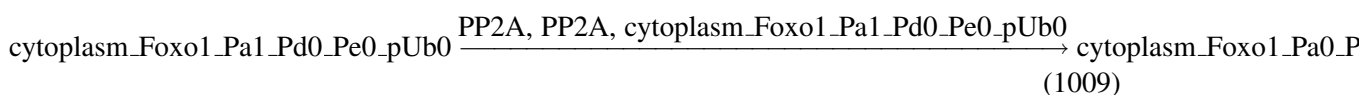
### Reactant

Table 637: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Modifiers

Table 638: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Product

Table 639: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{174} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_174}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kdephos}) \qquad (1010)$$

$$\text{function\_174}\left([\text{PP2A}], \text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}],\right. \tag{1011}$$

$$\left.\text{kdephos}\right) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{PP2A}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kdephos}}{\text{vol}\left(\text{cytoplasm}\right)}$$

$$\text{function\_174}\left([\text{PP2A}], \text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}],\right. \tag{1012}$$

$$\left.\text{kdephos}\right) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{PP2A}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kdephos}}{\text{vol}\left(\text{cytoplasm}\right)}$$

Table 640: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.175 Reaction R214

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 by PP2A

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0.} \tag{1013}$$
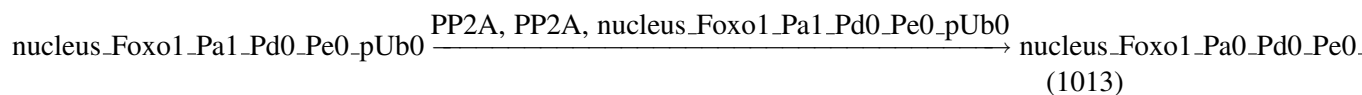
**Reactant**

Table 641: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

**Modifiers**

Table 642: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

**Product**

Table 643: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{175} = \text{vol}(\text{nucleus}) \cdot \text{function\_175}([PP2A], \text{vol}(\text{cytoplasm}), \text{kdephos}, \text{vol}(\text{nucleus}), \quad (1014)$$
$$[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}])$$

$$\text{function\_175}([PP2A], \text{vol}(\text{cytoplasm}), \text{kdephos},$$
$$\text{vol}(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [PP2A] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$
$$(1015)$$

$$\text{function\_175}([PP2A], \text{vol}(\text{cytoplasm}), \text{kdephos},$$
$$\text{vol}(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [PP2A] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$
$$(1016)$$

Table 644: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.176 Reaction R215

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd0_Pe0-_pUb0 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd}$$

(1017)
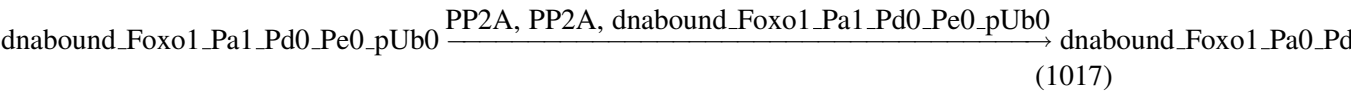
### Reactant

Table 645: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Modifiers

Table 646: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Product

Table 647: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{176} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_176}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kdephos})$$

(1018)

$$\text{function\_176}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kdephos}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

(1019)

$$\text{function\_176}\left([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}),\right.$$
$$\left.[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kdephos}\right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

(1020)

Table 648: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.177 Reaction R216

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd0_Pe0-_pUb1 by PP2A

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0\_P}$$

(1021)
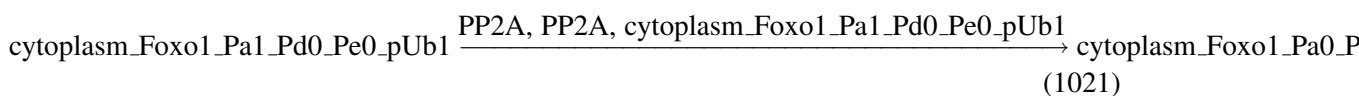
**Reactant**

Table 649: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

**Modifiers**

Table 650: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

**Product**

Table 651: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{177} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_177}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kdephos}) \tag{1022}$$

$$\text{function\_177}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \tag{1023}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_177}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \tag{1024}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$
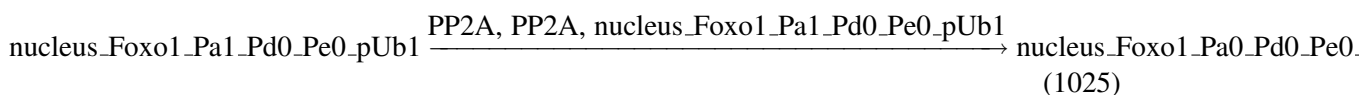
Table 652: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

### 8.178 Reaction R217

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 by PP2A

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0.} \tag{1025}$$

### Reactant

*Produced by* SBML2LATEX

## Table 653: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Modifiers

## Table 654: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Product

## Table 655: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$
v_{178} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_178}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \text{vol}\,(\text{nucleus})\,, \\ [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}]) \tag{1026}
$$

$$
\text{function\_178}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \\ \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}]) \\
= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})} \tag{1027}
$$

$$
\text{function\_178}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \\ \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}]) \\
= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})} \tag{1028}
$$

Table 656: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.179 Reaction R218

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd0_Pe0-_pUb1 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_Pd}$$

$$(1029)$$
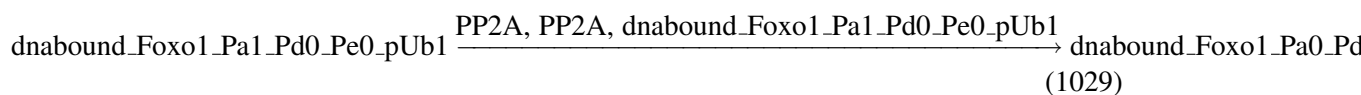
### Reactant

Table 657: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Modifiers

Table 658: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Product

Table 659: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{179} = \text{vol}(\text{dnabound}) \cdot \text{function\_179}([\text{PP2A}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kdephos}) \quad (1030)$$

$$\text{function\_179}([\text{PP2A}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kdephos}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})} \quad (1031)$$

$$\text{function\_179}([\text{PP2A}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kdephos}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})} \quad (1032)$$

Table 660: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.180 Reaction R219

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd0_Pe1-_pUb0 by PP2A

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_P} \quad (1033)$$
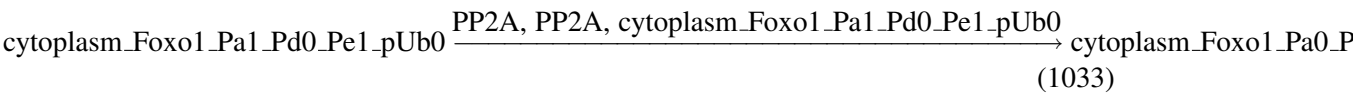
**Reactant**

Table 661: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Modifiers

Table 662: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Product

Table 663: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{180} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_180}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kdephos}) \tag{1034}$$

$$\text{function\_180}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \tag{1035}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_180}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \tag{1036}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 664: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.181 Reaction R220

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 by PP2A

### Reaction equation

$$
\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_}
$$

(1037)
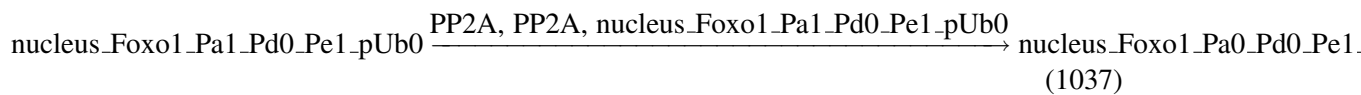
### Reactant

Table 665: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Modifiers

Table 666: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Product

Table 667: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{181} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_181}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \text{vol}\,(\text{nucleus})\,, \quad (1038)$$
$$[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}])$$

$$\text{function\_181}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos},$$
$$\text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$
$$(1039)$$

$$\text{function\_181}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos},$$
$$\text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$
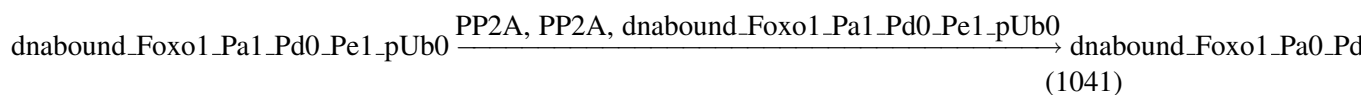$$(1040)$$

Table 668: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.182 Reaction R221

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd0_Pe1-_pUb0 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd}$$
$$(1041)$$

### Reactant

*Produced by* SBML₂LATEX

Table 669: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Modifiers

Table 670: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Product

Table 671: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{182} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_182}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kdephos}) \tag{1042}$$

$$\text{function\_182}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kdephos}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})} \tag{1043}$$

$$\text{function\_182}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kdephos}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})} \tag{1044}$$

Table 672: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.183 Reaction R222

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd0_Pe1-_pUb1 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0\_P}$$
$$(1045)$$

### Reactant

Table 673: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Modifiers

Table 674: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Product

Table 675: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

**Derived unit** contains undeclared units

$$v_{183} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_183}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{kdephos}) \tag{1046}$$

$$\text{function\_183}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \tag{1047}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_183}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \tag{1048}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 676: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.184 Reaction R223

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 by PP2A

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_}$$
$$\tag{1049}$$
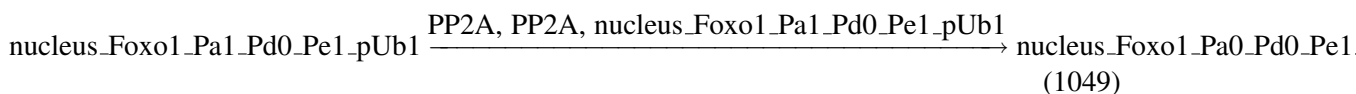
**Reactant**

Table 677: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Modifiers

**Table 678: Properties of each modifier.**

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Product

**Table 679: Properties of each product.**

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{184} = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{function\_184}\,([\mathrm{PP2A}], \mathrm{vol}\,(\mathrm{cytoplasm})\,, \mathrm{kdephos}, \mathrm{vol}\,(\mathrm{nucleus})\,, \quad (1050)$$
$$[\mathrm{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}])$$

$$\mathrm{function\_184}\,([\mathrm{PP2A}], \mathrm{vol}\,(\mathrm{cytoplasm})\,, \mathrm{kdephos},$$
$$\mathrm{vol}\,(\mathrm{nucleus})\,, [\mathrm{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}])$$
$$= \frac{[\mathrm{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \mathrm{vol}\,(\mathrm{nucleus}) \cdot [\mathrm{PP2A}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kdephos}}{\mathrm{vol}\,(\mathrm{nucleus})}$$
$$(1051)$$

$$\mathrm{function\_184}\,([\mathrm{PP2A}], \mathrm{vol}\,(\mathrm{cytoplasm})\,, \mathrm{kdephos},$$
$$\mathrm{vol}\,(\mathrm{nucleus})\,, [\mathrm{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}])$$
$$= \frac{[\mathrm{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \mathrm{vol}\,(\mathrm{nucleus}) \cdot [\mathrm{PP2A}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kdephos}}{\mathrm{vol}\,(\mathrm{nucleus})}$$
$$(1052)$$

**Table 680: Properties of each parameter.**

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

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## 8.185 Reaction R224

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd0_Pe1-_pUb1 by PP2A

### Reaction equation

$$
\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_Pd}
$$

$$(1053)$$
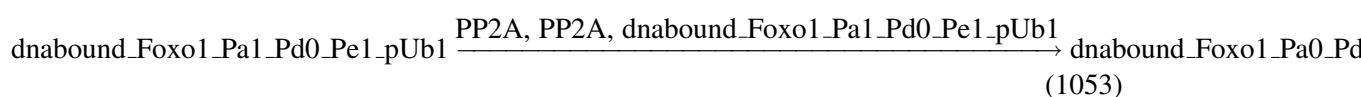
### Reactant

Table 681: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Modifiers

Table 682: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Product

Table 683: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$
v_{185} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_185}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,
$$
$$
[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{kdephos}) \quad (1054)
$$

function_185 ([PP2A], vol (cytoplasm) , vol (dnabound) ,
[dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1], kdephos)

$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol (dnabound)} \cdot [\text{PP2A}] \cdot \text{vol (cytoplasm)} \cdot \text{kdephos}}{\text{vol (dnabound)}}$$

(1055)

function_185 ([PP2A], vol (cytoplasm) , vol (dnabound) ,
[dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1], kdephos)

$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol (dnabound)} \cdot [\text{PP2A}] \cdot \text{vol (cytoplasm)} \cdot \text{kdephos}}{\text{vol (dnabound)}}$$

(1056)

Table 684: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.186 Reaction R225

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd1_Pe0-_pUb0 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_P}$$

(1057)
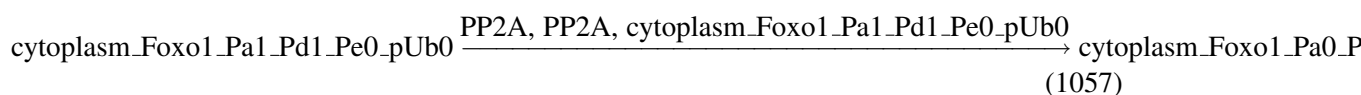
### Reactant

Table 685: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Modifiers

Table 686: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

Table 687: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{186} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_186}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{kdephos}) \qquad (1058)$$

$$\text{function\_186}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \qquad (1059)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_186}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \qquad (1060)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 688: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.187 Reaction R226

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 by PP2A

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0.}$$

$$(1061)$$
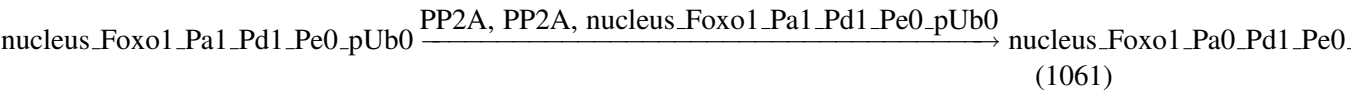
## Reactant

Table 689: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

## Modifiers

Table 690: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

## Product

Table 691: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{187} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_187}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \text{vol}\,(\text{nucleus})\,, \\ [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}]) \quad (1062)$$

$$\text{function\_187}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \\ \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

$$(1063)$$

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$$\text{function\_187}\,([PP2A], \text{vol}\,(\text{cytoplasm}), \text{kdephos},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [PP2A] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

$$(1064)$$

Table 692: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.188 Reaction R227

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd1_Pe0-_pUb0 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd}$$

$$(1065)$$
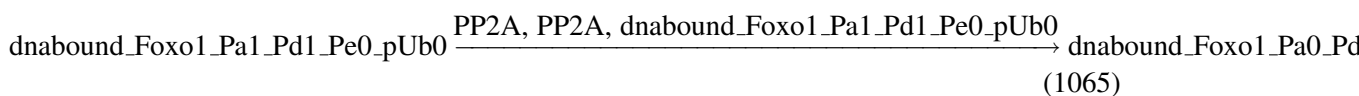
### Reactant

Table 693: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Modifiers

Table 694: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

Table 695: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{188} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_188}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), \quad (1066)$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{kdephos})$$

function_188 ([PP2A], vol (cytoplasm), vol (dnabound),
[dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0], kdephos)

$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

$$(1067)$$

function_188 ([PP2A], vol (cytoplasm), vol (dnabound),
[dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0], kdephos)

$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

$$(1068)$$

Table 696: Properties of each parameter.

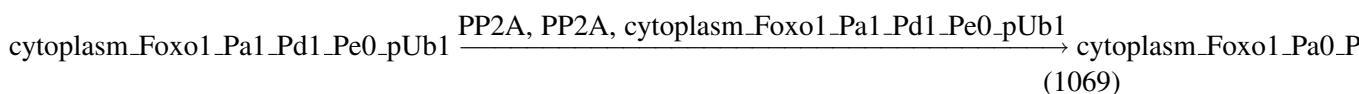| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.189 Reaction R228

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd1_Pe0-_pUb1 by PP2A

## Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0\_P}$$
$$(1069)$$

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### Reactant

Table 697: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Modifiers

Table 698: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Product

Table 699: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{189} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_189}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kdephos}) \tag{1070}$$

$$\text{function\_189}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \tag{1071}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_189}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \tag{1072}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 700: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.190 Reaction R229

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 by PP2A

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_}$$

$$(1073)$$
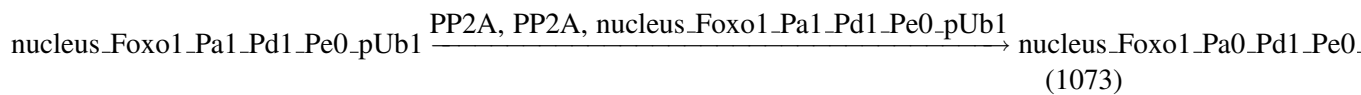
### Reactant

Table 701: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Modifiers

Table 702: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Product

Table 703: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{190} = \text{vol (nucleus)} \cdot \text{function\_190} ([\text{PP2A}], \text{vol (cytoplasm)}, \text{kdephos}, \text{vol (nucleus)},$$
$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}]) \quad (1074)$$

$$\text{function\_190} ([\text{PP2A}], \text{vol (cytoplasm)}, \text{kdephos},$$
$$\text{vol (nucleus)}, [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol (nucleus)} \cdot [\text{PP2A}] \cdot \text{vol (cytoplasm)} \cdot \text{kdephos}}{\text{vol (nucleus)}}$$
$$(1075)$$

$$\text{function\_190} ([\text{PP2A}], \text{vol (cytoplasm)}, \text{kdephos},$$
$$\text{vol (nucleus)}, [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol (nucleus)} \cdot [\text{PP2A}] \cdot \text{vol (cytoplasm)} \cdot \text{kdephos}}{\text{vol (nucleus)}}$$
$$(1076)$$

Table 704: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.191 Reaction R230

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1 to dnabound\_Foxo1\_Pa0\_Pd1\_Pe0-\_pUb1 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_Pd}$$
$$(1077)$$
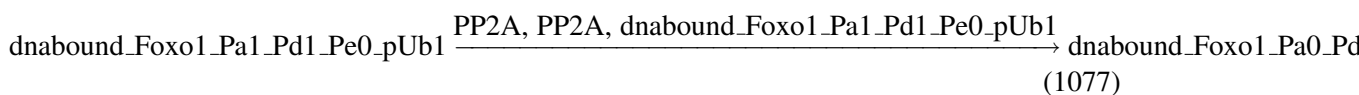
### Reactant

Table 705: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Modifiers

Table 706: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Product

Table 707: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{191} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_191}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kdephos}) \tag{1078}$$

$$\text{function\_191}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kdephos}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})} \tag{1079}$$

$$\text{function\_191}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kdephos}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})} \tag{1080}$$

Table 708: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.192 Reaction R231

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd1_Pe1-_pUb0 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_P} \tag{1081}$$

### Reactant

Table 709: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Modifiers

Table 710: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Product

Table 711: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

**Derived unit** contains undeclared units

$$v_{192} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_192}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kdephos}) \quad (1082)$$

$$\text{function\_192}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \quad (1083)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_192}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \quad (1084)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 712: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.193 Reaction R232

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 by PP2A

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_}$$
$$(1085)$$
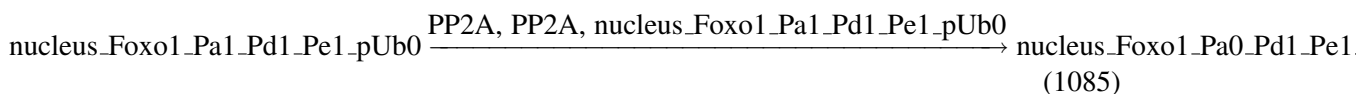
**Reactant**

Table 713: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Modifiers

Table 714: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Product

Table 715: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{193} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_193}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos}, \text{vol}\,(\text{nucleus}),$$
$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}]) \quad (1086)$$

$$\text{function\_193}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$
$$(1087)$$

$$\text{function\_193}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$
$$(1088)$$

Table 716: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.194 Reaction R233

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd1_Pe1-_pUb0 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd}$$

$$(1089)$$
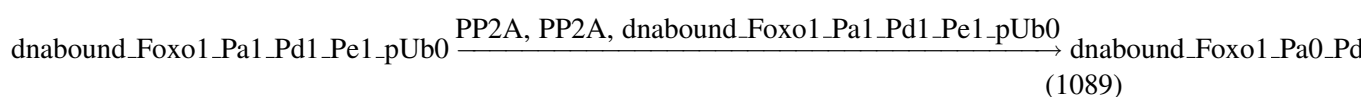
### Reactant

Table 717: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Modifiers

Table 718: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Product

Table 719: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{194} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_194}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kdephos}) \quad (1090)$$

$function\_194\left([PP2A], vol\left(cytoplasm\right), vol\left(dnabound\right),\right.$
$\left[dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0\right], kdephos)$
$= \dfrac{[dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0] \cdot vol\left(dnabound\right) \cdot [PP2A] \cdot vol\left(cytoplasm\right) \cdot kdephos}{vol\left(dnabound\right)}$

$$(1091)$$

$function\_194\left([PP2A], vol\left(cytoplasm\right), vol\left(dnabound\right),\right.$
$\left[dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0\right], kdephos)$
$= \dfrac{[dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0] \cdot vol\left(dnabound\right) \cdot [PP2A] \cdot vol\left(cytoplasm\right) \cdot kdephos}{vol\left(dnabound\right)}$

$$(1092)$$

Table 720: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.195 Reaction R234

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd1_Pe1-_pUb1 by PP2A

### Reaction equation

$$cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1 \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} cytoplasm\_Foxo1\_Pa0\_P$$

$$(1093)$$
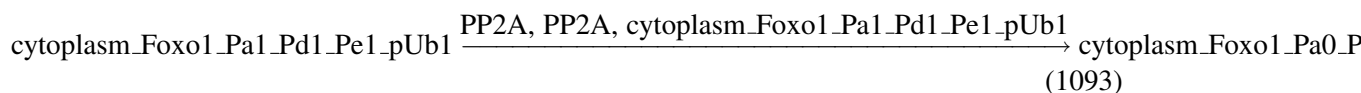
### Reactant

Table 721: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Modifiers

Table 722: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

**Product**

Table 723: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{195} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_195}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{kdephos}) \tag{1094}$$

$$\text{function\_195}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \tag{1095}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_195}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \tag{1096}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 724: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.196 Reaction R235

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 by PP2A

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_}$$

(1097)
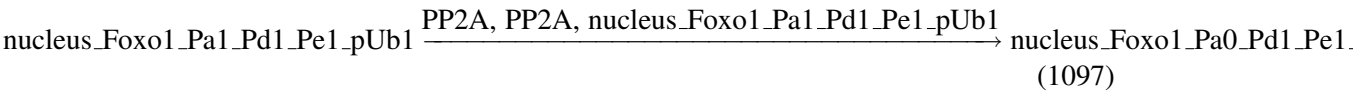
## Reactant

Table 725: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Modifiers

Table 726: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Product

Table 727: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{196} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_196}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \text{vol}\,(\text{nucleus})\,, \\ [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}])$$

(1098)

$$\text{function\_196}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \\ \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

(1099)

$$\text{function\_196}\left([PP2A], \text{vol}(\text{cytoplasm}), \text{kdephos},\right.$$
$$\left.\text{vol}(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}]\right)$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{nucleus}) \cdot [PP2A] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{nucleus})}$$

$$(1100)$$

Table 728: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.197 Reaction R236

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd1_Pe1-_pUb1 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_Pd}$$

$$(1101)$$
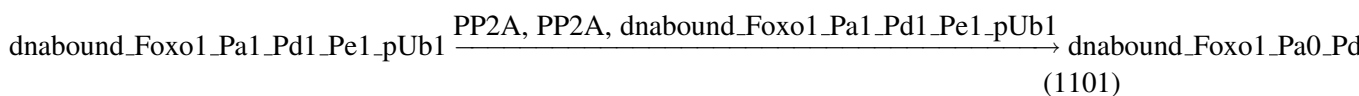
### Reactant

Table 729: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Modifiers

Table 730: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Product

## Table 731: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{197} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_197}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{kdephos}) \quad (1102)$$

function_197 ([PP2A], vol (cytoplasm), vol (dnabound),
[dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1], kdephos)

$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

$$(1103)$$

function_197 ([PP2A], vol (cytoplasm), vol (dnabound),
[dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1], kdephos)

$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

$$(1104)$$

## Table 732: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.198 Reaction R237

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd1_Pe0-_pUb0 by IKK_P

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_}$$

$$(1105)$$
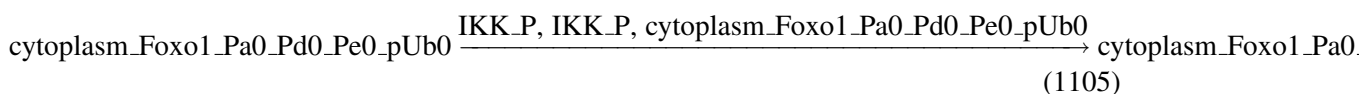
### Reactant

Table 733: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Modifiers

Table 734: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

Table 735: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{198} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_198}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}) \tag{1106}$$

$$\text{function\_198}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \tag{1107}$$
$$\text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_198}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \tag{1108}$$
$$\text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

Table 736: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.199 Reaction R238

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 by IKK_P

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe}$$

(1109)
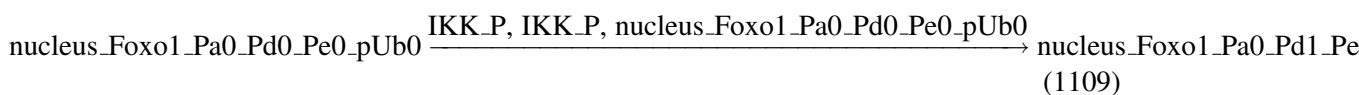
### Reactant

Table 737: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Modifiers

Table 738: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

Table 739: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{199} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_199}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]) \quad (1110)$$

$$\text{function\_199}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1111)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$\text{function\_199}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1112)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

Table 740: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.200 Reaction R239

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd1_Pe0-_pUb0 by IKK_P

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_} $$
$$(1113)$$
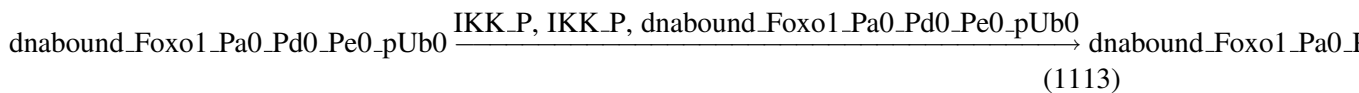
### Reactant

Table 741: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

*Produced by SBML2LATEX*

### Modifiers

Table 742: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

Table 743: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{200} = \text{vol}\left(\text{dnabound}\right) \cdot \text{function\_200}\left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right),\right.$$
$$\left.\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}\right) \tag{1114}$$

$$\text{function\_200}\left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right),\right. \tag{1115}$$
$$\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{IKK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{dnabound}\right)}$$

$$\text{function\_200}\left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right),\right. \tag{1116}$$
$$\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{IKK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{dnabound}\right)}$$

Table 744: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.201 Reaction R240

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd1_Pe0-_pUb1 by IKK_P

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0}$$

(1117)
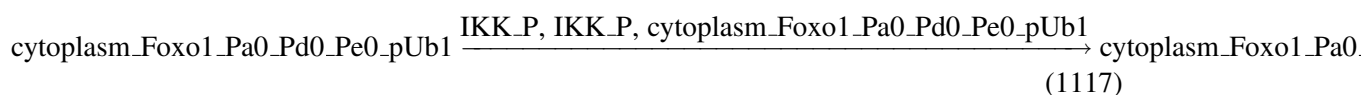
### Reactant

Table 745: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Modifiers

Table 746: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Product

Table 747: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{201} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_201}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin})$$

(1118)

$$\text{function\_201}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \tag{1119}$$

$$\text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin})$$

$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_201}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \tag{1120}$$

$$\text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin})$$

$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

Table 748: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.202 Reaction R241

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 by IKK_P

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe} \tag{1121}$$
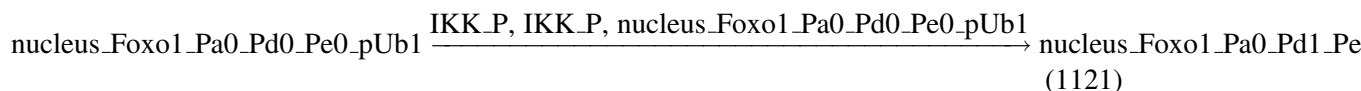
### Reactant

Table 749: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Modifiers

Table 750: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| IKK_P | IKK_P | |

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Product

Table 751: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{202} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_202}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]) \quad (1122)$$

$$\text{function\_202}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1123)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$\text{function\_202}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1124)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

Table 752: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.203 Reaction R242

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd1_Pe0_-pUb1 by IKK_P

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_F}$$

$$(1125)$$
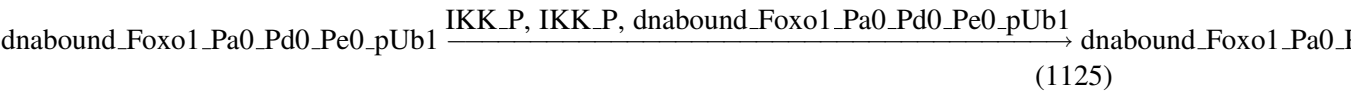
### Reactant

Table 753: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Modifiers

Table 754: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Product

Table 755: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{203} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_203}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$\text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin}) \quad (1126)$$

$$\text{function\_203}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1127)$$
$$\text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$
\begin{aligned}
&\text{function\_203}\left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right),\right. &(1128)\\
&\left.\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin}\right)\\
&= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{IKK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{dnabound}\right)}
\end{aligned}
$$

Table 756: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.204 Reaction R243

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd1_Pe1-_pUb0 by IKK_P

### Reaction equation

$$
\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0}.
$$

$$(1129)$$
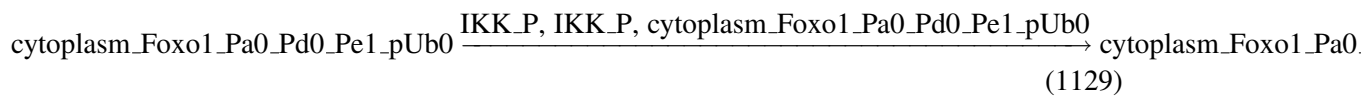
### Reactant

Table 757: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Modifiers

Table 758: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Product

*Produced by* SBML2LATEX

Table 759: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{204} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_204}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1130)$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin})$$

function_204 ([IKK_P], by_ikk_phos_factor,                (1131)
vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0], kkin)

$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

function_204 ([IKK_P], by_ikk_phos_factor,                (1132)
vol (cytoplasm), [cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0], kkin)

$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

Table 760: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.205 Reaction R244

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 by IKK_P

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe} \quad (1133)$$
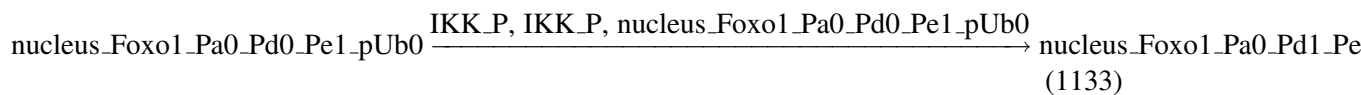
**Reactant**

Table 761: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Modifiers

Table 762: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Product

Table 763: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$
v_{205} = \mathrm{vol}\left(\mathrm{nucleus}\right) \cdot \mathrm{function\_205}\left([\mathrm{IKK\_P}], \mathrm{by\_ikk\_phos\_factor}, \mathrm{vol}\left(\mathrm{cytoplasm}\right), \atop \mathrm{kkin}, \mathrm{vol}\left(\mathrm{nucleus}\right), [\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\right) \tag{1134}
$$

$$
\mathrm{function\_205}\left([\mathrm{IKK\_P}], \mathrm{by\_ikk\_phos\_factor}, \mathrm{vol}\left(\mathrm{cytoplasm}\right), \tag{1135}
$$
$$
\mathrm{kkin}, \mathrm{vol}\left(\mathrm{nucleus}\right), [\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\right)
$$
$$
= \frac{[\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \mathrm{vol}\left(\mathrm{nucleus}\right) \cdot [\mathrm{IKK\_P}] \cdot \mathrm{vol}\left(\mathrm{cytoplasm}\right) \cdot \mathrm{by\_ikk\_phos\_factor} \cdot \mathrm{kkin}}{\mathrm{vol}\left(\mathrm{nucleus}\right)}
$$

$$
\mathrm{function\_205}\left([\mathrm{IKK\_P}], \mathrm{by\_ikk\_phos\_factor}, \mathrm{vol}\left(\mathrm{cytoplasm}\right), \tag{1136}
$$
$$
\mathrm{kkin}, \mathrm{vol}\left(\mathrm{nucleus}\right), [\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\right)
$$
$$
= \frac{[\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \mathrm{vol}\left(\mathrm{nucleus}\right) \cdot [\mathrm{IKK\_P}] \cdot \mathrm{vol}\left(\mathrm{cytoplasm}\right) \cdot \mathrm{by\_ikk\_phos\_factor} \cdot \mathrm{kkin}}{\mathrm{vol}\left(\mathrm{nucleus}\right)}
$$

Table 764: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.206 Reaction R245

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd1_Pe1-_pUb0 by IKK_P

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_} \tag{1137}$$
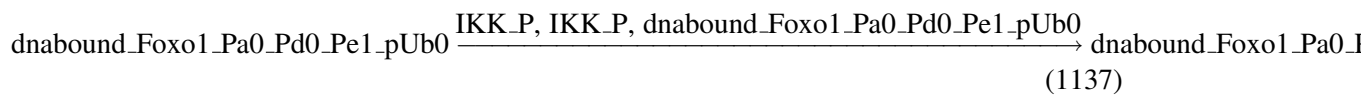
### Reactant

Table 765: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Modifiers

Table 766: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Product

Table 767: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{206} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_206}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm})\,, \quad (1138)$$
$$\text{vol}\,(\text{dnabound})\,, [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin})$$

$$\text{function\_206}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm})\,, \quad (1139)$$
$$\text{vol}\,(\text{dnabound})\,, [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$\text{function\_206}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm})\,, \quad (1140)$$
$$\text{vol}\,(\text{dnabound})\,, [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

Table 768: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.207 Reaction R246

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd1_Pe1-_pUb1 by IKK_P

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0.}$$
$$(1141)$$
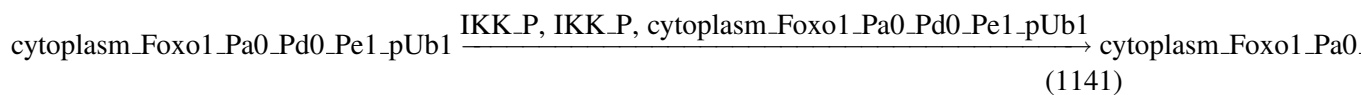
**Reactant**

Table 769: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Modifiers

Table 770: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Product

Table 771: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{207} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_207}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kkin}) \quad (1142)$$

$$\text{function\_207}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \quad\quad\quad\quad\quad (1143)$$
$$\text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_207}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \quad\quad\quad\quad\quad (1144)$$
$$\text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

Table 772: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.208 Reaction R247

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1
by IKK_P

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe}$$

$$(1145)$$
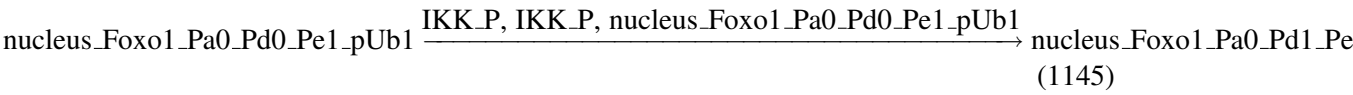
### Reactant

Table 773: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Modifiers

Table 774: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Product

Table 775: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{208} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_208}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]) \qquad (1146)$$

$$\text{function\_208}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm})\,, \tag{1147}$$
$$\text{kkin}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$\text{function\_208}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm})\,, \tag{1148}$$
$$\text{kkin}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

Table 776: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.209 Reaction R248

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd1_Pe1-_pUb1 by IKK_P

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_P}$$
$$\tag{1149}$$
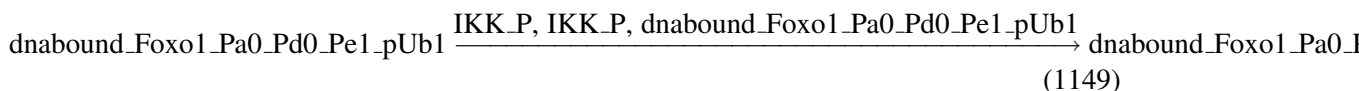
### Reactant

Table 777: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Modifiers

Table 778: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| IKK_P | IKK_P | |

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Product

Table 779: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{209} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_209}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \\ \text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kkin}) \tag{1150}$$

$$\text{function\_209}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \\ \text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kkin}) \tag{1151} \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$\text{function\_209}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \\ \text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kkin}) \tag{1152} \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

Table 780: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.210 Reaction R249

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd0_Pe0-_pUb0 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_P}$$

$$(1153)$$
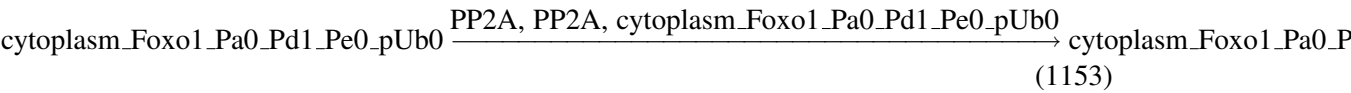
### Reactant

Table 781: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Modifiers

Table 782: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Product

Table 783: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{210} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_210}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kdephos}) \qquad (1154)$$

$$\text{function\_210}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \qquad (1155)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_210}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \qquad (1156)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 784: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.211 Reaction R250

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 by PP2A

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_}$$

$$(1157)$$
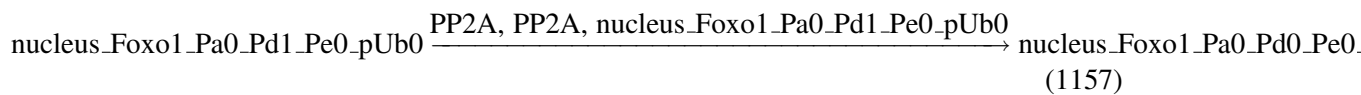
### Reactant

Table 785: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Modifiers

Table 786: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Product

Table 787: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{211} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_211}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos}, \text{vol}\,(\text{nucleus}), \tag{1158}$$
$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}])$$

$$\text{function\_211}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$
$$\tag{1159}$$

$$\text{function\_211}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$
$$\tag{1160}$$

Table 788: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.212 Reaction R251

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd0_Pe0-
_pUb0 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd} \tag{1161}$$
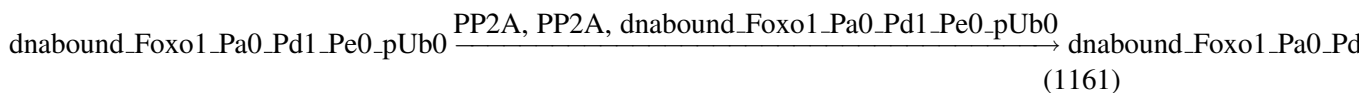
### Reactant

## Table 789: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Modifiers

## Table 790: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Product

## Table 791: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{212} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_212}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \atop [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kdephos}) \qquad (1162)$$

$\text{function\_212}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$
$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kdephos})$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

$$(1163)$$

$\text{function\_212}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$
$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kdephos})$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

$$(1164)$$

Table 792: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.213 Reaction R252

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd0_Pe0-_pUb1 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0\_P}$$

$$(1165)$$
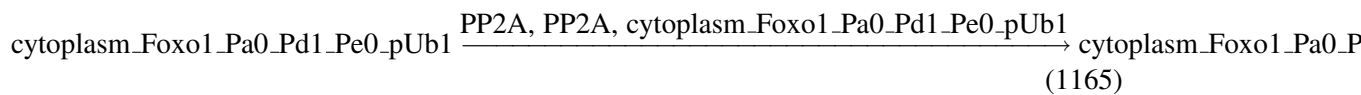
### Reactant

Table 793: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Modifiers

Table 794: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Product

Table 795: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{213} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_213}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kdephos}) \qquad (1166)$$

$$\text{function\_213}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \qquad (1167)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_213}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \qquad (1168)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 796: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.214 Reaction R253

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 by PP2A

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_}$$
$$(1169)$$
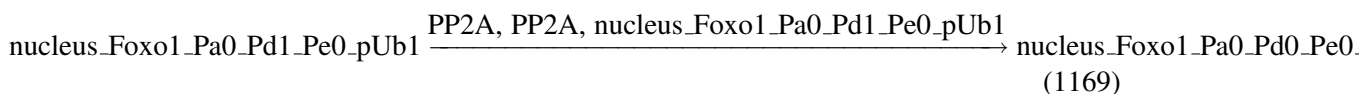
**Reactant**

Table 797: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Modifiers

Table 798: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Product

Table 799: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{214} = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{function\_214}\,([\mathrm{PP2A}], \mathrm{vol}\,(\mathrm{cytoplasm}), \mathrm{kdephos}, \mathrm{vol}\,(\mathrm{nucleus}), \\ [\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]) \tag{1170}$$

$$\mathrm{function\_214}\,([\mathrm{PP2A}], \mathrm{vol}\,(\mathrm{cytoplasm}), \mathrm{kdephos}, \\ \mathrm{vol}\,(\mathrm{nucleus}), [\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]) \\ = \frac{[\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \mathrm{vol}\,(\mathrm{nucleus}) \cdot [\mathrm{PP2A}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kdephos}}{\mathrm{vol}\,(\mathrm{nucleus})} \tag{1171}$$

$$\mathrm{function\_214}\,([\mathrm{PP2A}], \mathrm{vol}\,(\mathrm{cytoplasm}), \mathrm{kdephos}, \\ \mathrm{vol}\,(\mathrm{nucleus}), [\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]) \\ = \frac{[\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \mathrm{vol}\,(\mathrm{nucleus}) \cdot [\mathrm{PP2A}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kdephos}}{\mathrm{vol}\,(\mathrm{nucleus})} \tag{1172}$$

Table 800: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.215 Reaction R254

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd0_Pe0-_pUb1 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_Pd}$$

$$(1173)$$
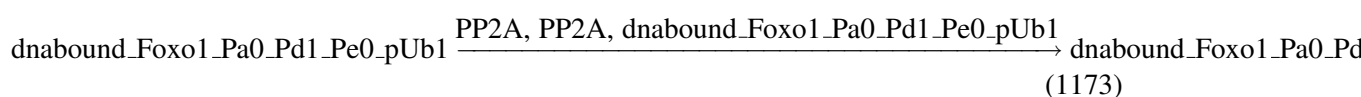
### Reactant

Table 801: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Modifiers

Table 802: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Product

Table 803: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{215} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_215}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kdephos}) \quad (1174)$$

function_215 ([PP2A], vol (cytoplasm), vol (dnabound),

[dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1], kdephos)

$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol (dnabound)} \cdot [\text{PP2A}] \cdot \text{vol (cytoplasm)} \cdot \text{kdephos}}{\text{vol (dnabound)}}$$

(1175)

function_215 ([PP2A], vol (cytoplasm), vol (dnabound),

[dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1], kdephos)

$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol (dnabound)} \cdot [\text{PP2A}] \cdot \text{vol (cytoplasm)} \cdot \text{kdephos}}{\text{vol (dnabound)}}$$

(1176)

Table 804: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.216 Reaction R255

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd0_Pe1-_pUb0 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_P}$$

(1177)
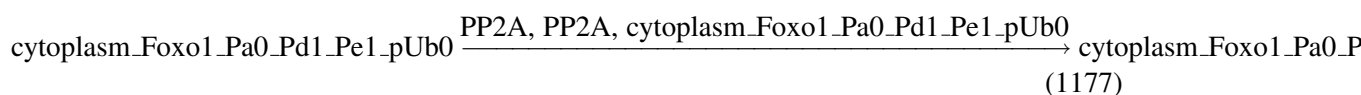
### Reactant

Table 805: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Modifiers

Table 806: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Product

Table 807: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{216} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_216}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kdephos}) \tag{1178}$$

$$\text{function\_216}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \tag{1179}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_216}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \tag{1180}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 808: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.217 Reaction R256

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 by PP2A

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_}$$

$$(1181)$$
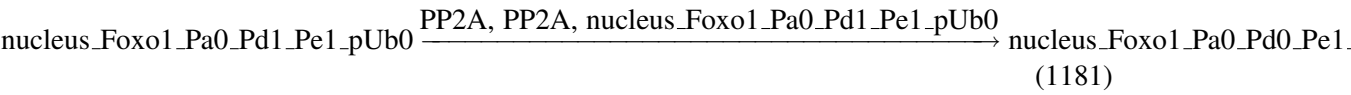
## Reactant

Table 809: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Modifiers

Table 810: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Product

Table 811: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{217} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_217}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \text{vol}\,(\text{nucleus})\,, \\ [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]) \quad (1182)$$

$$\text{function\_217}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \\ \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

$$(1183)$$

$$\text{function\_217}\left([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos},\right.$$
$$\left.\text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]\right)$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

(1184)

Table 812: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.218 Reaction R257

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd0_Pe1-_pUb0 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd}$$

(1185)
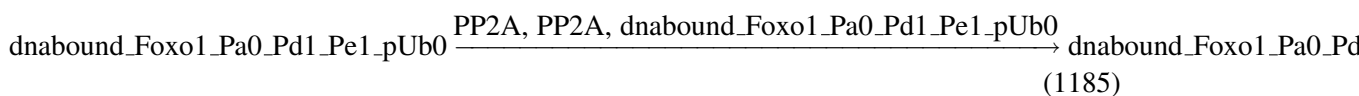
### Reactant

Table 813: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Modifiers

Table 814: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Product

Table 815: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{218} = \text{vol}(\text{dnabound}) \cdot \text{function\_218}([\text{PP2A}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kdephos}) \quad (1186)$$

function_218 ([PP2A], vol (cytoplasm), vol (dnabound),
[dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0], kdephos)

$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

$$(1187)$$

function_218 ([PP2A], vol (cytoplasm), vol (dnabound),
[dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0], kdephos)

$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

$$(1188)$$

Table 816: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.219 Reaction R258

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd0_Pe1-_pUb1 by PP2A

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0\_P}$$

$$(1189)$$
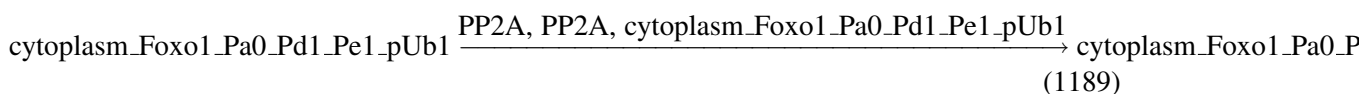
### Reactant

<div align="center">

Table 817: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

</div>

### Modifiers

<div align="center">

Table 818: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

</div>

### Product

<div align="center">

Table 819: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

</div>

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{219} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_219}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kdephos}) \quad (1190)$$

$$\text{function\_219}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \quad (1191)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_219}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \quad (1192)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 820: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.220 Reaction R259

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 by PP2A

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_}$$

$$(1193)$$
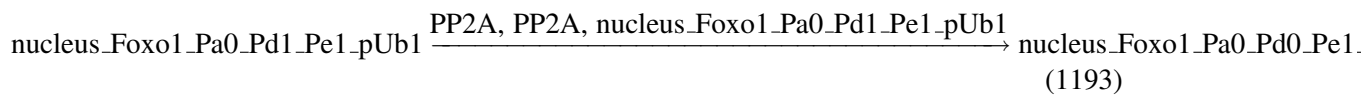
### Reactant

Table 821: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Modifiers

Table 822: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Product

Table 823: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{220} = \text{vol}\left(\text{nucleus}\right) \cdot \text{function\_220}\left(\left[\text{PP2A}\right], \text{vol}\left(\text{cytoplasm}\right), \text{kdephos}, \text{vol}\left(\text{nucleus}\right),\right.$$
$$\left.\left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}\right]\right) \quad (1194)$$

$$\text{function\_220}\left(\left[\text{PP2A}\right], \text{vol}\left(\text{cytoplasm}\right), \text{kdephos},\right.$$
$$\left.\text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}\right]\right)$$
$$= \frac{\left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \left[\text{PP2A}\right] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kdephos}}{\text{vol}\left(\text{nucleus}\right)}$$

$$(1195)$$

$$\text{function\_220}\left(\left[\text{PP2A}\right], \text{vol}\left(\text{cytoplasm}\right), \text{kdephos},\right.$$
$$\left.\text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}\right]\right)$$
$$= \frac{\left[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \left[\text{PP2A}\right] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kdephos}}{\text{vol}\left(\text{nucleus}\right)}$$

$$(1196)$$

Table 824: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.221 Reaction R260

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd0_Pe1-_pUb1 by PP2A

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_Pd}$$

$$(1197)$$
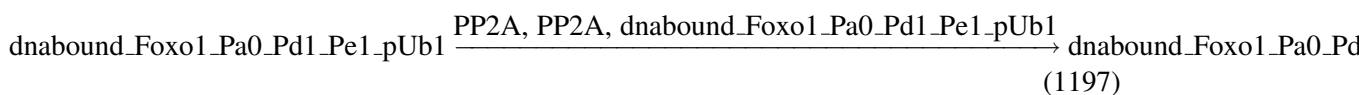
**Reactant**

## Table 825: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

## Modifiers

## Table 826: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

## Product

## Table 827: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{221} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_221}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kdephos}) \tag{1198}$$

$$\text{function\_221}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kdephos}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})} \tag{1199}$$

$$\text{function\_221}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kdephos}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})} \tag{1200}$$

Table 828: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.222 Reaction R261

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe0-_pUb0 by IKK_P

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_}$$

$$(1201)$$
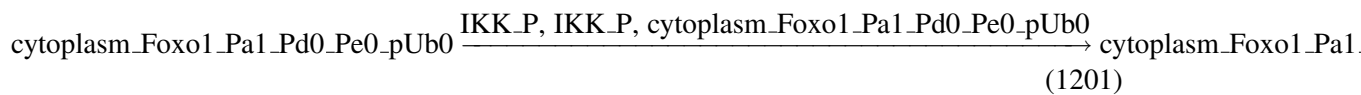
### Reactant

Table 829: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Modifiers

Table 830: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Product

Table 831: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{222} = \text{vol}(\text{cytoplasm}) \cdot \text{function\_222}([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}(\text{cytoplasm}), \quad (1202)$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kkin})$$

$$\text{function\_222}([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \quad (1203)$$
$$\text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})}$$

$$\text{function\_222}([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \quad (1204)$$
$$\text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})}$$

Table 832: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.223 Reaction R262

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 by IKK_P

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe}$$
$$(1205)$$
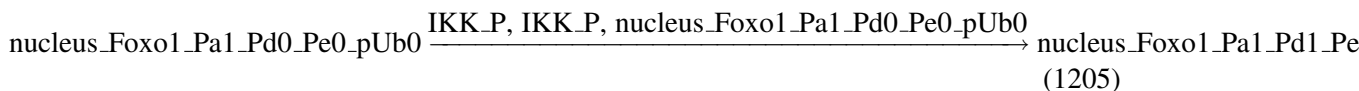
### Reactant

Table 833: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Modifiers

Table 834: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Product

Table 835: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{223} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_223}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}) ,$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}) , [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}]) \quad (1206)$$

$$\text{function\_223}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}) , \quad (1207)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}) , [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$\text{function\_223}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}) , \quad (1208)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}) , [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

Table 836: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.224 Reaction R263

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe0-_pUb0 by IKK_P

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_F}$$

$$(1209)$$
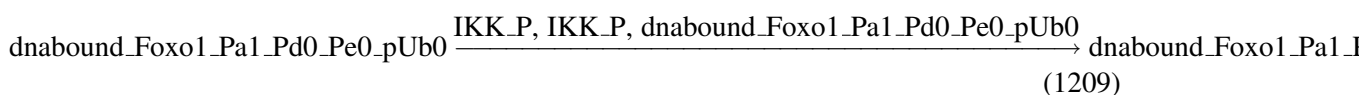
### Reactant

Table 837: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Modifiers

Table 838: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Product

Table 839: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{224} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_224}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$\text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kkin})$$

$$(1210)$$

$$\text{function\_224} \left( [\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm})\,, \right. \tag{1211}$$
$$\left. \text{vol}\,(\text{dnabound})\,, [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kkin} \right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$\text{function\_224} \left( [\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm})\,, \right. \tag{1212}$$
$$\left. \text{vol}\,(\text{dnabound})\,, [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kkin} \right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

Table 840: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.225 Reaction R264

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd1_Pe0-_pUb1 by IKK_P

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1\_} \tag{1213}$$
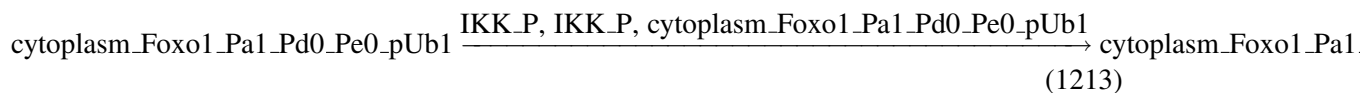
### Reactant

Table 841: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Modifiers

Table 842: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| IKK_P | IKK_P | |

| Id | Name | SBO |
|----|------|-----|
| IKK_P | IKK_P | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

## Product

Table 843: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{225} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_225}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \tag{1214}$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kkin})$$

$$\text{function\_225}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \tag{1215}$$
$$\text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_225}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \tag{1216}$$
$$\text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

Table 844: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.226 Reaction R265

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 by IKK_P

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe}$$

$$(1217)$$
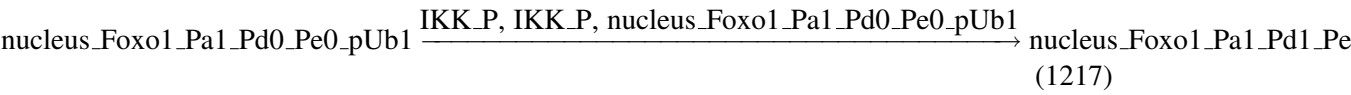
### Reactant

Table 845: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Modifiers

Table 846: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Product

Table 847: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{226} = \text{vol}\left(\text{nucleus}\right) \cdot \text{function\_226}\left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right), \right.$$
$$\left. \text{kkin}, \text{vol}\left(\text{nucleus}\right), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}]\right)$$

$$(1218)$$

$$\text{function\_226}\left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right), \right.$$
$$\left. \text{kkin}, \text{vol}\left(\text{nucleus}\right), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}]\right)$$

$$(1219)$$

$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{nucleus}\right) \cdot [\text{IKK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{nucleus}\right)}$$

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$$\text{function\_226}\left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right),\right. \qquad (1220)$$
$$\left.\text{kkin}, \text{vol}\left(\text{nucleus}\right), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}]\right)$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{nucleus}\right) \cdot [\text{IKK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{nucleus}\right)}$$

Table 848: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.227 Reaction R266

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe0-_pUb1 by IKK_P

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_I}$$
$$(1221)$$
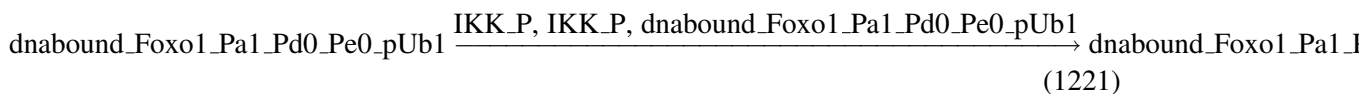
### Reactant

Table 849: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Modifiers

Table 850: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Product

Table 851: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{227} = \text{vol}(\text{dnabound}) \cdot \text{function\_227}([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}(\text{cytoplasm}),$$
$$\text{vol}(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kkin}) \quad (1222)$$

$$\text{function\_227}([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}(\text{cytoplasm}), \quad (1223)$$
$$\text{vol}(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{dnabound})}$$

$$\text{function\_227}([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}(\text{cytoplasm}), \quad (1224)$$
$$\text{vol}(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{dnabound})}$$

Table 852: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.228 Reaction R267

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe1-_pUb0 by IKK_P

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_} \quad (1225)$$
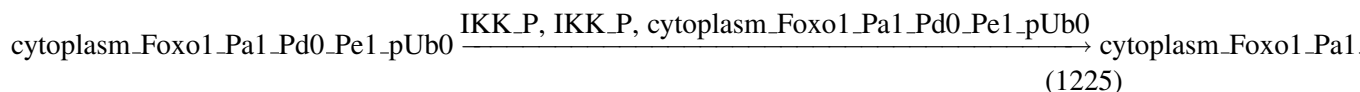
### Reactant

Table 853: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Modifiers

Table 854: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Product

Table 855: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$
v_{228} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_228}\left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right), \right. \\ \left. [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kkin}\right) \tag{1226}
$$

$$
\text{function\_228}\left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \right. \tag{1227}
$$
$$
\left. \text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kkin}\right)
$$
$$
= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{IKK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{cytoplasm}\right)}
$$

$$
\text{function\_228}\left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \right. \tag{1228}
$$
$$
\left. \text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kkin}\right)
$$
$$
= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{IKK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{cytoplasm}\right)}
$$

Table 856: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.229 Reaction R268

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 by IKK_P

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe}$$

(1229)
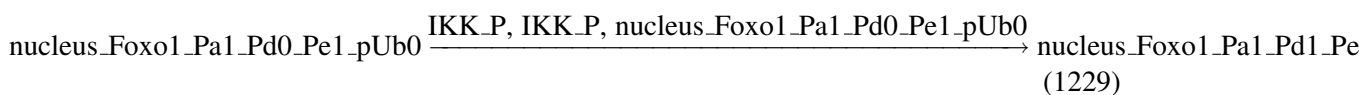
### Reactant

Table 857: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Modifiers

Table 858: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Product

Table 859: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{229} = \text{vol (nucleus)} \cdot \text{function\_229} \left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol (cytoplasm)}, \right. \tag{1230}$$
$$\left. \text{kkin}, \text{vol (nucleus)}, [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}]\right)$$

$$\text{function\_229} \left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol (cytoplasm)}, \right. \tag{1231}$$
$$\left. \text{kkin}, \text{vol (nucleus)}, [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}]\right)$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (nucleus)} \cdot [\text{IKK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol (nucleus)}}$$

$$\text{function\_229} \left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol (cytoplasm)}, \right. \tag{1232}$$
$$\left. \text{kkin}, \text{vol (nucleus)}, [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}]\right)$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol (nucleus)} \cdot [\text{IKK\_P}] \cdot \text{vol (cytoplasm)} \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol (nucleus)}}$$

Table 860: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.230 Reaction R269

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe1-_pUb0 by IKK_P

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_P} \tag{1233}$$
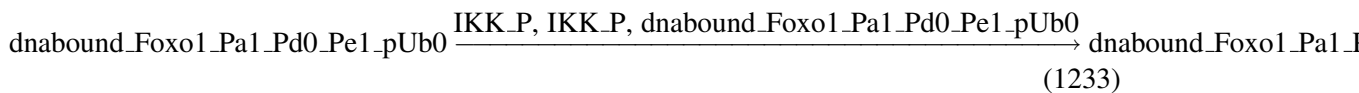
### Reactant

Table 861: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Modifiers

Table 862: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Product

Table 863: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{230} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_230}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \\ \text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kkin}) \tag{1234}$$

$$\text{function\_230}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \tag{1235} \\ \text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kkin}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$\text{function\_230}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \tag{1236} \\ \text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kkin}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

Table 864: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.231 Reaction R270

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd1_Pe1-_pUb1 by IKK_P

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{IKK\_P, IKK\_P, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1\_} \tag{1237}$$
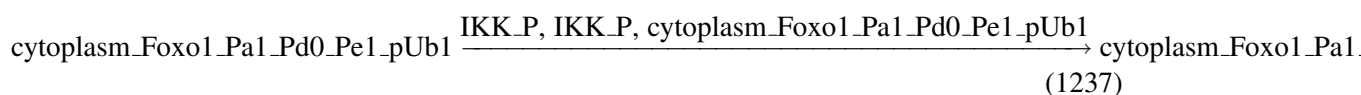
### Reactant

Table 865: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Modifiers

Table 866: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Product

Table 867: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{231} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_231}\left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right), \right.$$
$$\left. [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{kkin}\right) \tag{1238}$$

$$\text{function\_231} \left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \right. \tag{1239}$$
$$\text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})}$$

$$\text{function\_231} \left([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \right. \tag{1240}$$
$$\text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{IKK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})}$$

Table 868: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.232 Reaction R271

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 by IKK_P

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{IKK\_P, IKK\_P, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe} \tag{1241}$$
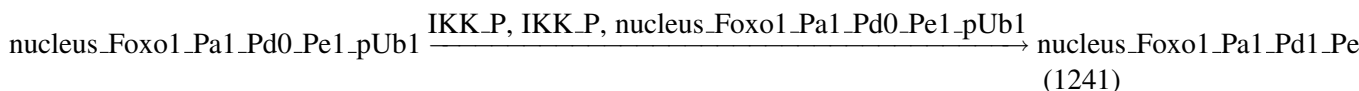
**Reactant**

Table 869: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

**Modifiers**

Table 870: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| IKK_P | IKK_P | |

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Product

Table 871: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{232} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_232}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \\ \text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}]) \tag{1242}$$

$$\text{function\_232}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \tag{1243} \\ \text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$\text{function\_232}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \tag{1244} \\ \text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

Table 872: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

### 8.233 Reaction R272

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe1-_pUb1 by IKK_P

## Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{IKK\_P, IKK\_P, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_I}$$

(1245)
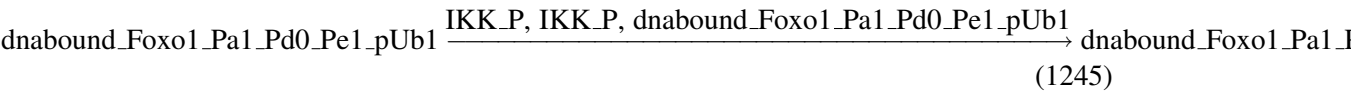
## Reactant

Table 873: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

## Modifiers

Table 874: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| IKK_P | IKK_P | |
| IKK_P | IKK_P | |
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

## Product

Table 875: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{233} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_233}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$\text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{kkin})$$

(1246)

$$\text{function\_233}\,([\text{IKK\_P}], \text{by\_ikk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$

(1247)

$$\text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{kkin})$$

$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{IKK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_ikk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$\text{function\_233} \left([IKK\_P], by\_ikk\_phos\_factor, vol(cytoplasm), \right. \tag{1248}$$
$$\left. vol(dnabound), [dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1], kkin\right)$$
$$= \frac{[dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1] \cdot vol(dnabound) \cdot [IKK\_P] \cdot vol(cytoplasm) \cdot by\_ikk\_phos\_factor \cdot kkin}{vol(dnabound)}$$

Table 876: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.234 Reaction R273

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe0-_pUb0 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_P} \tag{1249}$$
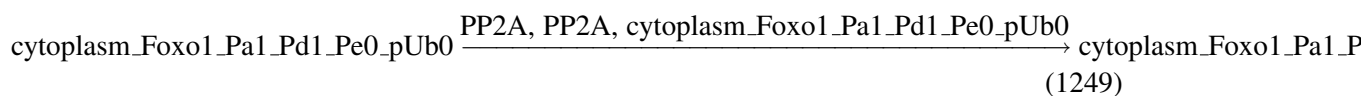
### Reactant

Table 877: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Modifiers

Table 878: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

| Id | Name | SBO |
|---|---|---|
| `cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0` | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{234} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_234}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{kdephos}) \quad (1250)$$

$$\text{function\_234}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \quad (1251)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_234}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \quad (1252)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 880: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| `kdephos` | kdephos | | $10^{-6}$ | | ☑ |

## 8.235 Reaction R274

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 by PP2A

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0.} \quad (1253)$$
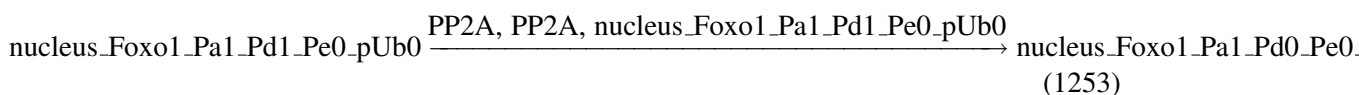
**Reactant**

Table 881: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

## Modifiers

Table 882: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

## Product

Table 883: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{235} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_235}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos}, \text{vol}\,(\text{nucleus}), \\ [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}]) \quad (1254)$$

$$\text{function\_235}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos}, \\ \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})} \\ (1255)$$

$$\text{function\_235}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos}, \\ \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})} \\ (1256)$$

Table 884: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.236 Reaction R275

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe0-_pUb0 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd}$$

$$(1257)$$
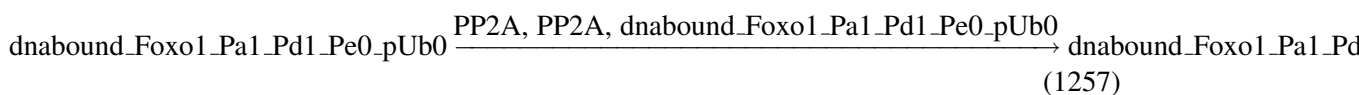
### Reactant

Table 885: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Modifiers

Table 886: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

Table 887: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{236} = \text{vol}(\text{dnabound}) \cdot \text{function\_236}([\text{PP2A}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}), \quad (1258)$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{kdephos})$$

function\_236 ([PP2A], vol (cytoplasm), vol (dnabound),
[dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0], kdephos)
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

$$(1259)$$

function\_236 ([PP2A], vol (cytoplasm), vol (dnabound),
[dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0], kdephos)
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

$$(1260)$$

Table 888: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.237 Reaction R276

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1 to cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0- \_pUb1 by PP2A

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1\_P}$$
$$(1261)$$
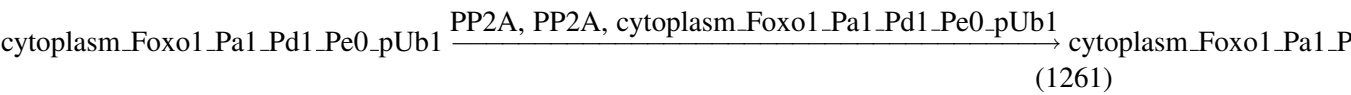
**Reactant**

Table 889: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Modifiers

Table 890: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Product

Table 891: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{237} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_237}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kdephos}) \tag{1262}$$

$$\text{function\_237}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \tag{1263}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_237}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \tag{1264}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 892: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.238 Reaction R277

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 by PP2A

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_}$$

$$(1265)$$
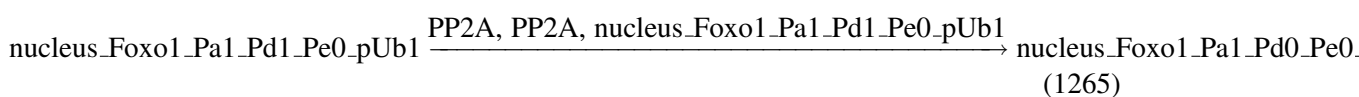
### Reactant

Table 893: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Modifiers

Table 894: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Product

Table 895: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{238} = \text{vol (nucleus)} \cdot \text{function\_238} ([\text{PP2A}], \text{vol (cytoplasm)}, \text{kdephos}, \text{vol (nucleus)}, \quad (1266)$$
$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}])$$

$$\text{function\_238} ([\text{PP2A}], \text{vol (cytoplasm)}, \text{kdephos},$$
$$\text{vol (nucleus)}, [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol (nucleus)} \cdot [\text{PP2A}] \cdot \text{vol (cytoplasm)} \cdot \text{kdephos}}{\text{vol (nucleus)}}$$
$$(1267)$$

$$\text{function\_238} ([\text{PP2A}], \text{vol (cytoplasm)}, \text{kdephos},$$
$$\text{vol (nucleus)}, [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol (nucleus)} \cdot [\text{PP2A}] \cdot \text{vol (cytoplasm)} \cdot \text{kdephos}}{\text{vol (nucleus)}}$$
$$(1268)$$

Table 896: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---------|---------|-----|-----------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.239 Reaction R278

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd0_Pe0-_pUb1 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_Pd}$$
$$(1269)$$
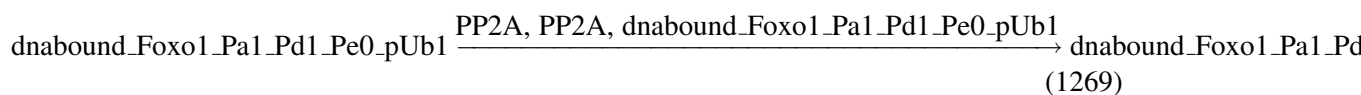
### Reactant

## Table 897: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Modifiers

## Table 898: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Product

## Table 899: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{239} = \text{vol}\left(\text{dnabound}\right) \cdot \text{function\_239}\left([\text{PP2A}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right),\right.$$
$$\left.[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kdephos}\right) \quad (1270)$$

$$\text{function\_239}\left([\text{PP2A}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right),\right.$$
$$\left.[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kdephos}\right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{PP2A}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kdephos}}{\text{vol}\left(\text{dnabound}\right)}$$
$$(1271)$$

$$\text{function\_239}\left([\text{PP2A}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right),\right.$$
$$\left.[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kdephos}\right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{PP2A}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kdephos}}{\text{vol}\left(\text{dnabound}\right)}$$
$$(1272)$$

Table 900: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.240 Reaction R279

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe1-_pUb0 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_P}$$

$$(1273)$$

### Reactant

Table 901: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Modifiers

Table 902: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Product

Table 903: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{240} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_240}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kdephos}) \qquad (1274)$$

$$\text{function\_240}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \qquad (1275)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_240}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \qquad (1276)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 904: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.241 Reaction R280

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 by PP2A

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_}$$
$$(1277)$$
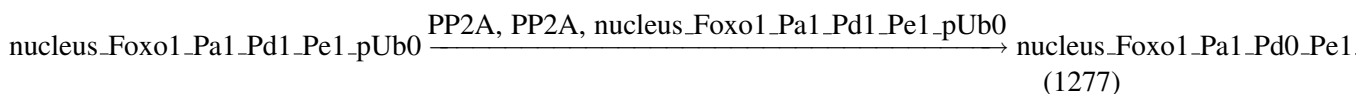
### Reactant

Table 905: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Modifiers

Table 906: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Product

Table 907: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{241} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_241}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos}, \text{vol}\,(\text{nucleus}), \atop [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}]) \quad (1278)$$

$$\text{function\_241}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$
$$(1279)$$

$$\text{function\_241}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$
$$(1280)$$

Table 908: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

*Produced by* SBML2LATEX

### 8.242 Reaction R281

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe1-_pUb0 by PP2A

#### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd}$$

(1281)
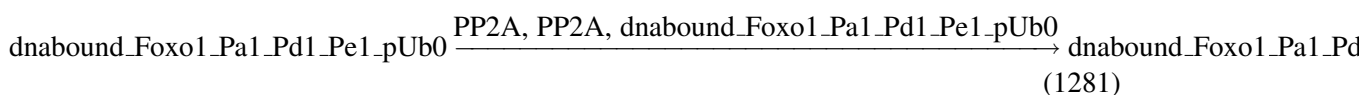
#### Reactant

Table 909: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

#### Modifiers

Table 910: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

#### Product

Table 911: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_{242} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_242}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kdephos})$$

(1282)

$$\text{function\_242}\,([\text{PP2A}],\text{vol}\,(\text{cytoplasm})\,,\text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}],\text{kdephos})$$
$$=\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}]\cdot\text{vol}\,(\text{dnabound})\cdot[\text{PP2A}]\cdot\text{vol}\,(\text{cytoplasm})\cdot\text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

$$(1283)$$

$$\text{function\_242}\,([\text{PP2A}],\text{vol}\,(\text{cytoplasm})\,,\text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}],\text{kdephos})$$
$$=\frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}]\cdot\text{vol}\,(\text{dnabound})\cdot[\text{PP2A}]\cdot\text{vol}\,(\text{cytoplasm})\cdot\text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

$$(1284)$$

Table 912: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

### 8.243 Reaction R282

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd0_Pe1-_pUb1 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}\xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}}\text{cytoplasm\_Foxo1\_Pa1\_P}$$

$$(1285)$$
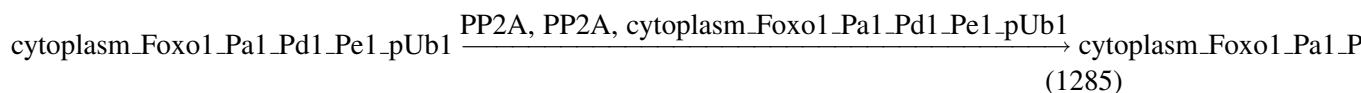
### Reactant

Table 913: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Modifiers

Table 914: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

**Product**

Table 915: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{243} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_243}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{kdephos}) \tag{1286}$$

$$\text{function\_243}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \tag{1287}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_243}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \tag{1288}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 916: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.244 Reaction R283

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 by PP2A

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_}$$

(1289)
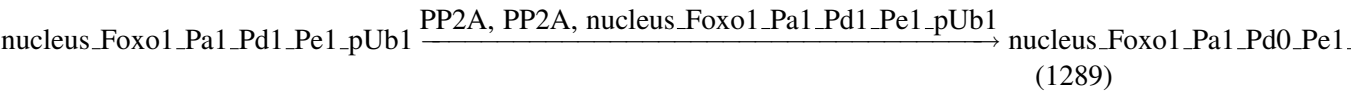
### Reactant

Table 917: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Modifiers

Table 918: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Product

Table 919: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{244} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_244}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \text{vol}\,(\text{nucleus})\,, \\ [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}])$$

(1290)

$$\text{function\_244}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \\ \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

(1291)

*Produced by* SBML2LATEX

$$
\begin{aligned}
\text{function\_244}\,(&[\text{PP2A}],\text{vol}\,(\text{cytoplasm})\,,\text{kdephos},\\
&\text{vol}\,(\text{nucleus})\,,[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}])\\
=\;&\frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}]\cdot\text{vol}\,(\text{nucleus})\cdot[\text{PP2A}]\cdot\text{vol}\,(\text{cytoplasm})\cdot\text{kdephos}}{\text{vol}\,(\text{nucleus})}
\end{aligned}
$$

$$(1292)$$

Table 920: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.245 Reaction R284

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd0_Pe1-_pUb1 by PP2A

### Reaction equation

$$
\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}\xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}}\text{dnabound\_Foxo1\_Pa1\_Pd}
$$

$$(1293)$$
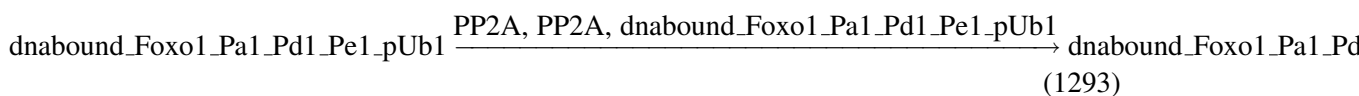
### Reactant

Table 921: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Modifiers

Table 922: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Product

Table 923: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{245} = \text{vol}(\text{dnabound}) \cdot \text{function\_245}([\text{PP2A}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{kdephos}) \quad (1294)$$

function_245 ([PP2A], vol (cytoplasm), vol (dnabound),
[dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1], kdephos)
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

$$(1295)$$

function_245 ([PP2A], vol (cytoplasm), vol (dnabound),
[dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1], kdephos)
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

$$(1296)$$

Table 924: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.246 Reaction R285

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd0_Pe1-_pUb0 by JNK_P

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0}$$

$$(1297)$$
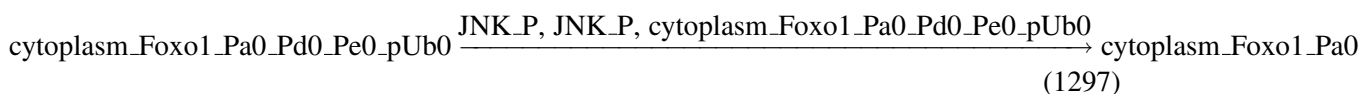
### Reactant

Table 925: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Modifiers

Table 926: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

Table 927: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{246} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_246}\left([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right),\right. \\ \left. [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}\right) \tag{1298}$$

$$\text{function\_246}\left([\text{JNK\_P}], \text{by\_jnk\_phos\_factor},\right. \tag{1299}\\ \left.\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}\right) \\ = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{JNK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{cytoplasm}\right)}$$

$$\text{function\_246}\left([\text{JNK\_P}], \text{by\_jnk\_phos\_factor},\right. \tag{1300}\\ \left.\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}\right) \\ = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{JNK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{cytoplasm}\right)}$$

Table 928: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.247 Reaction R286

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 by JNK_P

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe}$$

$$(1301)$$
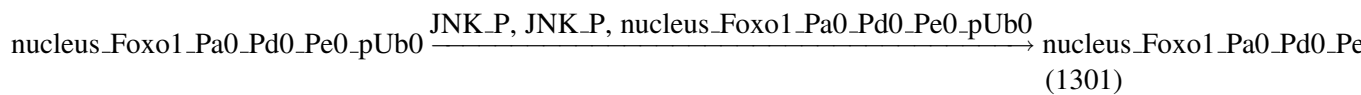
### Reactant

Table 929: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Modifiers

Table 930: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

Table 931: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{247} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_247}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm})\,, \quad (1302)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}])$$

function\_247 ([JNK\_P], by\_jnk\_phos\_factor, vol (cytoplasm) , $\qquad (1303)$
kkin, vol (nucleus) , [nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0])
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

function\_247 ([JNK\_P], by\_jnk\_phos\_factor, vol (cytoplasm) , $\qquad (1304)$
kkin, vol (nucleus) , [nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0])
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

Table 932: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.248 Reaction R287

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0 to dnabound\_Foxo1\_Pa0\_Pd0\_Pe1-\_pUb0 by JNK\_P

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_} \quad (1305)$$
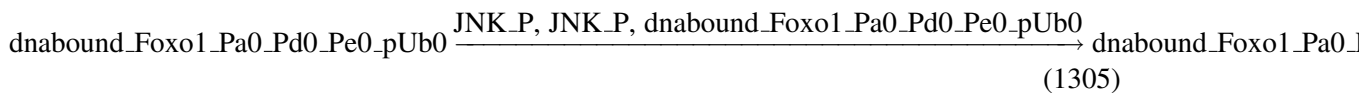
**Reactant**

Table 933: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0 | dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0 | |

### Modifiers

<p align="center">Table 934: Properties of each modifier.</p>

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

<p align="center">Table 935: Properties of each product.</p>

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{248} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_248}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}) \tag{1306}$$

$$\text{function\_248}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}) \tag{1307}$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$\text{function\_248}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kkin}) \tag{1308}$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

<p align="center">Table 936: Properties of each parameter.</p>

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.249 Reaction R288

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd0_Pe1-_pUb1 by JNK_P

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0}$$

$$(1309)$$
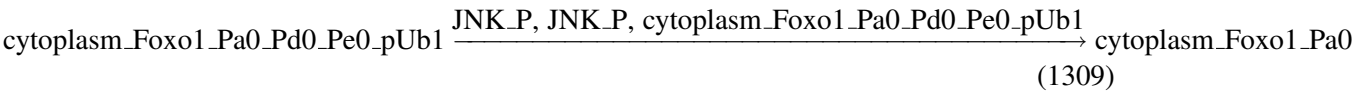
### Reactant

Table 937: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Modifiers

Table 938: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Product

Table 939: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{249} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_249}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),\\ [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin}) \quad (1310)$$

$$\text{function\_249}\left([\text{JNK\_P}], \text{by\_jnk\_phos\_factor},\right. \tag{1311}$$
$$\left.\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{JNK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{cytoplasm}\right)}$$

$$\text{function\_249}\left([\text{JNK\_P}], \text{by\_jnk\_phos\_factor},\right. \tag{1312}$$
$$\left.\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{JNK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{cytoplasm}\right)}$$

Table 940: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.250 Reaction R289

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 by JNK_P

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe} \tag{1313}$$
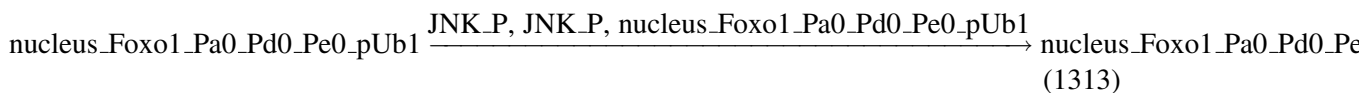
**Reactant**

Table 941: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

**Modifiers**

Table 942: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| JNK_P | JNK_P | |

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Product

Table 943: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{250} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_250}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}]) \quad (1314)$$

$$\text{function\_250}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1315)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$\text{function\_250}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1316)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

Table 944: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.251 Reaction R290

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd0_Pe1-_pUb1 by JNK_P

## Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_I} \tag{1317}$$
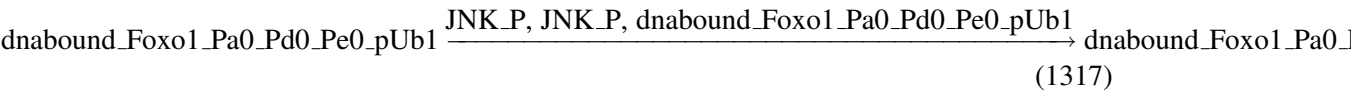
## Reactant

Table 945: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Modifiers

Table 946: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Product

Table 947: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{251} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_251}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \tag{1318}$$
$$\text{vol}\,(\text{dnabound})\,, [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin})$$

$$\text{function\_251}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm})\,, \tag{1319}$$
$$\text{vol}\,(\text{dnabound})\,, [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

*Produced by SBML2LATEX*

$$\text{function\_251}\left([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right),\right. \tag{1320}$$
$$\left.\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kkin}\right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{JNK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{dnabound}\right)}$$

Table 948: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.252 Reaction R291

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd0_Pe0-_pUb0 by PP2A

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_P}$$
$$\tag{1321}$$
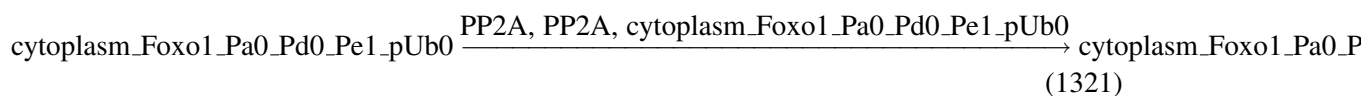
**Reactant**

Table 949: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

**Modifiers**

Table 950: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

**Product**

Table 951: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{252} = \text{vol}(\text{cytoplasm}) \cdot \text{function\_252}([\text{PP2A}], \text{vol}(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kdephos}) \quad (1322)$$

$$\text{function\_252}([\text{PP2A}], \text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \quad (1323)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

$$\text{function\_252}([\text{PP2A}], \text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \quad (1324)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{cytoplasm})}$$

Table 952: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.253 Reaction R292

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 by PP2A

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0.}$$
$$(1325)$$
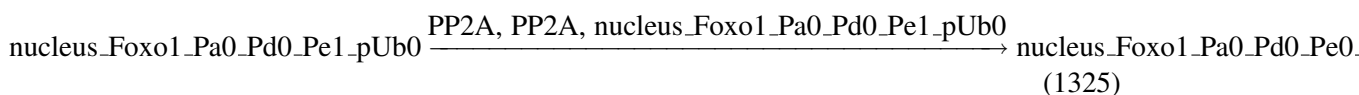
### Reactant

Table 953: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Modifiers

Table 954: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Product

Table 955: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{253} = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{function\_253}\,([\mathrm{PP2A}], \mathrm{vol}\,(\mathrm{cytoplasm})\,, \mathrm{kdephos}, \mathrm{vol}\,(\mathrm{nucleus})\,, \tag{1326}$$
$$[\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}])$$

$$\mathrm{function\_253}\,([\mathrm{PP2A}], \mathrm{vol}\,(\mathrm{cytoplasm})\,, \mathrm{kdephos},$$
$$\mathrm{vol}\,(\mathrm{nucleus})\,, [\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}])$$
$$= \frac{[\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \mathrm{vol}\,(\mathrm{nucleus}) \cdot [\mathrm{PP2A}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kdephos}}{\mathrm{vol}\,(\mathrm{nucleus})} \tag{1327}$$

$$\mathrm{function\_253}\,([\mathrm{PP2A}], \mathrm{vol}\,(\mathrm{cytoplasm})\,, \mathrm{kdephos},$$
$$\mathrm{vol}\,(\mathrm{nucleus})\,, [\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}])$$
$$= \frac{[\mathrm{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \mathrm{vol}\,(\mathrm{nucleus}) \cdot [\mathrm{PP2A}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kdephos}}{\mathrm{vol}\,(\mathrm{nucleus})} \tag{1328}$$

Table 956: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.254 Reaction R293

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd0_Pe0-_pUb0 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd}$$

$$(1329)$$
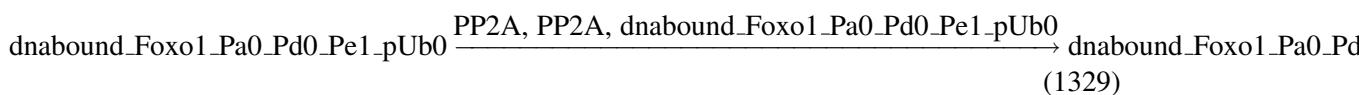
### Reactant

Table 957: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Modifiers

Table 958: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Product

Table 959: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{254} = \text{vol} \, (\text{dnabound}) \cdot \text{function\_254} \, ([\text{PP2A}], \text{vol} \, (\text{cytoplasm}), \text{vol} \, (\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kdephos}) \quad (1330)$$

function\_254 $([\text{PP2A}], \text{vol} \, (\text{cytoplasm}), \text{vol} \, (\text{dnabound}),$
$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kdephos})$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol} \, (\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol} \, (\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol} \, (\text{dnabound})}$$
$$(1331)$$

function\_254 $([\text{PP2A}], \text{vol} \, (\text{cytoplasm}), \text{vol} \, (\text{dnabound}),$
$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kdephos})$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol} \, (\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol} \, (\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol} \, (\text{dnabound})}$$
$$(1332)$$

Table 960: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.255 Reaction R294

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1 to cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0-\_pUb1 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0\_P}$$
$$(1333)$$
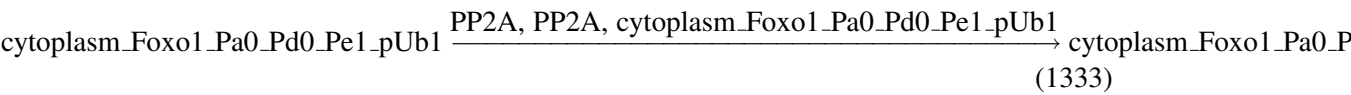
### Reactant

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Modifiers

Table 962: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Product

Table 963: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{255} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_255}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \\ [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kdephos}) \tag{1334}$$

$$\text{function\_255}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \tag{1335}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_255}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \tag{1336}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 964: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.256 Reaction R295

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 by PP2A

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_}$$

(1337)
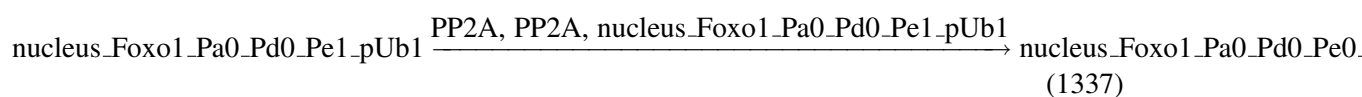
### Reactant

Table 965: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Modifiers

Table 966: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Product

Table 967: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{256} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_256}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \text{vol}\,(\text{nucleus})\,, \tag{1338}$$
$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}])$$

$$\begin{aligned}
&\text{function\_256}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \\
&\quad \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]) \\
&\quad = \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}
\end{aligned}$$
$$\tag{1339}$$

$$\begin{aligned}
&\text{function\_256}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \\
&\quad \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}]) \\
&\quad = \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}
\end{aligned}$$
$$\tag{1340}$$

Table 968: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.257 Reaction R296

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd0_Pe0-_pUb1 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_Pd}$$
$$\tag{1341}$$
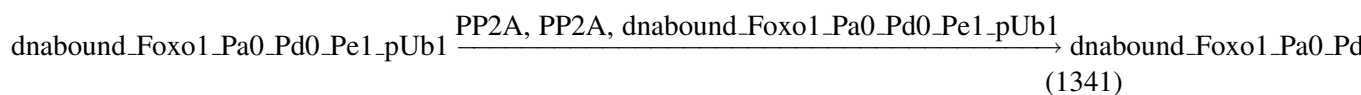
### Reactant

Table 969: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Modifiers

Table 970: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Product

Table 971: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{257} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_257}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \quad (1342)$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kdephos})$$

$$\text{function\_257}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kdephos})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$
$$(1343)$$

$$\text{function\_257}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kdephos})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$
$$(1344)$$

Table 972: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.258 Reaction R297

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd1_Pe1-_pUb0 by JNK_P

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0}$$

$$(1345)$$
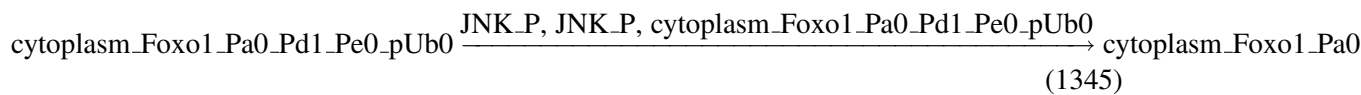
### Reactant

Table 973: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Modifiers

Table 974: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Product

Table 975: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{258} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_258}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm})\,, \quad (1346)$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin})$$

$$\text{function\_258}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \quad\quad\quad\quad\quad\quad\quad\quad (1347)$$
$$\text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_258}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \quad\quad\quad\quad\quad\quad\quad\quad (1348)$$
$$\text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

Table 976: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.259 Reaction R298

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 by JNK_P

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe}$$
$$(1349)$$
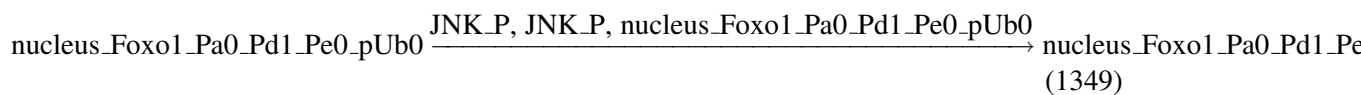
**Reactant**

Table 977: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Modifiers

Table 978: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Product

Table 979: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{259} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_259}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1350)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}])$$

$$\text{function\_259}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1351)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$\text{function\_259}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1352)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

Table 980: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

### 8.260 Reaction R299

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd1_Pe1-_pUb0 by JNK_P

#### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_I}$$

$$(1353)$$
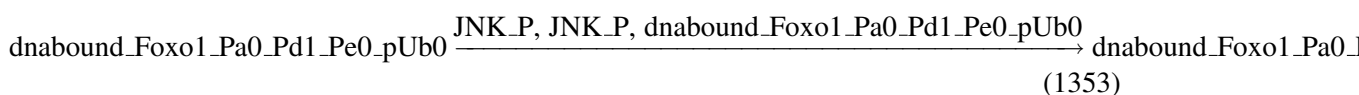
#### Reactant

Table 981: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

#### Modifiers

Table 982: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

#### Product

Table 983: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_{260} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_260}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$\text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kkin}) \quad (1354)$$

$$
\text{function\_260}\left(\left[\text{JNK\_P}\right], \text{by\_jnk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right),\right. \tag{1355}
$$
$$
\left.\text{vol}\left(\text{dnabound}\right), \left[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}\right], \text{kkin}\right)
$$
$$
= \frac{\left[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}\right] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \left[\text{JNK\_P}\right] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{dnabound}\right)}
$$

$$
\text{function\_260}\left(\left[\text{JNK\_P}\right], \text{by\_jnk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right),\right. \tag{1356}
$$
$$
\left.\text{vol}\left(\text{dnabound}\right), \left[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}\right], \text{kkin}\right)
$$
$$
= \frac{\left[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}\right] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \left[\text{JNK\_P}\right] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{dnabound}\right)}
$$

Table 984: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.261 Reaction R300

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 to cytoplasm_Foxo1_Pa0_Pd1_Pe1-_pUb1 by JNK_P

### Reaction equation

$$
\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0} \tag{1357}
$$
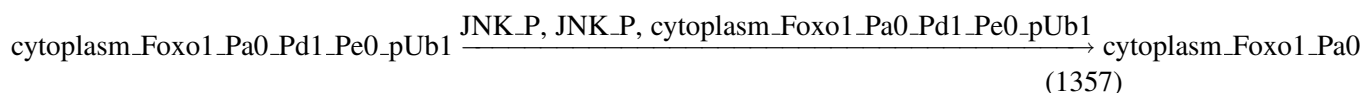
### Reactant

Table 985: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Modifiers

Table 986: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| JNK_P | JNK_P | |

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Product

Table 987: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{261} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_261}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1358)$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin})$$

$$\text{function\_261}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \quad (1359)$$
$$\text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_261}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \quad (1360)$$
$$\text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

Table 988: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

### 8.262 Reaction R301

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 by JNK_P

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe}$$

$$(1361)$$
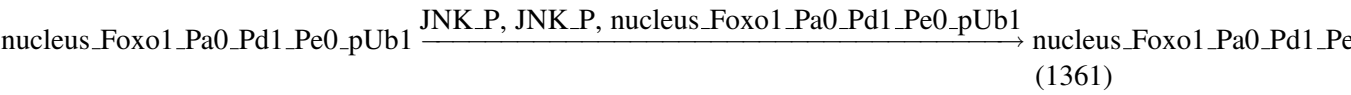
### Reactant

Table 989: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Modifiers

Table 990: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Product

Table 991: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{262} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_262}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}]) \tag{1362}$$

$$\text{function\_262}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \tag{1363}$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$\text{function\_262}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$ $$\hspace{11cm}(1364)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

Table 992: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.263 Reaction R302

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 to dnabound_Foxo1_Pa0_Pd1_Pe1-_pUb1 by JNK_P

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa0\_l}$$
$$\hspace{13cm}(1365)$$
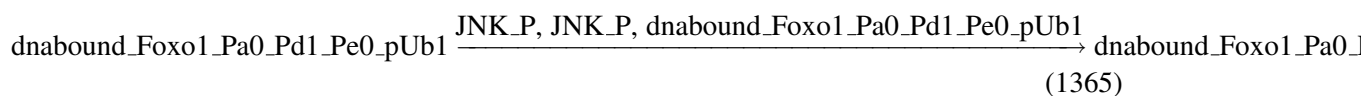
**Reactant**

Table 993: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

**Modifiers**

Table 994: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

**Product**

Table 995: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{263} = \text{vol}(\text{dnabound}) \cdot \text{function\_263}([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}(\text{cytoplasm}),$$
$$\text{vol}(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin}) \quad (1366)$$

$$\text{function\_263}([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}(\text{cytoplasm}), \quad (1367)$$
$$\text{vol}(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{dnabound})}$$

$$\text{function\_263}([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}(\text{cytoplasm}), \quad (1368)$$
$$\text{vol}(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{dnabound})}$$

Table 996: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.264 Reaction R303

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd1_Pe0-_pUb0 by PP2A

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_P} \quad (1369)$$

**Reactant**

*Produced by SBML2LATEX*
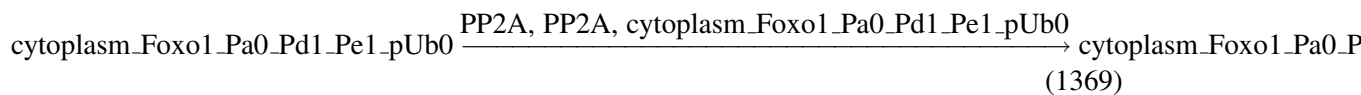
Table 997: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Modifiers

Table 998: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Product

Table 999: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{264} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_264}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kdephos}) \tag{1370}$$

$$\text{function\_264}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \tag{1371}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_264}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \tag{1372}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 1000: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.265 Reaction R304

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0
by PP2A

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_}$$

$$(1373)$$
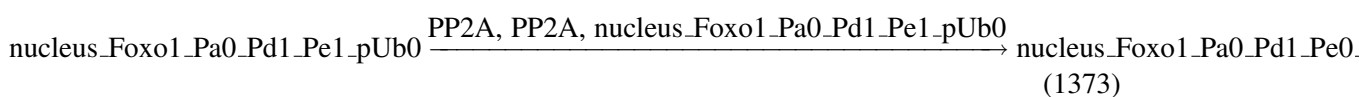
### Reactant

Table 1001: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Modifiers

Table 1002: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Product

Table 1003: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{265} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_265}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos}, \text{vol}\,(\text{nucleus}), \quad (1374)$$
$$[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}])$$

function\_265 ([PP2A], vol (cytoplasm), kdephos,
  vol (nucleus), [nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0])

$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

$$(1375)$$

function\_265 ([PP2A], vol (cytoplasm), kdephos,
  vol (nucleus), [nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0])

$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$

$$(1376)$$

Table 1004: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.266 Reaction R305

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0 to dnabound\_Foxo1\_Pa0\_Pd1\_Pe0-
\_pUb0 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd}$$

$$(1377)$$
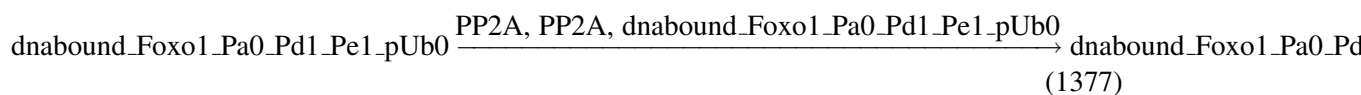
### Reactant

Table 1005: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Modifiers

Table 1006: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Product

Table 1007: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{266} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_266}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \quad (1378)$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kdephos})$$

$\text{function\_266}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$
$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kdephos})$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

$$(1379)$$

$\text{function\_266}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$
$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kdephos})$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

$$(1380)$$

Table 1008: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.267 Reaction R306

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa0_Pd1_Pe0-_pUb1 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa0\_P}$$

$$(1381)$$

### Reactant

Table 1009: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Modifiers

Table 1010: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Product

Table 1011: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

**Kinetic Law**

**Derived unit**  contains undeclared units

$$v_{267} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_267}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kdephos}) \qquad (1382)$$

$$\text{function\_267}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \qquad (1383)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_267}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \qquad (1384)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 1012: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.268 Reaction R307

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 by PP2A

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_}$$
$$(1385)$$
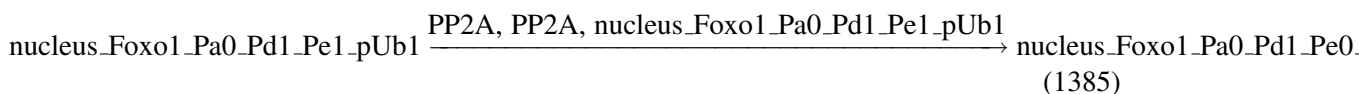
**Reactant**

Table 1013: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

## Modifiers

Table 1014: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

## Product

Table 1015: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{268} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_268}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \text{vol}\,(\text{nucleus})\,, \\ [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}]) \tag{1386}$$

$$\text{function\_268}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \\ \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})} \tag{1387}$$

$$\text{function\_268}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{kdephos}, \\ \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})} \tag{1388}$$

Table 1016: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.269 Reaction R308

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa0_Pd1_Pe0- _pUb1 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pd}$$

(1389)
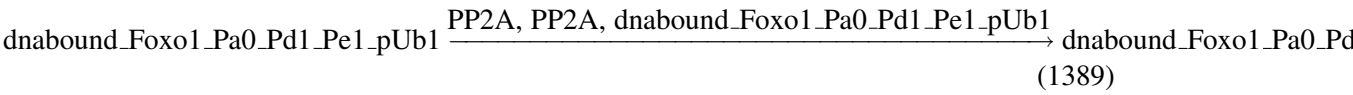
### Reactant

Table 1017: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Modifiers

Table 1018: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Product

Table 1019: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{269} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_269}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kdephos})$$

(1390)

$$\text{function\_269}\left([\text{PP2A}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kdephos}\right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{PP2A}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kdephos}}{\text{vol}\left(\text{dnabound}\right)}$$

$$(1391)$$

$$\text{function\_269}\left([\text{PP2A}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right),$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kdephos}\right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{PP2A}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kdephos}}{\text{vol}\left(\text{dnabound}\right)}$$

$$(1392)$$

Table 1020: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.270 Reaction R309

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe1-_pUb0 by JNK_P

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1}$$

$$(1393)$$
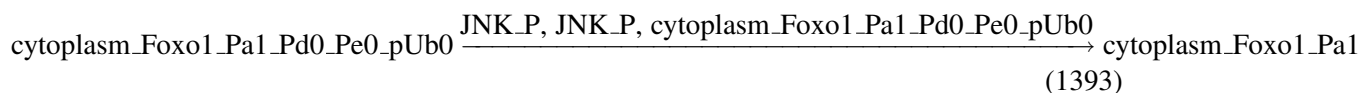
### Reactant

Table 1021: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Modifiers

Table 1022: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

**Product**

Table 1023: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

**Kinetic Law**

**Derived unit**  contains undeclared units

$$v_{270} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_270}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),\qquad (1394)$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kkin})$$

$$\text{function\_270}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \qquad\qquad (1395)$$
$$\text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_270}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \qquad\qquad (1396)$$
$$\text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})}$$

Table 1024: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.271 Reaction R310

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 by JNK_P

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe}$$

(1397)
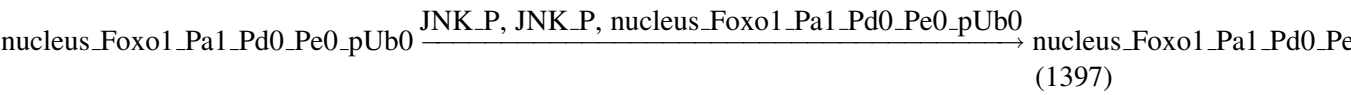
## Reactant

Table 1025: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

## Modifiers

Table 1026: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

## Product

Table 1027: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{271} = \text{vol}\left(\text{nucleus}\right) \cdot \text{function\_271}\left([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right),\right.$$
$$\left.\text{kkin}, \text{vol}\left(\text{nucleus}\right), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}]\right)$$

(1398)

$$\text{function\_271}\left([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right),\right.$$

(1399)

$$\text{kkin}, \text{vol}\left(\text{nucleus}\right), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{nucleus}\right) \cdot [\text{JNK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{nucleus}\right)}$$

$$\text{function\_271} \left( [\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol} \left( \text{cytoplasm} \right), \right. \qquad\qquad (1400)$$
$$\left. \text{kkin}, \text{vol} \left( \text{nucleus} \right), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \right)$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol} \left( \text{nucleus} \right) \cdot [\text{JNK\_P}] \cdot \text{vol} \left( \text{cytoplasm} \right) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol} \left( \text{nucleus} \right)}$$

Table 1028: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.272 Reaction R311

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe1-_pUb0 by JNK_P

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_}$$
$$(1401)$$
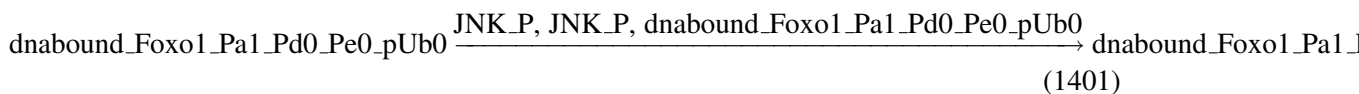
### Reactant

Table 1029: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Modifiers

Table 1030: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Product

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| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{272} = \text{vol}(\text{dnabound}) \cdot \text{function\_272}([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}(\text{cytoplasm}), \quad (1402)$$
$$\text{vol}(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kkin})$$

$$\text{function\_272}([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}(\text{cytoplasm}), \quad (1403)$$
$$\text{vol}(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{dnabound})}$$

$$\text{function\_272}([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}(\text{cytoplasm}), \quad (1404)$$
$$\text{vol}(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{dnabound})}$$

Table 1032: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

### 8.273 Reaction R312

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd0_Pe1-_pUb1 by JNK_P

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1}$$

$$(1405)$$
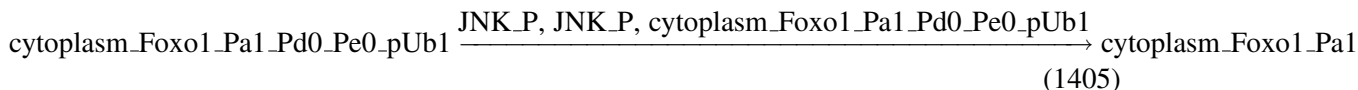
### Reactant

## Table 1033: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Modifiers

## Table 1034: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Product

## Table 1035: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{273} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_273}\left([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\left(\text{cytoplasm}\right), \atop [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kkin}\right) \quad (1406)$$

$$\text{function\_273}\left([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \qquad\qquad\qquad\qquad (1407) \atop \text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kkin}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{JNK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{cytoplasm}\right)}$$

$$\text{function\_273}\left([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \qquad\qquad\qquad\qquad (1408) \atop \text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kkin}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [\text{JNK\_P}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\left(\text{cytoplasm}\right)}$$

Table 1036: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.274 Reaction R313

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 by JNK_P

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe}$$

(1409)

### Reactant

Table 1037: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Modifiers

Table 1038: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Product

Table 1039: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{274} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_274}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1410)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}])$$

$$\text{function\_274}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1411)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$\text{function\_274}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \quad (1412)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

Table 1040: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.275 Reaction R314

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd0_Pe1-_pUb1 by JNK_P

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_} \quad (1413)$$
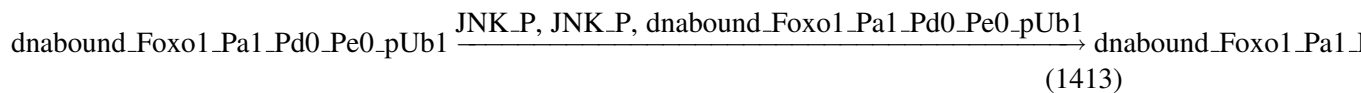
**Reactant**

Table 1041: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Modifiers

Table 1042: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Product

Table 1043: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{275} = \mathrm{vol}\,(\mathrm{dnabound}) \cdot \mathrm{function\_275}\,([\mathrm{JNK\_P}], \mathrm{by\_jnk\_phos\_factor}, \mathrm{vol}\,(\mathrm{cytoplasm}),$$
$$\mathrm{vol}\,(\mathrm{dnabound}), [\mathrm{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \mathrm{kkin}) \quad (1414)$$

$$\mathrm{function\_275}\,([\mathrm{JNK\_P}], \mathrm{by\_jnk\_phos\_factor}, \mathrm{vol}\,(\mathrm{cytoplasm}), \quad (1415)$$
$$\mathrm{vol}\,(\mathrm{dnabound}), [\mathrm{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \mathrm{kkin})$$
$$= \frac{[\mathrm{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \mathrm{vol}\,(\mathrm{dnabound}) \cdot [\mathrm{JNK\_P}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{by\_jnk\_phos\_factor} \cdot \mathrm{kkin}}{\mathrm{vol}\,(\mathrm{dnabound})}$$

$$\mathrm{function\_275}\,([\mathrm{JNK\_P}], \mathrm{by\_jnk\_phos\_factor}, \mathrm{vol}\,(\mathrm{cytoplasm}), \quad (1416)$$
$$\mathrm{vol}\,(\mathrm{dnabound}), [\mathrm{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \mathrm{kkin})$$
$$= \frac{[\mathrm{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \mathrm{vol}\,(\mathrm{dnabound}) \cdot [\mathrm{JNK\_P}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{by\_jnk\_phos\_factor} \cdot \mathrm{kkin}}{\mathrm{vol}\,(\mathrm{dnabound})}$$

Table 1044: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.276 Reaction R315

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe0- _pUb0 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_P}$$

(1417)
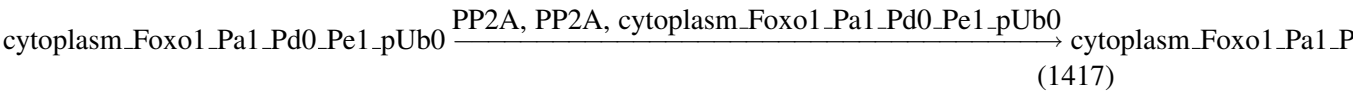
### Reactant

Table 1045: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Modifiers

Table 1046: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Product

Table 1047: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{276} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_276}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kdephos})$$

(1418)

$$\text{function\_276} \left( [\text{PP2A}], \text{vol} \left( \text{cytoplasm} \right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \right. \tag{1419}$$

$$\left. \text{kdephos} \right) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol} \left( \text{cytoplasm} \right) \cdot [\text{PP2A}] \cdot \text{vol} \left( \text{cytoplasm} \right) \cdot \text{kdephos}}{\text{vol} \left( \text{cytoplasm} \right)}$$

$$\text{function\_276} \left( [\text{PP2A}], \text{vol} \left( \text{cytoplasm} \right), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \right. \tag{1420}$$

$$\left. \text{kdephos} \right) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol} \left( \text{cytoplasm} \right) \cdot [\text{PP2A}] \cdot \text{vol} \left( \text{cytoplasm} \right) \cdot \text{kdephos}}{\text{vol} \left( \text{cytoplasm} \right)}$$

Table 1048: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.277 Reaction R316

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 by PP2A

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_} \tag{1421}$$
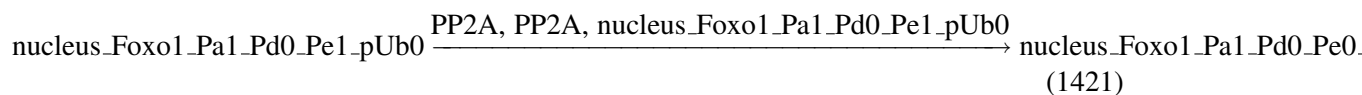
### Reactant

Table 1049: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Modifiers

Table 1050: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

**Product**

Table 1051: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{277} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_277}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos}, \text{vol}\,(\text{nucleus}),$$
$$[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}]) \quad (1422)$$

$$\text{function\_277}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$
$$(1423)$$

$$\text{function\_277}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos},$$
$$\text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}$$
$$(1424)$$

Table 1052: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.278 Reaction R317

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe0-_pUb0 by PP2A

*Produced by SBML2LATEX*

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd}$$

$$(1425)$$
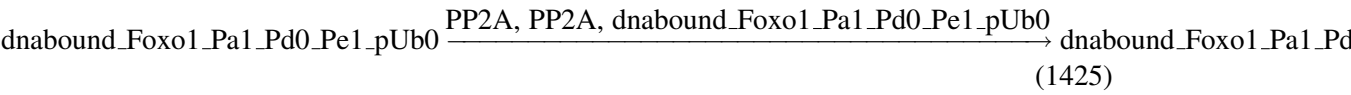
### Reactant

Table 1053: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Modifiers

Table 1054: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Product

Table 1055: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{278} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_278}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), \atop [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kdephos}) \quad (1426)$$

$$\text{function\_278}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kdephos})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$

$$(1427)$$

$$\text{function\_278}\left([\text{PP2A}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right),$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kdephos}\right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot [\text{PP2A}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kdephos}}{\text{vol}\left(\text{dnabound}\right)}$$

$$\tag{1428}$$

Table 1056: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.279 Reaction R318

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd0_Pe0-_pUb1 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1\_P}$$

$$\tag{1429}$$
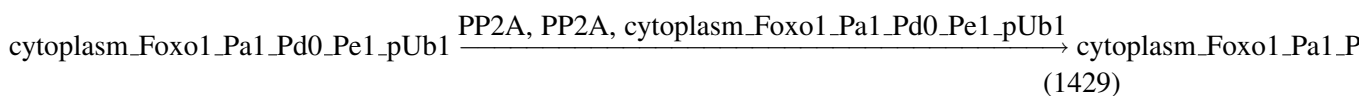
### Reactant

Table 1057: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Modifiers

Table 1058: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Product

Table 1059: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

**Kinetic Law**

**Derived unit**  contains undeclared units

$$v_{279} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_279}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \\ [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{kdephos}) \qquad (1430)$$

$$\text{function\_279}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \qquad (1431) \\ \text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_279}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \qquad (1432) \\ \text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 1060: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.280  Reaction R319

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 by PP2A

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_} \\ (1433)$$
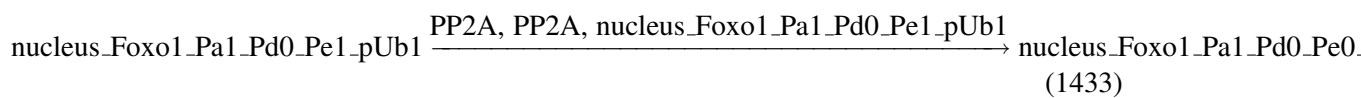
**Reactant**

Table 1061: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Modifiers

Table 1062: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Product

Table 1063: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$
v_{280} = \mathrm{vol\,(nucleus)} \cdot \mathrm{function\_280}\,([\mathrm{PP2A}], \mathrm{vol\,(cytoplasm)}, \mathrm{kdephos}, \mathrm{vol\,(nucleus)}, \tag{1434}
$$
$$
[\mathrm{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}])
$$

$$
\mathrm{function\_280}\,([\mathrm{PP2A}], \mathrm{vol\,(cytoplasm)}, \mathrm{kdephos},
$$
$$
\mathrm{vol\,(nucleus)}, [\mathrm{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}])
$$
$$
= \frac{[\mathrm{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \mathrm{vol\,(nucleus)} \cdot [\mathrm{PP2A}] \cdot \mathrm{vol\,(cytoplasm)} \cdot \mathrm{kdephos}}{\mathrm{vol\,(nucleus)}} \tag{1435}
$$

$$
\mathrm{function\_280}\,([\mathrm{PP2A}], \mathrm{vol\,(cytoplasm)}, \mathrm{kdephos},
$$
$$
\mathrm{vol\,(nucleus)}, [\mathrm{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}])
$$
$$
= \frac{[\mathrm{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \mathrm{vol\,(nucleus)} \cdot [\mathrm{PP2A}] \cdot \mathrm{vol\,(cytoplasm)} \cdot \mathrm{kdephos}}{\mathrm{vol\,(nucleus)}} \tag{1436}
$$

*Produced by SBML2LATEX*

Table 1064: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.281 Reaction R320

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd0_Pe0-_pUb1 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_Pd}$$

(1437)
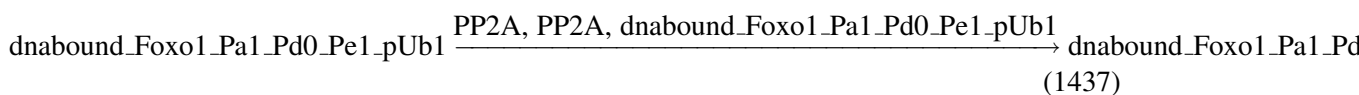
### Reactant

Table 1065: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Modifiers

Table 1066: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Product

Table 1067: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{281} = \text{vol}(\text{dnabound}) \cdot \text{function\_281}([\text{PP2A}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}), \quad (1438)$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{kdephos})$$

$\text{function\_281}([\text{PP2A}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}),$
$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{kdephos})$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

$$(1439)$$

$\text{function\_281}([\text{PP2A}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}),$
$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{kdephos})$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}(\text{dnabound})}$$

$$(1440)$$

Table 1068: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.282 Reaction R321

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe1-_pUb0 by JNK_P

## Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1}$$

$$(1441)$$
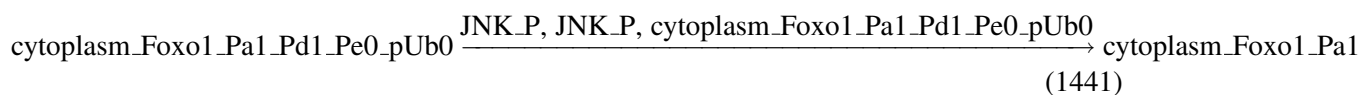
## Reactant

Table 1069: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

## Modifiers

Table 1070: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

## Product

Table 1071: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$
v_{282} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_282}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \\
[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{kkin}) \quad (1442)
$$

$$
\text{function\_282}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \\
\text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{kkin}) \\
= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \quad (1443)
$$

$$
\text{function\_282}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \\
\text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{kkin}) \\
= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{cytoplasm})} \quad (1444)
$$

Table 1072: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.283 Reaction R322

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 by JNK_P

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe}$$
$$(1445)$$
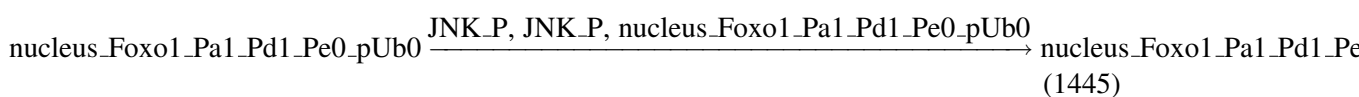
### Reactant

Table 1073: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Modifiers

Table 1074: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

Table 1075: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{283} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_283}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm})\,,\quad (1446)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}])$$

$$\text{function\_283}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm})\,,\qquad\qquad (1447)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$\text{function\_283}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm})\,,\qquad\qquad (1448)$$
$$\text{kkin}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

Table 1076: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.284 Reaction R323

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe1-_pUb0 by JNK_P

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_\_}$$
$$(1449)$$
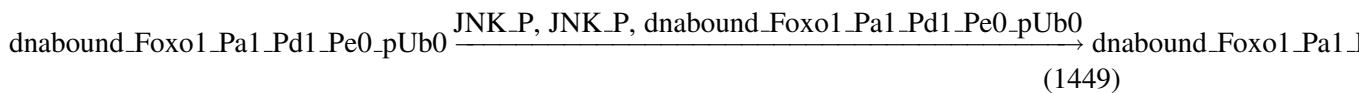
**Reactant**

Table 1077: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Modifiers

Table 1078: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

Table 1079: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{284} = \mathrm{vol}\,(\mathrm{dnabound}) \cdot \mathrm{function\_284}\,([\mathrm{JNK\_P}], \mathrm{by\_jnk\_phos\_factor}, \mathrm{vol}\,(\mathrm{cytoplasm}),$$
$$\mathrm{vol}\,(\mathrm{dnabound}), [\mathrm{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \mathrm{kkin}) \qquad (1450)$$

$$\mathrm{function\_284}\,([\mathrm{JNK\_P}], \mathrm{by\_jnk\_phos\_factor}, \mathrm{vol}\,(\mathrm{cytoplasm}), \qquad (1451)$$
$$\mathrm{vol}\,(\mathrm{dnabound}), [\mathrm{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \mathrm{kkin})$$
$$= \frac{[\mathrm{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \mathrm{vol}\,(\mathrm{dnabound}) \cdot [\mathrm{JNK\_P}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{by\_jnk\_phos\_factor} \cdot \mathrm{kkin}}{\mathrm{vol}\,(\mathrm{dnabound})}$$

$$\mathrm{function\_284}\,([\mathrm{JNK\_P}], \mathrm{by\_jnk\_phos\_factor}, \mathrm{vol}\,(\mathrm{cytoplasm}), \qquad (1452)$$
$$\mathrm{vol}\,(\mathrm{dnabound}), [\mathrm{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \mathrm{kkin})$$
$$= \frac{[\mathrm{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \mathrm{vol}\,(\mathrm{dnabound}) \cdot [\mathrm{JNK\_P}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{by\_jnk\_phos\_factor} \cdot \mathrm{kkin}}{\mathrm{vol}\,(\mathrm{dnabound})}$$

Table 1080: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.285 Reaction R324

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 to cytoplasm_Foxo1_Pa1_Pd1_Pe1-_pUb1 by JNK_P

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{JNK\_P, JNK\_P, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1}$$

$$(1453)$$
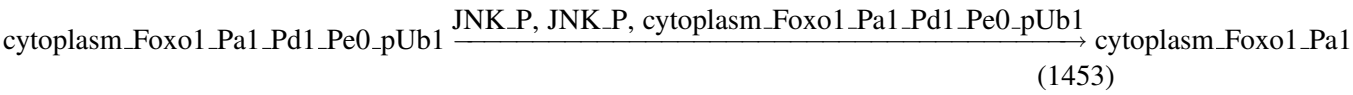
### Reactant

Table 1081: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Modifiers

Table 1082: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Product

Table 1083: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{285} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_285}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kkin}) \quad (1454)$$

$$\text{function\_285}\left([\text{JNK\_P}], \text{by\_jnk\_phos\_factor},\right. \tag{1455}$$
$$\text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})}$$

$$\text{function\_285}\left([\text{JNK\_P}], \text{by\_jnk\_phos\_factor},\right. \tag{1456}$$
$$\text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{JNK\_P}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}(\text{cytoplasm})}$$

Table 1084: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.286 Reaction R325

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 by JNK_P

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{JNK\_P, JNK\_P, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe} \tag{1457}$$
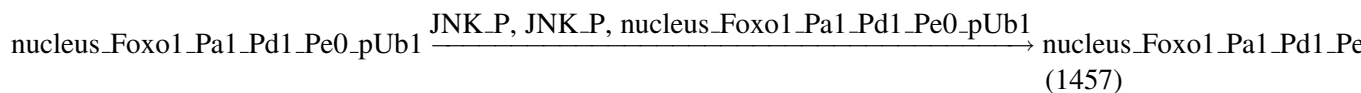
**Reactant**

Table 1085: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

**Modifiers**

Table 1086: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| JNK_P | JNK_P | |

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Product

Table 1087: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{286} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_286}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}]) \tag{1458}$$

$$\text{function\_286}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \tag{1459}$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

$$\text{function\_286}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}), \tag{1460}$$
$$\text{kkin}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{nucleus})}$$

Table 1088: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.287 Reaction R326

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe1-_pUb1 by JNK_P

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{JNK\_P, JNK\_P, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_}$$

(1461)
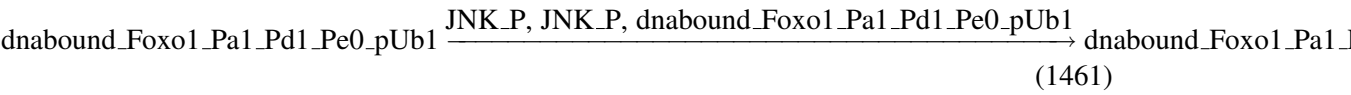
### Reactant

Table 1089: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Modifiers

Table 1090: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| JNK_P | JNK_P | |
| JNK_P | JNK_P | |
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Product

Table 1091: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{287} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_287}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$
$$\text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kkin})$$

(1462)

$$\text{function\_287}\,([\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol}\,(\text{cytoplasm}),$$

(1463)

$$\text{vol}\,(\text{dnabound}), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kkin})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{JNK\_P}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol}\,(\text{dnabound})}$$

$$\text{function\_287} \left( [\text{JNK\_P}], \text{by\_jnk\_phos\_factor}, \text{vol} \left( \text{cytoplasm} \right), \right. \tag{1464}$$
$$\left. \text{vol} \left( \text{dnabound} \right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kkin} \right)$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol} \left( \text{dnabound} \right) \cdot [\text{JNK\_P}] \cdot \text{vol} \left( \text{cytoplasm} \right) \cdot \text{by\_jnk\_phos\_factor} \cdot \text{kkin}}{\text{vol} \left( \text{dnabound} \right)}$$

Table 1092: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kkin | kkin | | $5 \cdot 10^{-5}$ | | ☑ |

## 8.288 Reaction R327

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe0-_pUb0 by PP2A

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_P} \tag{1465}$$

**Reactant**

Table 1093: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

**Modifiers**

Table 1094: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

**Product**

Table 1095: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{288} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_288}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kdephos}) \tag{1466}$$

$$\text{function\_288}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \tag{1467}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_288}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \tag{1468}$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 1096: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.289 Reaction R328

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 by PP2A

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0.} \tag{1469}$$
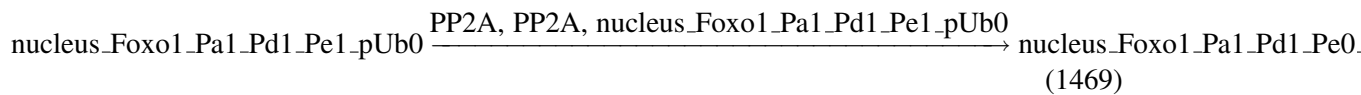
**Reactant**

## Table 1097: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Modifiers

## Table 1098: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Product

## Table 1099: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{289} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_289}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos}, \text{vol}\,(\text{nucleus}), \\ [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}]) \tag{1470}$$

$$\text{function\_289}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos}, \\ \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})} \tag{1471}$$

$$\text{function\_289}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos}, \\ \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})} \tag{1472}$$

Table 1100: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.290 Reaction R329

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe0-_pUb0 by PP2A

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd}$$

$$(1473)$$
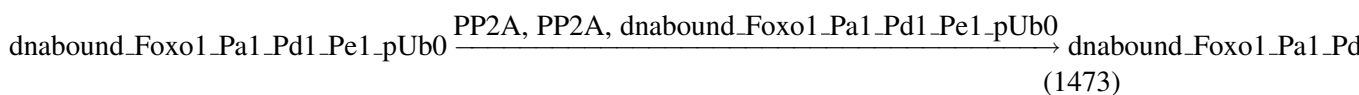
### Reactant

Table 1101: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Modifiers

Table 1102: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Product

Table 1103: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{290} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_290}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \atop [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kdephos}) \quad (1474)$$

$$\begin{aligned} &\text{function\_290}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ &[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kdephos}) \\ &= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})} \end{aligned}$$

$$(1475)$$

$$\begin{aligned} &\text{function\_290}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ &[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kdephos}) \\ &= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})} \end{aligned}$$

$$(1476)$$

Table 1104: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.291 Reaction R330

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 to cytoplasm_Foxo1_Pa1_Pd1_Pe0-_pUb1 by PP2A

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} \text{cytoplasm\_Foxo1\_Pa1\_P}$$

$$(1477)$$
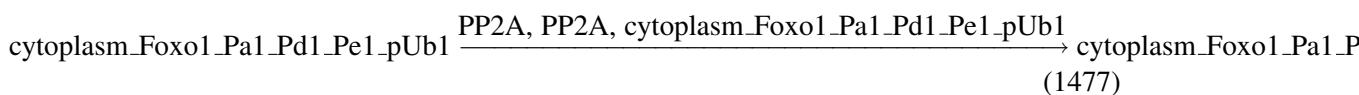
### Reactant

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Modifiers

Table 1106: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Product

Table 1107: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{291} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_291}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \quad (1478)$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{kdephos})$$

$$\text{function\_291}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \quad (1479)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_291}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \quad (1480)$$
$$\text{kdephos}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{cytoplasm})}$$

Table 1108: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.292 Reaction R331

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 by PP2A

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_}$$

$$(1481)$$
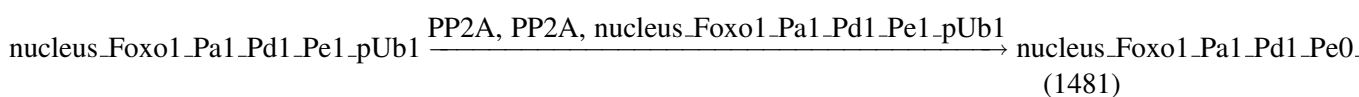
### Reactant

Table 1109: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Modifiers

Table 1110: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Product

Table 1111: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{292} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_292}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos}, \text{vol}\,(\text{nucleus}), \quad (1482)$$
$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}])$$

$$\begin{aligned}
&\text{function\_292}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos},\\
&\quad \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}])\\
&\quad = \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}
\end{aligned}$$
$$(1483)$$

$$\begin{aligned}
&\text{function\_292}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{kdephos},\\
&\quad \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}])\\
&\quad = \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{nucleus})}
\end{aligned}$$
$$(1484)$$

Table 1112: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.293 Reaction R332

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 to dnabound_Foxo1_Pa1_Pd1_Pe0-_pUb1 by PP2A

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{PP2A, PP2A, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} \text{dnabound\_Foxo1\_Pa1\_Pd} \quad (1485)$$
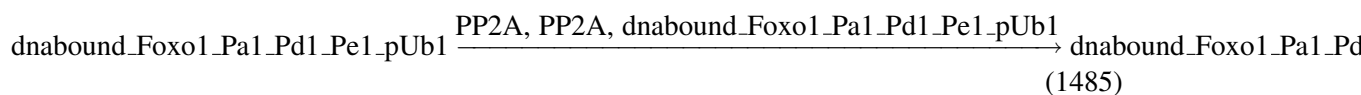
**Reactant**

## Table 1113: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Modifiers

## Table 1114: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| PP2A | PP2A | |
| PP2A | PP2A | |
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Product

## Table 1115: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{293} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_293}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), \atop [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{kdephos}) \quad (1486)$$

$$\text{function\_293}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{kdephos})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$
$$(1487)$$

$$\text{function\_293}\,([\text{PP2A}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{kdephos})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{PP2A}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdephos}}{\text{vol}\,(\text{dnabound})}$$
$$(1488)$$

Table 1116: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdephos | kdephos | | $10^{-6}$ | | ☑ |

## 8.294 Reaction R333

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd0_Pe0-_pUb1 by SCF

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_Pd0}$$

(1489)
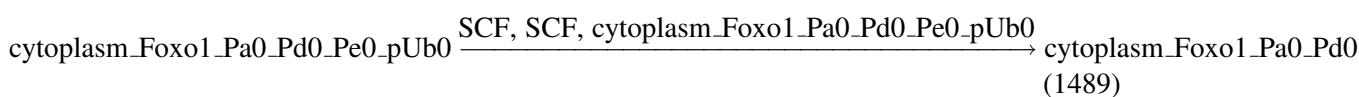
### Reactant

Table 1117: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Modifiers

Table 1118: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SCF | SCF | |
| SCF | SCF | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

Table 1119: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{294} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_294}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \\ [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kub}) \quad (1490)$$

$$\text{function\_294}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kub}) \\ = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$

$$(1491)$$

$$\text{function\_294}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kub}) \\ = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$

$$(1492)$$

Table 1120: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kub | kub | | $10^{-6}$ | | ☑ |

## 8.295 Reaction R334

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 by SCF

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pU} \quad (1493)$$
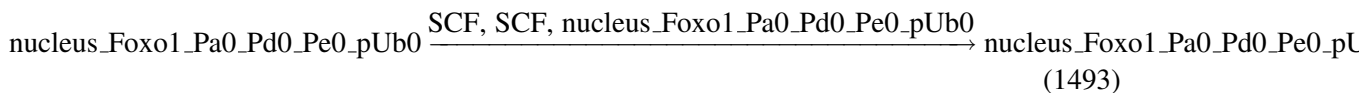
**Reactant**

Table 1121: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

## Modifiers

Table 1122: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

## Product

Table 1123: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{295} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_295}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{kub}, \text{vol}\,(\text{nucleus}), \atop [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}]) \quad (1494)$$

$$\text{function\_295}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{kub}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{nucleus})}$$
$$(1495)$$

$$\text{function\_295}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{kub}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{nucleus})}$$
$$(1496)$$

Table 1124: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kub | kub | | $10^{-6}$ | | ☑ |

## 8.296 Reaction R335

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd0_Pe0-_pUb1 by SCF

### Reaction equation

$$dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0 \xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} dnabound\_Foxo1\_Pa0\_Pd0\_...$$

$$(1497)$$
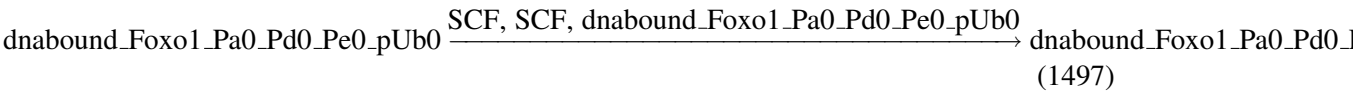
### Reactant

Table 1125: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Modifiers

Table 1126: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

### Product

Table 1127: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{296} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_296}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kub}) \quad (1498)$$

$$\begin{aligned}
\text{function\_296} &\left([\text{SCF}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}),\right. \\
&\left.[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kub}\right) \\
&= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}(\text{dnabound})}
\end{aligned}$$

(1499)

$$\begin{aligned}
\text{function\_296} &\left([\text{SCF}], \text{vol}(\text{cytoplasm}), \text{vol}(\text{dnabound}),\right. \\
&\left.[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{kub}\right) \\
&= \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}(\text{dnabound})}
\end{aligned}$$

(1500)

Table 1128: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kub | kub | | $10^{-6}$ | | ☑ |

## 8.297 Reaction R336

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd0_Pe1-_pUb1 by SCF

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_Pd0}$$

(1501)
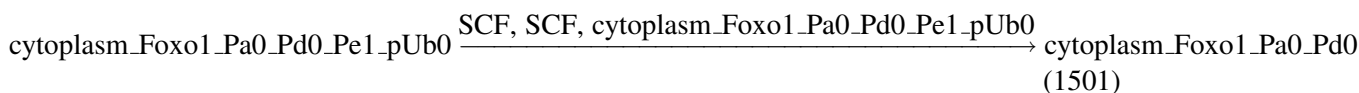
### Reactant

Table 1129: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Modifiers

Table 1130: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

**Product**

Table 1131: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{297} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_297}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kub}) \tag{1502}$$

$$\text{function\_297}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kub})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})} \tag{1503}$$

$$\text{function\_297}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kub})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})} \tag{1504}$$

Table 1132: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kub | kub | | $10^{-6}$ | | ☑ |

## 8.298 Reaction R337

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 by SCF

## Reaction equation

$$\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pU}$$

$$(1505)$$
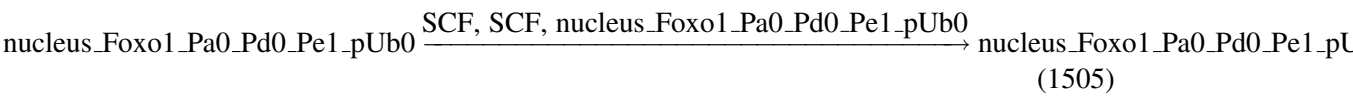
## Reactant

Table 1133: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Modifiers

Table 1134: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

## Product

Table 1135: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{298} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_298}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{kub}, \text{vol}\,(\text{nucleus})\,, \quad (1506)$$

$$[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}])$$

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$$\text{function\_298}\left([\text{SCF}], \text{vol}(\text{cytoplasm}), \text{kub}, \text{vol}(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\right)$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}(\text{nucleus})}$$

(1507)

$$\text{function\_298}\left([\text{SCF}], \text{vol}(\text{cytoplasm}), \text{kub}, \text{vol}(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}]\right)$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}(\text{nucleus})}$$

(1508)

Table 1136: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kub | kub | | $10^{-6}$ | | ☑ |

## 8.299 Reaction R338

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd0_Pe1-_pUb1 by SCF

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd0\_}$$

(1509)
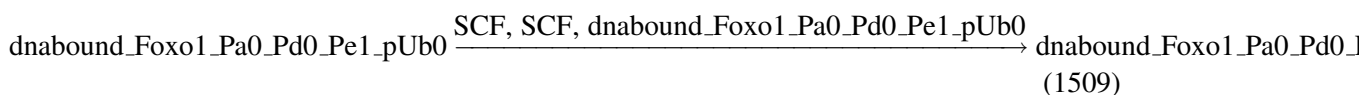
### Reactant

Table 1137: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Modifiers

Table 1138: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SCF | SCF | |
| SCF | SCF | |

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Product

Table 1139: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{299} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_299}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kub}) \tag{1510}$$

$$\text{function\_299}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kub}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})} \tag{1511}$$

$$\text{function\_299}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{kub}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})} \tag{1512}$$

Table 1140: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kub | kub | | $10^{-6}$ | | ☑ |

### 8.300 Reaction R339

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa0_Pd1_Pe0-_pUb1 by SCF

*Produced by SBML2LATEX*

## Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_Pd1}$$

$$(1513)$$
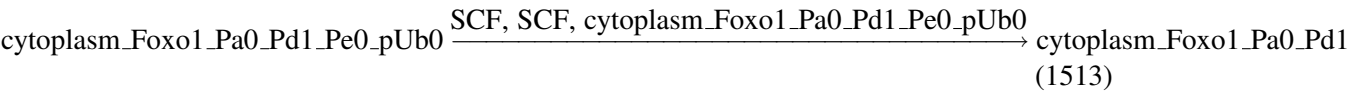
## Reactant

Table 1141: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Modifiers

Table 1142: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SCF | SCF | |
| SCF | SCF | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Product

Table 1143: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{300} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_300}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kub}) \qquad (1514)$$

$$\text{function\_300}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kub})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$

$$(1515)$$

$$\text{function\_300}\left([SCF], \text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kub}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot [SCF] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kub}}{\text{vol}\left(\text{cytoplasm}\right)}$$

$$(1516)$$

Table 1144: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kub | kub | | $2.2 \cdot 10^{-5}$ | | ☑ |

## 8.301 Reaction R340

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 by SCF

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pU}$$

$$(1517)$$
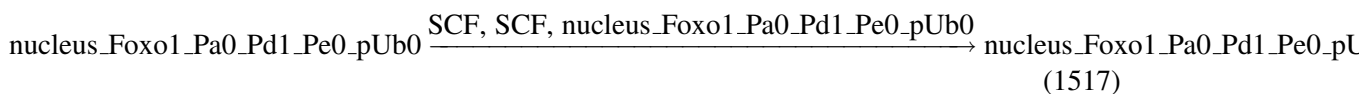
**Reactant**

Table 1145: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

**Modifiers**

Table 1146: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SCF | SCF | |
| SCF | SCF | |
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

**Product**

*Produced by* SBML2LATEX

Table 1147: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{301} = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{function\_301}\,([\mathrm{SCF}], \mathrm{vol}\,(\mathrm{cytoplasm})\,, \mathrm{kub}, \mathrm{vol}\,(\mathrm{nucleus})\,, \\ [\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]) \tag{1518}$$

$$\mathrm{function\_301}\,([\mathrm{SCF}], \mathrm{vol}\,(\mathrm{cytoplasm})\,, \mathrm{kub}, \mathrm{vol}\,(\mathrm{nucleus})\,, [\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]) \\ = \frac{[\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \mathrm{vol}\,(\mathrm{nucleus}) \cdot [\mathrm{SCF}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kub}}{\mathrm{vol}\,(\mathrm{nucleus})} \tag{1519}$$

$$\mathrm{function\_301}\,([\mathrm{SCF}], \mathrm{vol}\,(\mathrm{cytoplasm})\,, \mathrm{kub}, \mathrm{vol}\,(\mathrm{nucleus})\,, [\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}]) \\ = \frac{[\mathrm{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \mathrm{vol}\,(\mathrm{nucleus}) \cdot [\mathrm{SCF}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{kub}}{\mathrm{vol}\,(\mathrm{nucleus})} \tag{1520}$$

Table 1148: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kub | kub | | $2.2 \cdot 10^{-5}$ | | ☑ |

## 8.302 Reaction R341

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa0_Pd1_Pe0-_pUb1 by SCF

### Reaction equation

$$\mathrm{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \xrightarrow{\mathrm{SCF,\ SCF,\ dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \mathrm{dnabound\_Foxo1\_Pa0\_Pd1\_} \tag{1521}$$
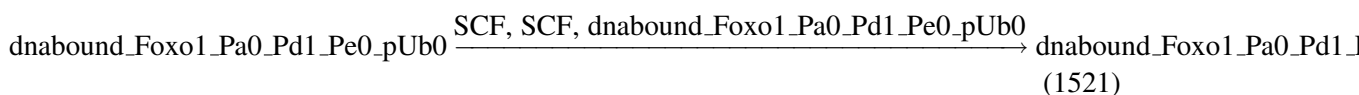
### Reactant

Table 1149: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Modifiers

Table 1150: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

## Product

Table 1151: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{302} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_302}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \atop [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kub}) \tag{1522}$$

$$\text{function\_302}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kub}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})} \tag{1523}$$

$$\text{function\_302}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \\ [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{kub}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})} \tag{1524}$$

Table 1152: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kub | kub | | $2.2 \cdot 10^{-5}$ | | ☑ |

## 8.303 Reaction R342

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa0_Pd1_Pe1-_pUb1 by SCF

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa0\_Pd1}$$

$$(1525)$$
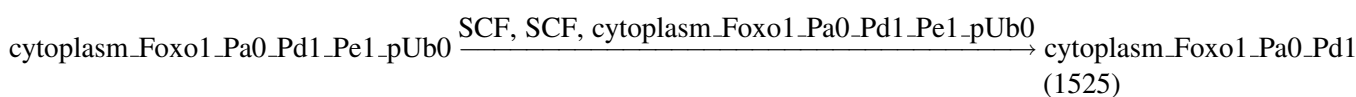
### Reactant

Table 1153: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Modifiers

Table 1154: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SCF | SCF | |
| SCF | SCF | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Product

Table 1155: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{303} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_303}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kub}) \qquad (1526)$$

$$\text{function\_303}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kub})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$
$$\qquad (1527)$$

$$\text{function\_303}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kub})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$
$$\qquad (1528)$$

Table 1156: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kub | kub | | $2.2 \cdot 10^{-5}$ | | ☑ |

## 8.304 Reaction R343

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 by SCF

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pU}$$
$$\qquad (1529)$$
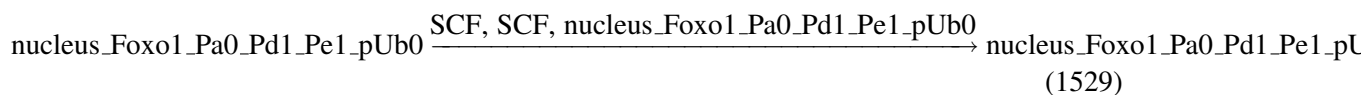
**Reactant**

Table 1157: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Modifiers

Table 1158: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Product

Table 1159: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{304} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_304}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{kub}, \text{vol}\,(\text{nucleus}), \\ [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]) \quad (1530)$$

$$\text{function\_304}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{kub}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{nucleus})} \quad (1531)$$

$$\text{function\_304}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{kub}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}]) \\ = \frac{[\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{nucleus})} \quad (1532)$$

Table 1160: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kub | kub | | $2.2 \cdot 10^{-5}$ | | ☑ |

## 8.305 Reaction R344

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa0_Pd1_Pe1-_pUb1 by SCF

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa0\_Pd1\_}$$

$$(1533)$$
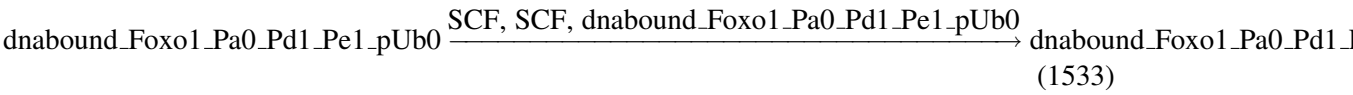
### Reactant

Table 1161: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Modifiers

Table 1162: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Product

Table 1163: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{305} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_305}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{kub}) \quad (1534)$$

$$\text{function\_305}\left([\text{SCF}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right),\right.$$
$$\left[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}\right], \text{kub}\right)$$
$$= \frac{\left[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}\right] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \left[\text{SCF}\right] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kub}}{\text{vol}\left(\text{dnabound}\right)}$$

$$(1535)$$

$$\text{function\_305}\left([\text{SCF}], \text{vol}\left(\text{cytoplasm}\right), \text{vol}\left(\text{dnabound}\right),\right.$$
$$\left[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}\right], \text{kub}\right)$$
$$= \frac{\left[\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}\right] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \left[\text{SCF}\right] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kub}}{\text{vol}\left(\text{dnabound}\right)}$$

$$(1536)$$

Table 1164: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kub | kub | | $2.2 \cdot 10^{-5}$ | | ☑ |

## 8.306 Reaction R345

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe0-_pUb1 by SCF

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_Pd0}$$

$$(1537)$$
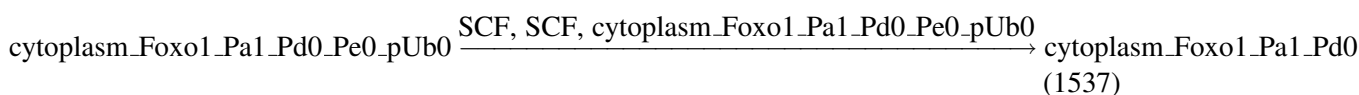
### Reactant

Table 1165: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Modifiers

Table 1166: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Product

Table 1167: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{306} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_306}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \\ [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kub}) \tag{1538}$$

$$\text{function\_306}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kub}) \\ = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})} \tag{1539}$$

$$\text{function\_306}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kub}) \\ = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})} \tag{1540}$$

Table 1168: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kub | kub | | $3 \cdot 10^{-6}$ | | ☑ |

## 8.307 Reaction R346

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 by SCF

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pU}$$

$$(1541)$$
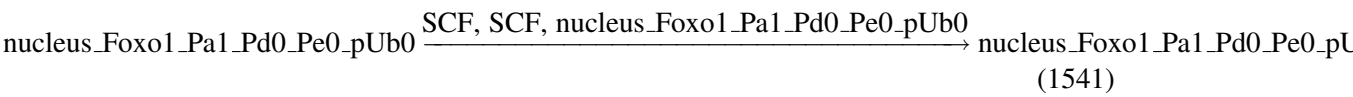
### Reactant

Table 1169: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Modifiers

Table 1170: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Product

Table 1171: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{307} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_307}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{kub}, \text{vol}\,(\text{nucleus}),$$

$$[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}])$$

$$(1542)$$

$$
\begin{aligned}
&\text{function\_307}\left([\text{SCF}], \text{vol}\left(\text{cytoplasm}\right), \text{kub}, \text{vol}\left(\text{nucleus}\right), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}]\right) \\
&= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{nucleus}\right) \cdot [\text{SCF}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kub}}{\text{vol}\left(\text{nucleus}\right)}
\end{aligned}
$$

$$(1543)$$

$$
\begin{aligned}
&\text{function\_307}\left([\text{SCF}], \text{vol}\left(\text{cytoplasm}\right), \text{kub}, \text{vol}\left(\text{nucleus}\right), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}]\right) \\
&= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{nucleus}\right) \cdot [\text{SCF}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kub}}{\text{vol}\left(\text{nucleus}\right)}
\end{aligned}
$$

$$(1544)$$

Table 1172: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kub | kub | | $3 \cdot 10^{-6}$ | | ☑ |

## 8.308 Reaction R347

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe0-_pUb1 by SCF

### Reaction equation

$$
\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} \xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd0\_}
$$

$$(1545)$$
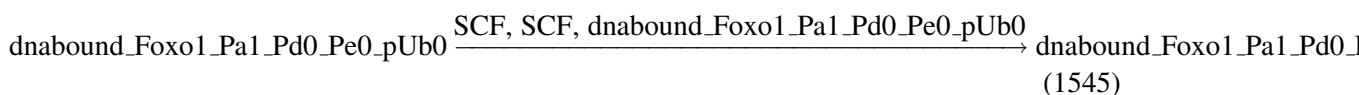
### Reactant

Table 1173: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

### Modifiers

Table 1174: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SCF | SCF | |
| SCF | SCF | |

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

## Product

Table 1175: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{308} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_308}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kub}) \qquad (1546)$$

$$\text{function\_308}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kub}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})}$$

$$(1547)$$

$$\text{function\_308}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{kub}) \\ = \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})}$$

$$(1548)$$

Table 1176: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kub | kub | | $3 \cdot 10^{-6}$ | | ☑ |

## 8.309 Reaction R348

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  conversion of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd0_Pe1-_pUb1 by SCF

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_Pd0}$$

$$(1549)$$
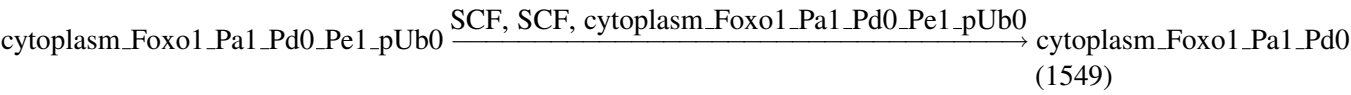
### Reactant

Table 1177: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Modifiers

Table 1178: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Product

Table 1179: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{309} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_309}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kub}) \tag{1550}$$

$$\text{function\_309}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kub})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$

$$(1551)$$

$$\text{function\_309}\left([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kub}\right)$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$

$$(1552)$$

Table 1180: Properties of each parameter.

| Id  | Name | SBO | Value | Unit | Constant |
|-----|------|-----|-------|------|----------|
| kub | kub  |     | $3 \cdot 10^{-6}$ |      | ☑ |

## 8.310 Reaction R349

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 by SCF

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pU}$$

$$(1553)$$
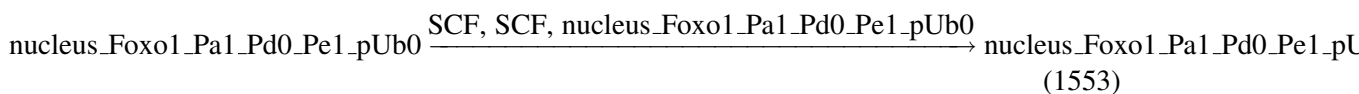
### Reactant

Table 1181: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Modifiers

Table 1182: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SCF | SCF | |
| SCF | SCF | |
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

### Product

Table 1183: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{310} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_310}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{kub}, \text{vol}\,(\text{nucleus}), \quad (1554)$$
$$[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}])$$

$$\text{function\_310}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{kub}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{nucleus})}$$
$$(1555)$$

$$\text{function\_310}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{kub}, \text{vol}\,(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{nucleus})}$$
$$(1556)$$

Table 1184: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kub | kub | | $3 \cdot 10^{-6}$ | | ☑ |

## 8.311 Reaction R350

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd0_Pe1-_pUb1 by SCF

**Reaction equation**

$$\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} \xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd0\_}$$
$$(1557)$$
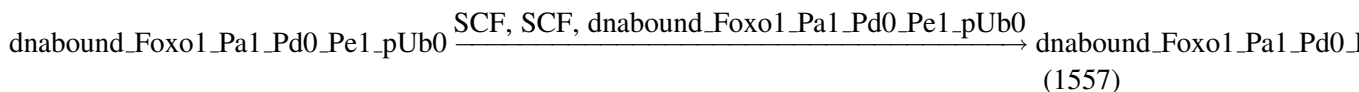
**Reactant**

Table 1185: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Modifiers

Table 1186: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Product

Table 1187: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{311} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_311}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \quad (1558)$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kub})$$

$$\text{function\_311}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kub})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})}$$
$$(1559)$$

$$\text{function\_311}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{kub})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})}$$
$$(1560)$$

Table 1188: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kub | kub | | $3 \cdot 10^{-6}$ | | ☑ |

## 8.312 Reaction R351

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe0-_pUb1 by SCF

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_Pd1}$$

$$(1561)$$
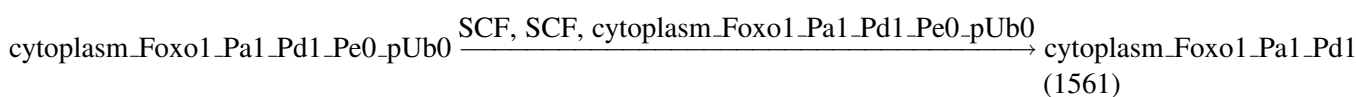
### Reactant

Table 1189: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Modifiers

Table 1190: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

Table 1191: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

*Produced by SBML2LATEX*

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{312} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_312}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{kub}) \qquad (1562)$$

$$\text{function\_312}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{kub})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$
$$(1563)$$

$$\text{function\_312}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{kub})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{cytoplasm})}$$
$$(1564)$$

Table 1192: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kub | kub | | $6.6 \cdot 10^{-5}$ | | ☑ |

## 8.313 Reaction R352

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 by SCF

**Reaction equation**

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pU}$$
$$(1565)$$
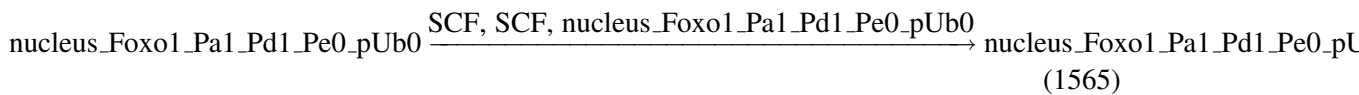
**Reactant**

Table 1193: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Modifiers

Table 1194: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

Table 1195: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{313} = \text{vol}(\text{nucleus}) \cdot \text{function\_313}([\text{SCF}], \text{vol}(\text{cytoplasm}), \text{kub}, \text{vol}(\text{nucleus}), \tag{1566}$$
$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}])$$

$$\text{function\_313}([\text{SCF}], \text{vol}(\text{cytoplasm}), \text{kub}, \text{vol}(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}(\text{nucleus})}$$
$$\tag{1567}$$

$$\text{function\_313}([\text{SCF}], \text{vol}(\text{cytoplasm}), \text{kub}, \text{vol}(\text{nucleus}), [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}])$$
$$= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}(\text{nucleus})}$$
$$\tag{1568}$$

Table 1196: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kub | kub | | $6.6 \cdot 10^{-5}$ | | ☑ |

## 8.314 Reaction R353

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe0-_pUb1 by SCF

### Reaction equation

$$\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} \xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd1\_}$$

$$(1569)$$
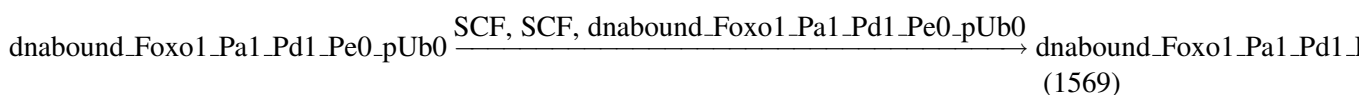
### Reactant

Table 1197: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Modifiers

Table 1198: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

Table 1199: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{314} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_314}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{vol}\,(\text{dnabound}), \\ [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{kub}) \qquad (1570)$$

$$\text{function\_314} ([\text{SCF}], \text{vol} (\text{cytoplasm}), \text{vol} (\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{kub})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol} (\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol} (\text{cytoplasm}) \cdot \text{kub}}{\text{vol} (\text{dnabound})}$$

$$(1571)$$

$$\text{function\_314} ([\text{SCF}], \text{vol} (\text{cytoplasm}), \text{vol} (\text{dnabound}),$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{kub})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol} (\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol} (\text{cytoplasm}) \cdot \text{kub}}{\text{vol} (\text{dnabound})}$$

$$(1572)$$

Table 1200: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kub | kub | | $6.6 \cdot 10^{-5}$ | | ☑ |

## 8.315 Reaction R354

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 to cytoplasm_Foxo1_Pa1_Pd1_Pe1-_pUb1 by SCF

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{SCF, SCF, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{cytoplasm\_Foxo1\_Pa1\_Pd1}$$

$$(1573)$$
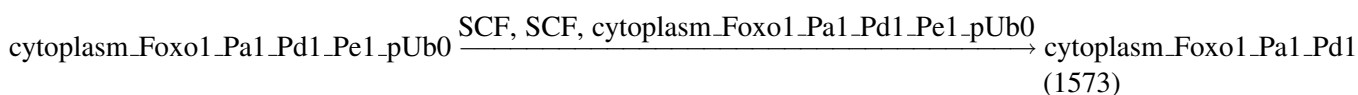
### Reactant

Table 1201: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Modifiers

Table 1202: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

**Product**

Table 1203: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{315} = \text{vol}(\text{cytoplasm}) \cdot \text{function\_315}([\text{SCF}], \text{vol}(\text{cytoplasm}), \atop [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kub}) \tag{1574}$$

$$\text{function\_315}([\text{SCF}], \text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kub})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}(\text{cytoplasm})} \tag{1575}$$

$$\text{function\_315}([\text{SCF}], \text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kub})$$
$$= \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{SCF}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}(\text{cytoplasm})} \tag{1576}$$

Table 1204: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kub | kub | | $6.6 \cdot 10^{-5}$ | | ☑ |

## 8.316 Reaction R355

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 to nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 by SCF

### Reaction equation

$$\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{SCF, SCF, nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pU}$$
$$(1577)$$
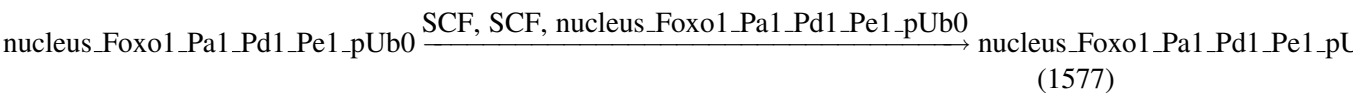
### Reactant

Table 1205: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Modifiers

Table 1206: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| SCF | SCF | |
| SCF | SCF | |
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Product

Table 1207: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{316} = \text{vol}\,(\text{nucleus}) \cdot \text{function\_316}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm}), \text{kub}, \text{vol}\,(\text{nucleus}), \quad (1578)$$
$$[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}])$$

$$
\begin{aligned}
&\text{function\_316}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{kub}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}]) \\
&= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{nucleus})}
\end{aligned}
$$

$$(1579)$$

$$
\begin{aligned}
&\text{function\_316}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{kub}, \text{vol}\,(\text{nucleus})\,, [\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}]) \\
&= \frac{[\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{nucleus}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{nucleus})}
\end{aligned}
$$

$$(1580)$$

Table 1208: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kub | kub | | $6.6 \cdot 10^{-5}$ | | ☑ |

## 8.317 Reaction R356

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** conversion of dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 to dnabound_Foxo1_Pa1_Pd1_Pe1-_pUb1 by SCF

### Reaction equation

$$
\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} \xrightarrow{\text{SCF, SCF, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{dnabound\_Foxo1\_Pa1\_Pd1\_}
$$

$$(1581)$$
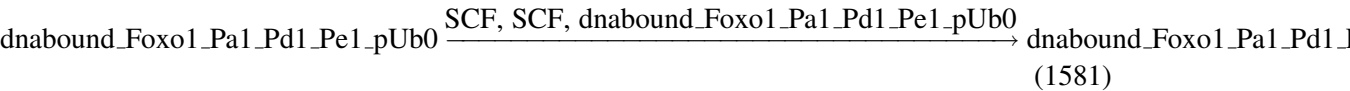
### Reactant

Table 1209: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Modifiers

Table 1210: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| SCF | SCF | |
| SCF | SCF | |

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

## Product

Table 1211: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{317} = \text{vol}\,(\text{dnabound}) \cdot \text{function\_317}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,, \tag{1582}$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kub})$$

$$\text{function\_317}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kub})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})}$$
$$\tag{1583}$$

$$\text{function\_317}\,([\text{SCF}], \text{vol}\,(\text{cytoplasm})\,, \text{vol}\,(\text{dnabound})\,,$$
$$[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{kub})$$
$$= \frac{[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot [\text{SCF}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kub}}{\text{vol}\,(\text{dnabound})}$$
$$\tag{1584}$$

Table 1212: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kub | kub | | $6.6 \cdot 10^{-5}$ | | ☑ |

## 8.318 Reaction R357

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** degradation of cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{degr\_Foxo1}$$

(1585)
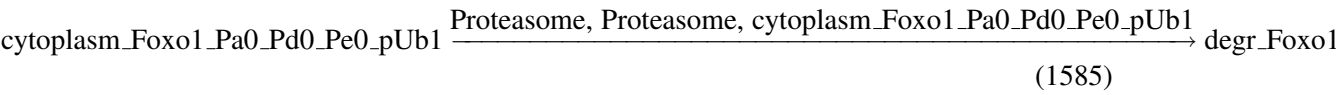
### Reactant

Table 1213: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Modifiers

Table 1214: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Proteasome | Proteasome | |
| Proteasome | Proteasome | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Product

Table 1215: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| degr_Foxo1 | degr_Foxo1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{318} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_318}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{kdeg})$$

(1586)

$$\text{function\_318}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}],$$

(1587)

$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_318}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}],$$

(1588)

$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$

Table 1216: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdeg | kdeg | | $10^{-4}$ | | ☑ |

## 8.319 Reaction R358

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** degradation of cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{degr\_Foxo1}$$

$$(1589)$$
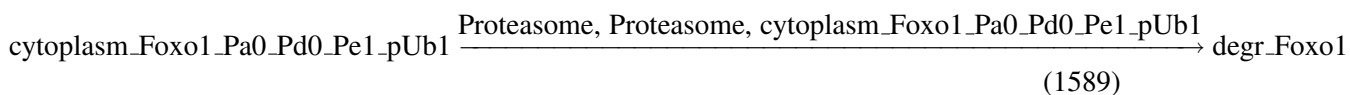
### Reactant

Table 1217: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Modifiers

Table 1218: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| Proteasome | Proteasome | |
| Proteasome | Proteasome | |
| cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

### Product

Table 1219: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| degr_Foxo1 | degr_Foxo1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{319} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_319}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), \quad (1590)$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{kdeg})$$

$$\text{function\_319}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \quad (1591)$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_319}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \quad (1592)$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$
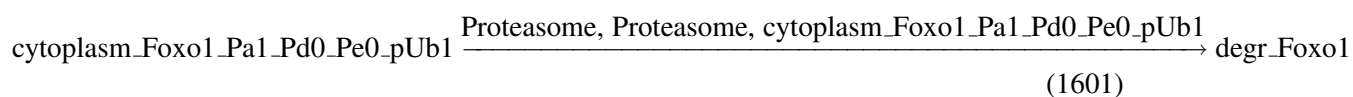
Table 1220: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdeg | kdeg | | $10^{-4}$ | | ☑ |

## 8.320 Reaction R359

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** degradation of cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{degr\_Foxo1}$$
$$(1593)$$
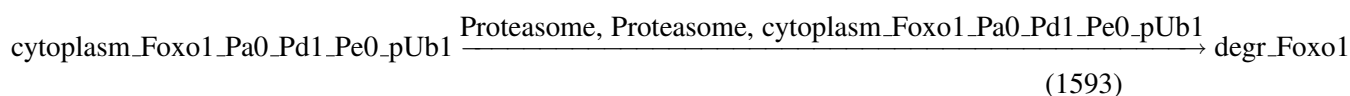
**Reactant**

Table 1221: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

**Modifiers**

| Id | Name | SBO |
|---|---|---|
| Proteasome | Proteasome | |
| Proteasome | Proteasome | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

**Product**

Table 1223: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| degr_Foxo1 | degr_Foxo1 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{320} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_320}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{kdeg}) \quad (1594)$$

$$\text{function\_320}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \quad (1595)$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_320}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \quad (1596)$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$

Table 1224: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdeg | kdeg | | $10^{-4}$ | | ☑ |

## 8.321 Reaction R360

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** degradation of cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{degr\_Foxo1}$$

$$(1597)$$
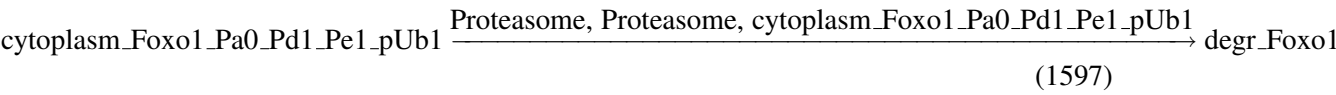
### Reactant

Table 1225: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Modifiers

Table 1226: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Proteasome | Proteasome | |
| Proteasome | Proteasome | |
| cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Product

Table 1227: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| degr_Foxo1 | degr_Foxo1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{321} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_321}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), \\ [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{kdeg}) \qquad (1598)$$

$$\text{function\_321}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \qquad (1599)$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_321}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \qquad (1600)$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$

Table 1228: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdeg | kdeg | | $10^{-4}$ | | ☑ |

### 8.322 Reaction R361

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** degradation of cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} \xrightarrow{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{degr\_Foxo1}$$

$$(1601)$$

### Reactant

Table 1229: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Modifiers

Table 1230: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| Proteasome | Proteasome | |
| Proteasome | Proteasome | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Product

Table 1231: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| degr_Foxo1 | degr_Foxo1 | |

**Kinetic Law**

**Derived unit**  contains undeclared units

$$v_{322} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_322}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{kdeg}) \qquad (1602)$$

$$\text{function\_322}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \qquad (1603)$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_322}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \qquad (1604)$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$

Table 1232: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdeg | kdeg | | $10^{-4}$ | | ☑ |

## 8.323 Reaction R362

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  degradation of cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1

**Reaction equation**

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \xrightarrow{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{degr\_Foxo1}$$
$$(1605)$$
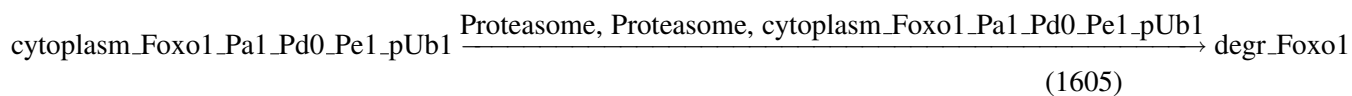
**Reactant**

Table 1233: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

**Modifiers**

Table 1234: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Proteasome | Proteasome | |
| Proteasome | Proteasome | |
| cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

## Product

Table 1235: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| degr_Foxo1 | degr_Foxo1 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{323} = \text{vol}(\text{cytoplasm}) \cdot \text{function\_323}\left([\text{Proteasome}], \text{vol}(\text{cytoplasm}), \right. \\ \left. [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \text{kdeg}\right) \quad (1606)$$

$$\text{function\_323}\left([\text{Proteasome}], \text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \quad (1607) \right.$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}(\text{cytoplasm})}$$

$$\text{function\_323}\left([\text{Proteasome}], \text{vol}(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}], \quad (1608) \right.$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}(\text{cytoplasm})}$$

Table 1236: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kdeg | kdeg | | $10^{-4}$ | | ☑ |

## 8.324 Reaction R363

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name** degradation of cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} \xrightarrow{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{degr\_Foxo1}$$

$$(1609)$$
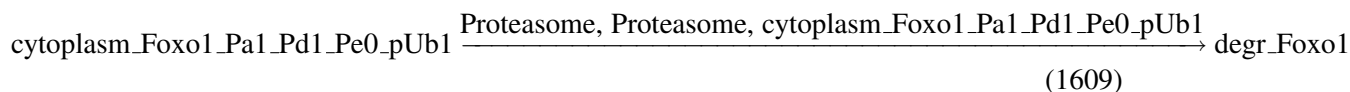
### Reactant

Table 1237: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Modifiers

Table 1238: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| Proteasome | Proteasome | |
| Proteasome | Proteasome | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Product

Table 1239: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| degr_Foxo1 | degr_Foxo1 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{324} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_324}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{kdeg}) \qquad (1610)$$

$$\text{function\_324}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \qquad (1611)$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_324}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}), [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \qquad (1612)$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$

Table 1240: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdeg | kdeg | | $10^{-4}$ | | ☑ |

## 8.325 Reaction R364

This is an irreversible reaction of one reactant forming one product influenced by three modifiers.

**Name**  degradation of cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1

### Reaction equation

$$\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \xrightarrow{\text{Proteasome, Proteasome, cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} \text{degr\_Foxo1}$$

$$(1613)$$
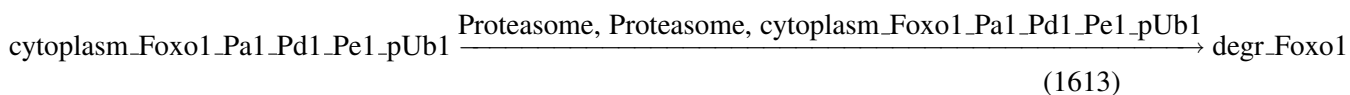
### Reactant

Table 1241: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Modifiers

Table 1242: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| Proteasome | Proteasome | |
| Proteasome | Proteasome | |
| cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

### Product

Table 1243: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| degr_Foxo1 | degr_Foxo1 | |

*Produced by SBML2LATEX*

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{325} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_325}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm}),$$
$$[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{kdeg}) \quad (1614)$$

$$\text{function\_325}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \quad (1615)$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$

$$\text{function\_325}\,([\text{Proteasome}], \text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \quad (1616)$$
$$\text{kdeg}) = \frac{[\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot [\text{Proteasome}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kdeg}}{\text{vol}\,(\text{cytoplasm})}$$

Table 1244: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kdeg | kdeg | | $10^{-4}$ | | ☑ |

## 8.326 Reaction R365

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name**  transcription of InR by dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{nucleus\_RNA\_InR}$$
$$(1617)$$
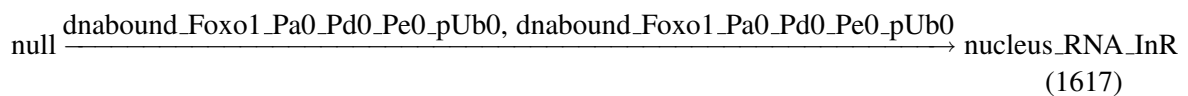
### Reactant

Table 1245: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

### Modifiers

## Table 1246: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

**Product**

## Table 1247: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_InR | nucleus_RNA_InR | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{326} = \text{function\_326}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{ktranscr}\right) \quad (1618)$$

$$\begin{aligned}
&\text{function\_326}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{ktranscr}\right)\\
&= [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}
\end{aligned} \quad (1619)$$

## Table 1248: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.327 Reaction R366

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0

**Reaction equation**

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}} \text{nucleus\_RNA\_SOD2}$$
$$(1620)$$
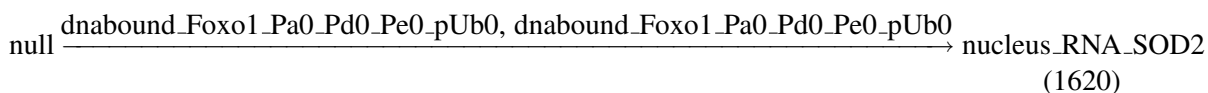
**Reactant**

Table 1249: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

## Modifiers

Table 1250: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0 | |

## Product

Table 1251: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{327} = \text{function\_327}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{ktranscr}\right) \quad (1621)$$

$$\text{function\_327}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}], \text{ktranscr}\right) \\ = [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr} \quad (1622)$$

Table 1252: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.328 Reaction R367

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1

## Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{nucleus\_RNA\_InR}$$

(1623)
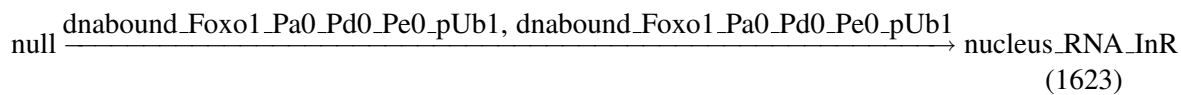
## Reactant

Table 1253: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| null | null | |

## Modifiers

Table 1254: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

## Product

Table 1255: Properties of each product.

| Id | Name | SBO |
|----------------|----------------|-----|
| nucleus_RNA_InR | nucleus_RNA_InR | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{328} = \text{function\_328}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{ktranscr}\right) \quad (1624)$$

$$\begin{aligned}\text{function\_328}&\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}], \text{ktranscr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}\end{aligned} \quad (1625)$$

Table 1256: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.329 Reaction R368

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1, dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}} \text{nucleus\_RNA\_SOD2}$$

$$(1626)$$
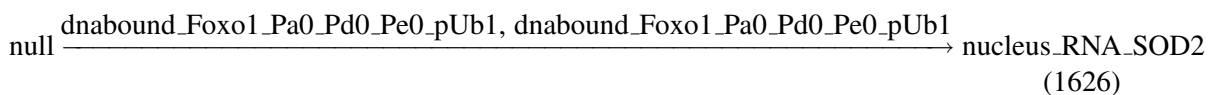
### Reactant

Table 1257: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

### Modifiers

Table 1258: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |
| dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1 | |

### Product

Table 1259: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{329} = \text{function\_329}\left(\text{vol}\left(\text{dnabound}\right), \left[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}\right], \text{ktranscr}\right) \quad (1627)$$

$$\begin{aligned}
&\text{function\_329}\left(\text{vol}\left(\text{dnabound}\right), \left[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}\right], \text{ktranscr}\right) \\
&= \left[\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1}\right] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}
\end{aligned} \quad (1628)$$

Table 1260: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.330 Reaction R369

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{nucleus\_RNA\_InR} \quad (1629)$$
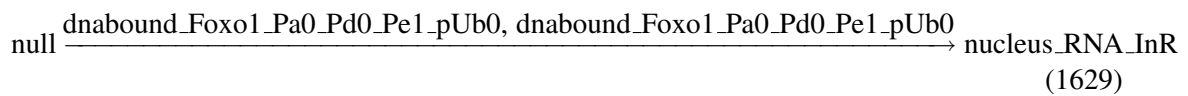
### Reactant

Table 1261: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

### Modifiers

Table 1262: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

### Product

*Produced by SBML2LATEX*

Table 1263: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_InR | nucleus_RNA_InR | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{330} = \text{function\_330} \left( \text{vol} \left( \text{dnabound} \right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{ktranscr} \right) \quad (1630)$$

$$
\begin{aligned}
&\text{function\_330} \left( \text{vol} \left( \text{dnabound} \right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{ktranscr} \right) \\
&= [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol} \left( \text{dnabound} \right) \cdot \text{ktranscr}
\end{aligned}
\quad (1631)
$$

Table 1264: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.331 Reaction R370

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0

**Reaction equation**

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}} \text{nucleus\_RNA\_SOD2} \quad (1632)$$
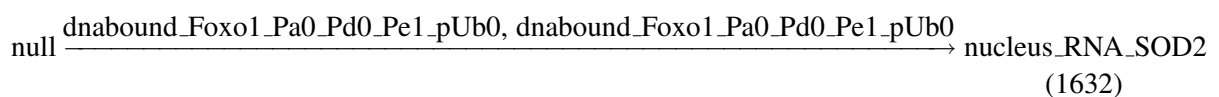
**Reactant**

Table 1265: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

**Modifiers**

Table 1266: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0 | |

**Product**

Table 1267: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{331} = \text{function\_331}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{ktranscr}\right) \quad (1633)$$

$$\begin{aligned}
&\text{function\_331}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}], \text{ktranscr}\right) \\
&= [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}
\end{aligned} \quad (1634)$$

Table 1268: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.332 Reaction R371

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1

**Reaction equation**

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{nucleus\_RNA\_InR} \quad (1635)$$
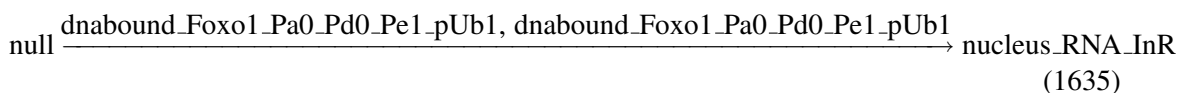
**Reactant**

Table 1269: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

## Modifiers

Table 1270: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Product

Table 1271: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_RNA_InR | nucleus_RNA_InR | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{332} = \text{function\_332} \left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \right], \text{ktranscr} \right) \quad (1636)$$

$$\begin{aligned} &\text{function\_332} \left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \right], \text{ktranscr} \right) \\ &= \left[ \text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} \right] \cdot \text{vol} \left( \text{dnabound} \right) \cdot \text{ktranscr} \end{aligned} \quad (1637)$$

Table 1272: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.333 Reaction R372

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1

## Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1, dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}} \text{nucleus\_RNA\_SOD2}$$

(1638)
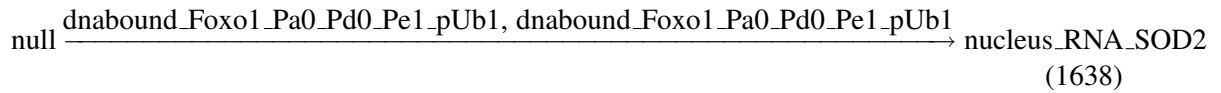
## Reactant

Table 1273: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| null | null | |

## Modifiers

Table 1274: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |
| dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1 | |

## Product

Table 1275: Properties of each product.

| Id | Name | SBO |
|-----------------|-----------------|-----|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

## Kinetic Law

**Derived unit**  contains undeclared units

$$v_{333} = \text{function\_333}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{ktranscr}\right) \quad (1639)$$

$$\begin{aligned}
&\text{function\_333}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}], \text{ktranscr}\right)\\
&= [\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}
\end{aligned} \quad (1640)$$

Table 1276: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.334 Reaction R373

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{nucleus\_RNA\_InR}$$

(1641)
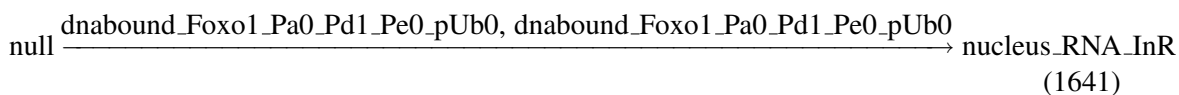
### Reactant

Table 1277: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

### Modifiers

Table 1278: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

### Product

Table 1279: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_InR | nucleus_RNA_InR | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{334} = \text{function\_334} \left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \right], \text{ktranscr} \right) \quad (1642)$$

$$\text{function\_334} \left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \right], \text{ktranscr} \right)$$
$$= \left[ \text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} \right] \cdot \text{vol} \left( \text{dnabound} \right) \cdot \text{ktranscr} \quad (1643)$$

Table 1280: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.335 Reaction R374

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0

**Reaction equation**

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}} \text{nucleus\_RNA\_SOD2} \quad (1644)$$
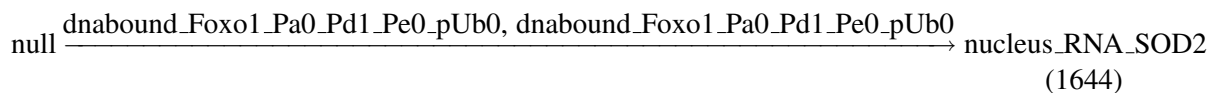
**Reactant**

Table 1281: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

**Modifiers**

Table 1282: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0 | |

**Product**

Table 1283: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{335} = \text{function\_335}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{ktranscr}\right) \quad (1645)$$

$$\begin{aligned}\text{function\_335}&\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}], \text{ktranscr}\right)\\ &= [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}\end{aligned} \quad (1646)$$

Table 1284: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.336 Reaction R375

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{nucleus\_RNA\_InR} \quad (1647)$$
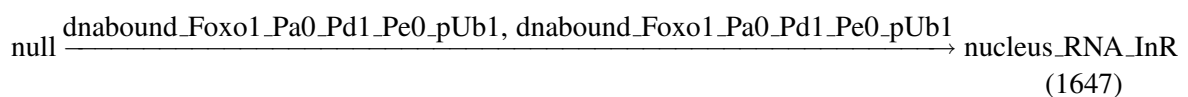
### Reactant

Table 1285: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

### Modifiers

Table 1286: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

**Product**

Table 1287: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_InR | nucleus_RNA_InR | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{336} = \text{function\_336}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{ktranscr}\right) \quad (1648)$$

$$\begin{aligned}&\text{function\_336}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}], \text{ktranscr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}\end{aligned} \quad (1649)$$

Table 1288: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.337 Reaction R376

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1

**Reaction equation**

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1, dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1}} \text{nucleus\_RNA\_SOD2} \quad (1650)$$
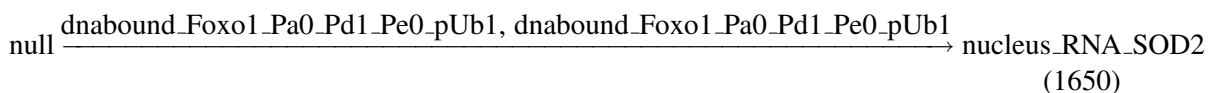
**Reactant**

Table 1289: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

## Modifiers

Table 1290: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |
| dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1 | |

## Product

Table 1291: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{337} = \text{function\_337} \left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \right], \text{ktranscr} \right) \quad (1651)$$

$$\begin{aligned} &\text{function\_337} \left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \right], \text{ktranscr} \right) \\ &= \left[ \text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} \right] \cdot \text{vol} \left( \text{dnabound} \right) \cdot \text{ktranscr} \end{aligned} \quad (1652)$$

Table 1292: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.338 Reaction R377

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0

## Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{nucleus\_RNA\_InR}$$

(1653)
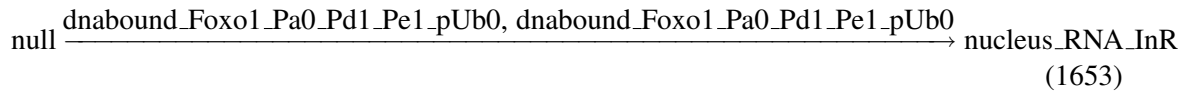
## Reactant

Table 1293: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| null | null | |

## Modifiers

Table 1294: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

## Product

Table 1295: Properties of each product.

| Id | Name | SBO |
|----------------|----------------|-----|
| nucleus_RNA_InR | nucleus_RNA_InR | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{338} = \text{function\_338}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{ktranscr}\right) \quad (1654)$$

$$\begin{aligned}
&\text{function\_338}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{ktranscr}\right) \\
&= [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}
\end{aligned}$$

(1655)

Table 1296: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.339 Reaction R378

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}} \text{nucleus\_RNA\_SOD2}$$

$$(1656)$$
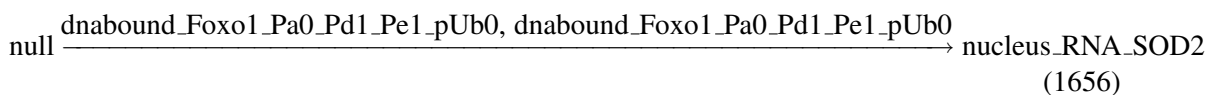
### Reactant

Table 1297: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

### Modifiers

Table 1298: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0 | |

### Product

Table 1299: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{339} = \text{function\_339}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{ktranscr}\right) \quad (1657)$$

$$\begin{aligned}
&\text{function\_339}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}], \text{ktranscr}\right) \\
&= [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}
\end{aligned} \quad (1658)$$

Table 1300: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.340 Reaction R379

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{nucleus\_RNA\_InR} \quad (1659)$$
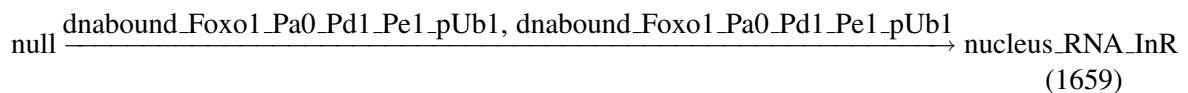
### Reactant

Table 1301: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

### Modifiers

Table 1302: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Product

*Produced by SBML2LATEX*

Table 1303: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_InR | nucleus_RNA_InR | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{340} = \text{function\_340}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{ktranscr}\right) \quad (1660)$$

$$\begin{aligned}\text{function\_340}&\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{ktranscr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}\end{aligned} \quad (1661)$$

Table 1304: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.341 Reaction R380

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1

**Reaction equation**

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1, dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}} \text{nucleus\_RNA\_SOD2} \quad (1662)$$
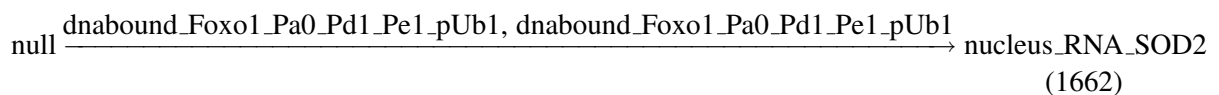
**Reactant**

Table 1305: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

**Modifiers**

Table 1306: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |
| dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1 | |

### Product

Table 1307: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{341} = \text{function\_341}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{ktranscr}\right) \quad (1663)$$

$$\begin{aligned} &\text{function\_341}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}], \text{ktranscr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr} \end{aligned} \quad (1664)$$

Table 1308: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.342 Reaction R381

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{nucleus\_RNA\_InR} \quad (1665)$$
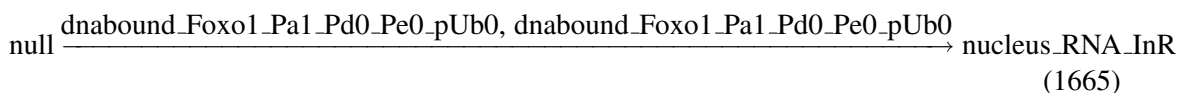
### Reactant

Table 1309: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

## Modifiers

Table 1310: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

## Product

Table 1311: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_RNA_InR | nucleus_RNA_InR | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{342} = \text{function\_342}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{ktranscr}\right) \quad (1666)$$

$$\text{function\_342}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{ktranscr}\right) \\ = [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr} \quad (1667)$$

Table 1312: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.343 Reaction R382

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0

## Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}} \text{nucleus\_RNA\_SOD2}$$

$$(1668)$$
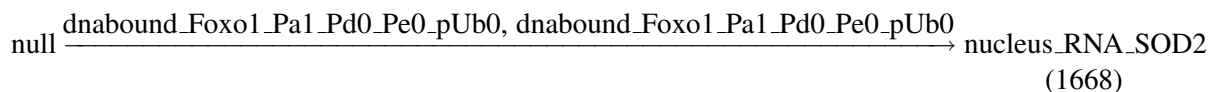
## Reactant

Table 1313: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

## Modifiers

Table 1314: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0 | |

## Product

Table 1315: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{343} = \text{function\_343}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{ktranscr}\right) \quad (1669)$$

$$\begin{aligned} \text{function\_343}&\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}], \text{ktranscr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr} \end{aligned} \quad (1670)$$

Table 1316: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.344 Reaction R383

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{nucleus\_RNA\_InR}$$
$$(1671)$$
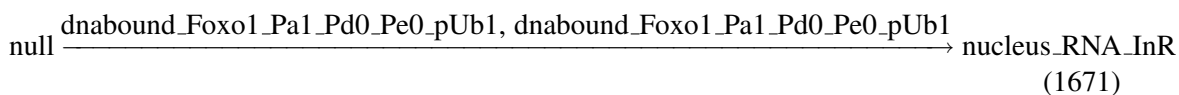
### Reactant

Table 1317: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

### Modifiers

Table 1318: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

### Product

Table 1319: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_RNA_InR | nucleus_RNA_InR | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{344} = \text{function\_344}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{ktranscr}\right) \quad (1672)$$

$$\text{function\_344}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{ktranscr}\right)$$
$$= [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr} \quad (1673)$$

Table 1320: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.345 Reaction R384

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1

**Reaction equation**

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1, dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}} \text{nucleus\_RNA\_SOD2} \quad (1674)$$
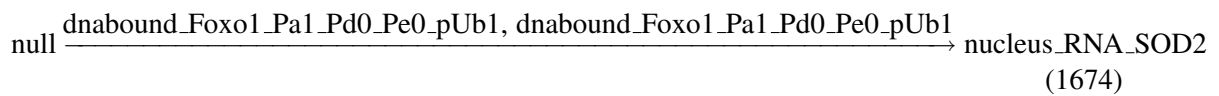
**Reactant**

Table 1321: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

**Modifiers**

Table 1322: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |
| dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1 | |

**Product**

Table 1323: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{345} = \text{function\_345}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{ktranscr}\right) \quad (1675)$$

$$\begin{aligned}
&\text{function\_345}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}], \text{ktranscr}\right) \\
&= [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}
\end{aligned} \quad (1676)$$

Table 1324: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.346 Reaction R385

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0

**Reaction equation**

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{nucleus\_RNA\_InR} \quad (1677)$$
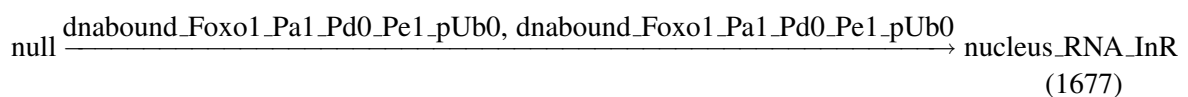
**Reactant**

Table 1325: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

**Modifiers**

Table 1326: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Product

Table 1327: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_InR | nucleus_RNA_InR | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{346} = \text{function\_346}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{ktranscr}\right) \quad (1678)$$

$$\begin{aligned}\text{function\_346}&\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{ktranscr}\right)\\ &= [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}\end{aligned} \quad (1679)$$

Table 1328: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.347 Reaction R386

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0

## Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}} \text{nucleus\_RNA\_SOD2} \quad (1680)$$
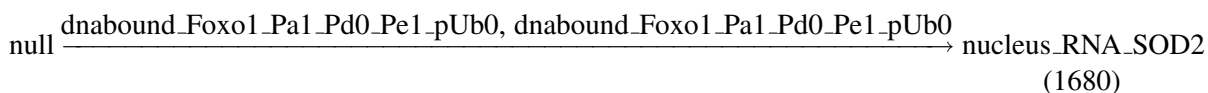
## Reactant

Table 1329: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

## Modifiers

Table 1330: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0 | |

## Product

Table 1331: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{347} = \text{function\_347}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{ktranscr}\right) \quad (1681)$$

$$\begin{aligned} &\text{function\_347}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}], \text{ktranscr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr} \end{aligned} \quad (1682)$$

Table 1332: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.348 Reaction R387

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1

## Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{nucleus\_RNA\_InR}$$

$$(1683)$$
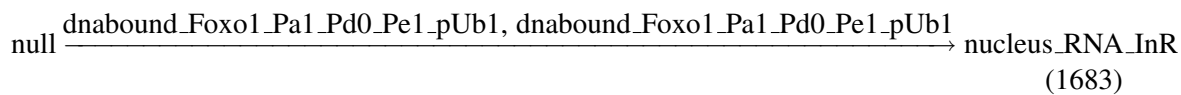
## Reactant

Table 1333: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| null | null | |

## Modifiers

Table 1334: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

## Product

Table 1335: Properties of each product.

| Id | Name | SBO |
|----------------|----------------|-----|
| nucleus_RNA_InR | nucleus_RNA_InR | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{348} = \text{function\_348}\left(\text{vol}\left(\text{dnabound}\right), \left[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}\right], \text{ktranscr}\right) \quad (1684)$$

$$\begin{aligned}
&\text{function\_348}\left(\text{vol}\left(\text{dnabound}\right), \left[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}\right], \text{ktranscr}\right) \\
&= \left[\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}\right] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}
\end{aligned} \quad (1685)$$

Table 1336: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.349 Reaction R388

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1, dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1}} \text{nucleus\_RNA\_SOD2}$$

(1686)
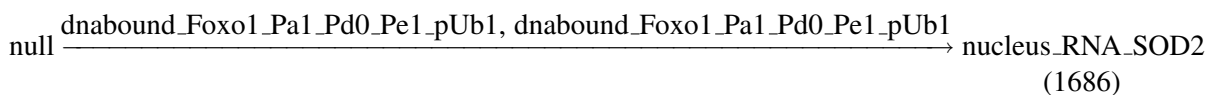
### Reactant

Table 1337: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

### Modifiers

Table 1338: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |
| dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1 | |

### Product

Table 1339: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{349} = \text{function\_349} \left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \right], \text{ktranscr} \right) \quad (1687)$$

$$\begin{aligned}
\text{function\_349} &\left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \right], \text{ktranscr} \right) \\
&= \left[ \text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} \right] \cdot \text{vol} \left( \text{dnabound} \right) \cdot \text{ktranscr}
\end{aligned} \quad (1688)$$

Table 1340: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.350 Reaction R389

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{nucleus\_RNA\_InR} \quad (1689)$$
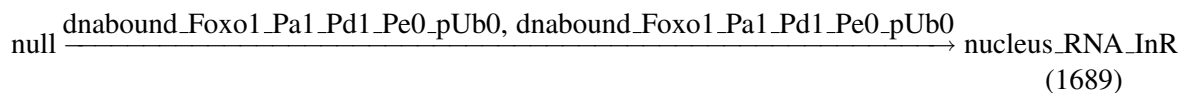
### Reactant

Table 1341: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

### Modifiers

Table 1342: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

### Product

Table 1343: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_InR | nucleus_RNA_InR | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{350} = \text{function\_350}\,(\text{vol}\,(\text{dnabound})\,, [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{ktranscr}) \quad (1690)$$

$$
\begin{aligned}
&\text{function\_350}\,(\text{vol}\,(\text{dnabound})\,, [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{ktranscr}) \\
&= [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\,(\text{dnabound}) \cdot \text{ktranscr}
\end{aligned}
\quad (1691)
$$

Table 1344: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.351 Reaction R390

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0

**Reaction equation**

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}} \text{nucleus\_RNA\_SOD2} \quad (1692)$$
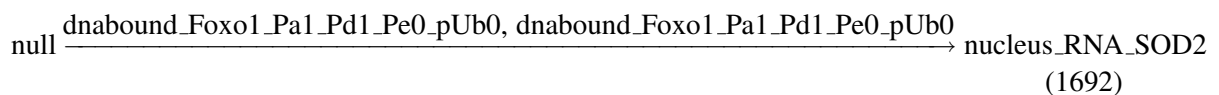
**Reactant**

Table 1345: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

**Modifiers**

Table 1346: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0 | |

## Product

Table 1347: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{351} = \text{function\_351}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{ktranscr}\right) \quad (1693)$$

$$\begin{aligned} &\text{function\_351}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}], \text{ktranscr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr} \end{aligned} \quad (1694)$$

Table 1348: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.352 Reaction R391

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1

## Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{nucleus\_RNA\_InR} \quad (1695)$$
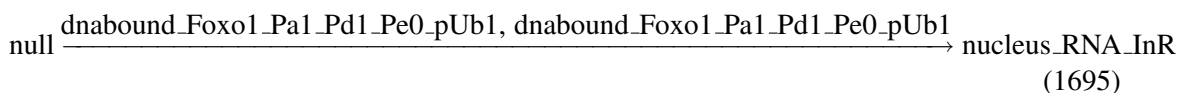
## Reactant

Table 1349: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

## Modifiers

Table 1350: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

## Product

Table 1351: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_InR | nucleus_RNA_InR | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{352} = \text{function\_352}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{ktranscr}\right) \quad (1696)$$

$$\begin{aligned}
&\text{function\_352}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{ktranscr}\right) \\
&= [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}
\end{aligned} \quad (1697)$$

Table 1352: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.353 Reaction R392

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1, dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}} \text{nucleus\_RNA\_SOD2}$$

(1698)
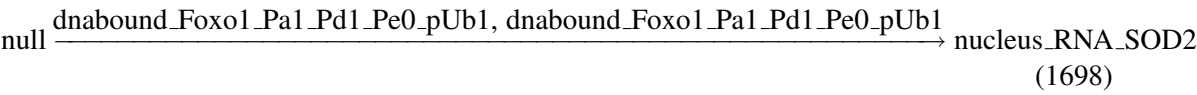
### Reactant

Table 1353: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| null | null | |

### Modifiers

Table 1354: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |
| dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1 | |

### Product

Table 1355: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{353} = \text{function\_353}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{ktranscr}\right) \quad (1699)$$

$$\text{function\_353}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}], \text{ktranscr}\right)$$
$$= [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr} \quad (1700)$$

Table 1356: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.354 Reaction R393

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of InR by dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{nucleus\_RNA\_InR}$$

$$(1701)$$
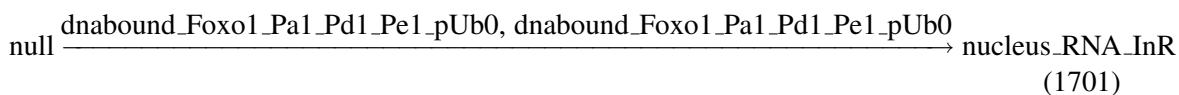
### Reactant

Table 1357: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

### Modifiers

Table 1358: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Product

Table 1359: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_InR | nucleus_RNA_InR | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{354} = \text{function\_354} \left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{ktranscr}\right) \quad (1702)$$

$$\begin{aligned}&\text{function\_354} \left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}], \text{ktranscr}\right) \\ &= [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}\end{aligned} \quad (1703)$$

Table 1360: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.355 Reaction R394

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}} \text{nucleus\_RNA\_SOD2} \quad (1704)$$
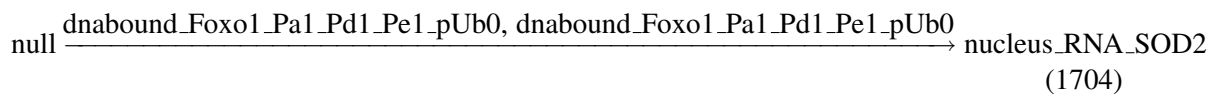
### Reactant

Table 1361: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

### Modifiers

Table 1362: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0 | |

### Product

Table 1363: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{355} = \text{function\_355}\left(\text{vol}\left(\text{dnabound}\right), \left[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}\right], \text{ktranscr}\right) \quad (1705)$$

$$\begin{aligned}&\text{function\_355}\left(\text{vol}\left(\text{dnabound}\right), \left[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}\right], \text{ktranscr}\right)\\ &= \left[\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0}\right] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}\end{aligned} \quad (1706)$$

Table 1364: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.356  Reaction R395

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name**  transcription of InR by dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1

### Reaction equation

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} \text{nucleus\_RNA\_InR} \quad (1707)$$
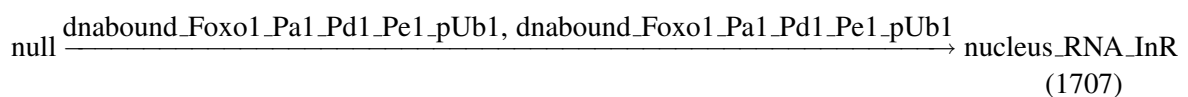
### Reactant

Table 1365: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

### Modifiers

Table 1366: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

**Product**

Table 1367: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_InR | nucleus_RNA_InR | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{356} = \text{function\_356}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{ktranscr}\right) \quad (1708)$$

$$\begin{aligned}&\text{function\_356}\left(\text{vol}\left(\text{dnabound}\right), [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}], \text{ktranscr}\right)\\&= [\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}] \cdot \text{vol}\left(\text{dnabound}\right) \cdot \text{ktranscr}\end{aligned} \quad (1709)$$

Table 1368: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| ktranscr | ktranscr | | 0.24 | | ☑ |

## 8.357 Reaction R396

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** transcription of SOD2 by dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1

**Reaction equation**

$$\text{null} \xrightarrow{\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1, dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1}} \text{nucleus\_RNA\_SOD2} \quad (1710)$$
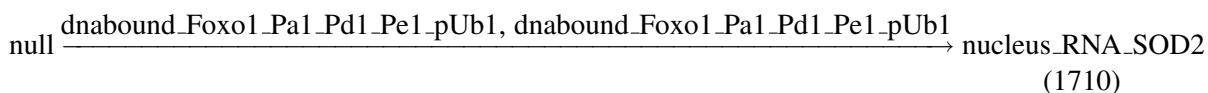
**Reactant**

Table 1369: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

## Modifiers

Table 1370: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |
| dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1 | |

## Product

Table 1371: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{357} = \text{function\_357} \left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \right], \text{ktranscr} \right) \quad (1711)$$

$$\text{function\_357} \left( \text{vol} \left( \text{dnabound} \right), \left[ \text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \right], \text{ktranscr} \right)$$
$$= \left[ \text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} \right] \cdot \text{vol} \left( \text{dnabound} \right) \cdot \text{ktranscr} \quad (1712)$$

Table 1372: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktranscr | ktranscr | | 0.95 | | ☑ |

## 8.358 Reaction R397

This is an irreversible reaction of one reactant forming one product.

**Name** basal transcription of InR

**Reaction equation**

$$\text{null} \longrightarrow \text{nucleus\_RNA\_InR} \tag{1713}$$

**Reactant**

Table 1373: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| null | null | |

**Product**

Table 1374: Properties of each product.

| Id | Name | SBO |
|-----------------|-----------------|-----|
| nucleus_RNA_InR | nucleus_RNA_InR | |

**Kinetic Law**

**Derived unit**  not available

$$v_{358} = \text{function\_358}\,(\text{v}) \tag{1714}$$

$$\text{function\_358}\,(\text{v}) = \text{v} \tag{1715}$$

Table 1375: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| v  | v    |     | 5.0   |      | ☑        |

## 8.359 Reaction R398

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name**  export of InR RNA

**Reaction equation**

$$\text{nucleus\_RNA\_InR} \xrightarrow{\text{nucleus\_RNA\_InR}} \text{cytoplasm\_RNA\_InR} \tag{1716}$$
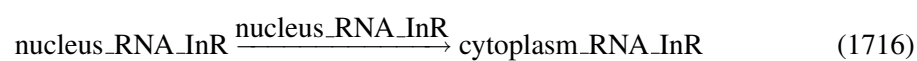
**Reactant**

Table 1376: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_InR | nucleus_RNA_InR | |

**Modifier**

Table 1377: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_InR | nucleus_RNA_InR | |

**Product**

Table 1378: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_RNA_InR | cytoplasm_RNA_InR | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{359} = \text{function\_359} \left( \text{kexp}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_RNA\_InR} \right] \right) \tag{1717}$$

$$\begin{aligned}&\text{function\_359} \left( \text{kexp}, \text{vol} \left( \text{nucleus} \right), \left[ \text{nucleus\_RNA\_InR} \right] \right) \\&= \left[ \text{nucleus\_RNA\_InR} \right] \cdot \text{vol} \left( \text{nucleus} \right) \cdot \text{kexp}\end{aligned} \tag{1718}$$

Table 1379: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kexp | kexp | | 0.22 | | ☑ |

## 8.360 Reaction R399

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** cyto degr of InR RNA

### Reaction equation

$$\text{cytoplasm\_RNA\_InR} \xrightarrow{\text{cytoplasm\_RNA\_InR}} \text{null} \tag{1719}$$

### Reactant

Table 1380: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_RNA_InR | cytoplasm_RNA_InR | |

### Modifier

Table 1381: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_RNA_InR | cytoplasm_RNA_InR | |

### Product

Table 1382: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| null | null | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{360} = \text{vol}\left(\text{cytoplasm}\right) \cdot \text{function\_360}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_RNA\_InR}], \text{kmdeg}\right) \tag{1720}$$

$$\begin{aligned}
&\text{function\_360}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_RNA\_InR}], \text{kmdeg}\right) \\
&= \frac{[\text{cytoplasm\_RNA\_InR}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kmdeg}}{\text{vol}\left(\text{cytoplasm}\right)}
\end{aligned} \tag{1721}$$

$$\begin{aligned}
&\text{function\_360}\left(\text{vol}\left(\text{cytoplasm}\right), [\text{cytoplasm\_RNA\_InR}], \text{kmdeg}\right) \\
&= \frac{[\text{cytoplasm\_RNA\_InR}] \cdot \text{vol}\left(\text{cytoplasm}\right) \cdot \text{kmdeg}}{\text{vol}\left(\text{cytoplasm}\right)}
\end{aligned} \tag{1722}$$

Table 1383: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kmdeg | kmdeg | | 5.622 | | ☑ |

## 8.361 Reaction R400

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** translation of InR

### Reaction equation

$$\text{null} \xrightarrow{\text{cytoplasm\_RNA\_InR, cytoplasm\_RNA\_InR}} \text{cytoplasm\_InR} \tag{1723}$$

### Reactant

Table 1384: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

### Modifiers

Table 1385: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_RNA_InR | cytoplasm_RNA_InR | |
| cytoplasm_RNA_InR | cytoplasm_RNA_InR | |

### Product

Table 1386: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_InR | cytoplasm_InR | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{361} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_361}\,(\text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_RNA\_InR}], \text{ktransl}) \quad (1724)$$

$$\begin{aligned} &\text{function\_361}\,(\text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_RNA\_InR}], \text{ktransl}) \\ &= \frac{[\text{cytoplasm\_RNA\_InR}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{ktransl}}{\text{vol}\,(\text{cytoplasm})} \end{aligned} \quad (1725)$$

$$\begin{aligned} &\text{function\_361}\,(\text{vol}\,(\text{cytoplasm})\,, [\text{cytoplasm\_RNA\_InR}], \text{ktransl}) \\ &= \frac{[\text{cytoplasm\_RNA\_InR}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{ktransl}}{\text{vol}\,(\text{cytoplasm})} \end{aligned} \quad (1726)$$

Table 1387: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktransl | ktransl | | 2.46 | | ☑ |

## 8.362 Reaction R401

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** degradation of InR protein

**Reaction equation**

$$\text{cytoplasm\_InR} \xrightarrow{\text{cytoplasm\_InR}} \text{null} \quad (1727)$$
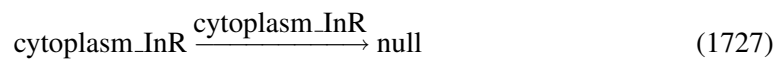
**Reactant**

Table 1388: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_InR | cytoplasm_InR | |

**Modifier**

Table 1389: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_InR | cytoplasm_InR | |

**Product**

<div align="center">

Table 1390: Properties of each product.

| Id | Name | SBO |
|----|------|-----|
| null | null | |

</div>

**Kinetic Law**

**Derived unit**  contains undeclared units

$$v_{362} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_362}\,(\text{vol}\,(\text{cytoplasm})\,,[\text{cytoplasm\_InR}],\text{kpdeg}) \quad (1728)$$

$$
\begin{aligned}
&\text{function\_362}\,(\text{vol}\,(\text{cytoplasm})\,,[\text{cytoplasm\_InR}],\text{kpdeg}) \\
&= \frac{[\text{cytoplasm\_InR}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kpdeg}}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (1729)
$$

$$
\begin{aligned}
&\text{function\_362}\,(\text{vol}\,(\text{cytoplasm})\,,[\text{cytoplasm\_InR}],\text{kpdeg}) \\
&= \frac{[\text{cytoplasm\_InR}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kpdeg}}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (1730)
$$

<div align="center">

Table 1391: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| kpdeg | kpdeg | | 0.004 | | ☑ |

</div>

## 8.363 Reaction R402

This is an irreversible reaction of one reactant forming one product.

**Name**  basal transcription of SOD2

**Reaction equation**

$$\text{null} \longrightarrow \text{nucleus\_RNA\_SOD2} \quad (1731)$$
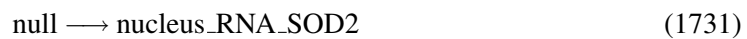
**Reactant**

Table 1392: Properties of each reactant.

| Id | Name | SBO |
|------|------|-----|
| null | null | |

## Product

Table 1393: Properties of each product.

| Id | Name | SBO |
|-----------------|-----------------|-----|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

## Kinetic Law

**Derived unit** not available

$$v_{363} = \text{function\_358}\,(\text{v})\tag{1732}$$

$$\text{function\_358}\,(\text{v}) = \text{v}\tag{1733}$$

Table 1394: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| v  | v    |     | 15.0  |      | ☑        |

## 8.364 Reaction R403

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** export of SOD2 RNA

## Reaction equation

$$\text{nucleus\_RNA\_SOD2} \xrightarrow{\text{nucleus\_RNA\_SOD2}} \text{cytoplasm\_RNA\_SOD2}\tag{1734}$$
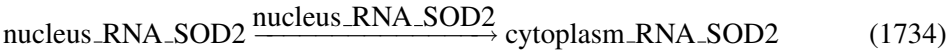
## Reactant

Table 1395: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

### Modifier

Table 1396: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| nucleus_RNA_SOD2 | nucleus_RNA_SOD2 | |

### Product

Table 1397: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_RNA_SOD2 | cytoplasm_RNA_SOD2 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{364} = \text{function\_363}\left(\text{kexp}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_RNA\_SOD2}\right]\right) \tag{1735}$$

$$\begin{aligned}\text{function\_363}&\left(\text{kexp}, \text{vol}\left(\text{nucleus}\right), \left[\text{nucleus\_RNA\_SOD2}\right]\right) \\ &= \left[\text{nucleus\_RNA\_SOD2}\right] \cdot \text{vol}\left(\text{nucleus}\right) \cdot \text{kexp}\end{aligned} \tag{1736}$$

Table 1398: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kexp | kexp | | 0.22 | | ☑ |

## 8.365 Reaction R404

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** cyto degr of SOD2 RNA

### Reaction equation

$$\text{cytoplasm\_RNA\_SOD2} \xrightarrow{\text{cytoplasm\_RNA\_SOD2}} \text{null} \tag{1737}$$

### Reactant

Table 1399: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_RNA_SOD2 | cytoplasm_RNA_SOD2 | |

### Modifier

Table 1400: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_RNA_SOD2 | cytoplasm_RNA_SOD2 | |

### Product

Table 1401: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| null | null | |

### Kinetic Law

**Derived unit**  contains undeclared units

$$v_{365} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_364}\,(\text{vol}\,(\text{cytoplasm})\,,[\text{cytoplasm\_RNA\_SOD2}],\text{kmdeg}) \tag{1738}$$

$$\begin{aligned} &\text{function\_364}\,(\text{vol}\,(\text{cytoplasm})\,,[\text{cytoplasm\_RNA\_SOD2}],\text{kmdeg}) \\ &= \frac{[\text{cytoplasm\_RNA\_SOD2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kmdeg}}{\text{vol}\,(\text{cytoplasm})} \end{aligned} \tag{1739}$$

$$\begin{aligned} &\text{function\_364}\,(\text{vol}\,(\text{cytoplasm})\,,[\text{cytoplasm\_RNA\_SOD2}],\text{kmdeg}) \\ &= \frac{[\text{cytoplasm\_RNA\_SOD2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kmdeg}}{\text{vol}\,(\text{cytoplasm})} \end{aligned} \tag{1740}$$

*Produced by SBML2LATEX*

Table 1402: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|---|---|---|---|---|---|
| kmdeg | kmdeg | | 5.622 | | ☑ |

## 8.366 Reaction R405

This is an irreversible reaction of one reactant forming one product influenced by two modifiers.

**Name** translation of SOD2

### Reaction equation

$$\text{null} \xrightarrow{\text{cytoplasm\_RNA\_SOD2, cytoplasm\_RNA\_SOD2}} \text{cytoplasm\_SOD2} \tag{1741}$$

### Reactant

Table 1403: Properties of each reactant.

| Id | Name | SBO |
|---|---|---|
| null | null | |

### Modifiers

Table 1404: Properties of each modifier.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_RNA_SOD2 | cytoplasm_RNA_SOD2 | |
| cytoplasm_RNA_SOD2 | cytoplasm_RNA_SOD2 | |

### Product

Table 1405: Properties of each product.

| Id | Name | SBO |
|---|---|---|
| cytoplasm_SOD2 | cytoplasm_SOD2 | |

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{366} = \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{function\_365}\,(\mathrm{vol}\,(\mathrm{cytoplasm})\,,[\mathrm{cytoplasm\_RNA\_SOD2}],\mathrm{ktransl}) \tag{1742}$$

$$\begin{aligned}
&\mathrm{function\_365}\,(\mathrm{vol}\,(\mathrm{cytoplasm})\,,[\mathrm{cytoplasm\_RNA\_SOD2}],\mathrm{ktransl}) \\
&= \frac{[\mathrm{cytoplasm\_RNA\_SOD2}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{ktransl}}{\mathrm{vol}\,(\mathrm{cytoplasm})}
\end{aligned} \tag{1743}$$

$$\begin{aligned}
&\mathrm{function\_365}\,(\mathrm{vol}\,(\mathrm{cytoplasm})\,,[\mathrm{cytoplasm\_RNA\_SOD2}],\mathrm{ktransl}) \\
&= \frac{[\mathrm{cytoplasm\_RNA\_SOD2}] \cdot \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{ktransl}}{\mathrm{vol}\,(\mathrm{cytoplasm})}
\end{aligned} \tag{1744}$$

Table 1406: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|----|------|-----|-------|------|----------|
| ktransl | ktransl | | 1.23 | | ☑ |

## 8.367 Reaction R406

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** degradation of SOD2 protein

**Reaction equation**

$$\mathrm{cytoplasm\_SOD2} \xrightarrow{\mathrm{cytoplasm\_SOD2}} \mathrm{null} \tag{1745}$$
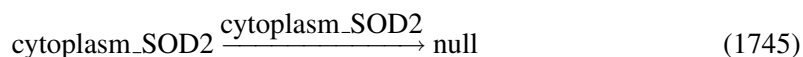
**Reactant**

Table 1407: Properties of each reactant.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_SOD2 | cytoplasm_SOD2 | |

**Modifier**

Table 1408: Properties of each modifier.

| Id | Name | SBO |
|----|------|-----|
| cytoplasm_SOD2 | cytoplasm_SOD2 | |

**Product**

Table 1409: Properties of each product.

| Id | Name | SBO |
|------|------|-----|
| null | null | |

**Kinetic Law**

**Derived unit** contains undeclared units

$$v_{367} = \text{vol}\,(\text{cytoplasm}) \cdot \text{function\_366}\,(\text{vol}\,(\text{cytoplasm}),[\text{cytoplasm\_SOD2}],\text{kpdeg}) \quad (1746)$$

$$\begin{aligned}
&\text{function\_366}\,(\text{vol}\,(\text{cytoplasm}),[\text{cytoplasm\_SOD2}],\text{kpdeg})\\
&= \frac{[\text{cytoplasm\_SOD2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kpdeg}}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (1747)$$

$$\begin{aligned}
&\text{function\_366}\,(\text{vol}\,(\text{cytoplasm}),[\text{cytoplasm\_SOD2}],\text{kpdeg})\\
&= \frac{[\text{cytoplasm\_SOD2}] \cdot \text{vol}\,(\text{cytoplasm}) \cdot \text{kpdeg}}{\text{vol}\,(\text{cytoplasm})}
\end{aligned} \quad (1748)$$

Table 1410: Properties of each parameter.

| Id | Name | SBO | Value | Unit | Constant |
|-------|-------|-----|-------|------|----------|
| kpdeg | kpdeg | | 0.002 | | ☑ |

# 9 Derived Rate Equations

When interpreted as an ordinary differential equation framework, this model implies the following set of equations for the rates of change of each species.

Identifiers for kinetic laws highlighted in gray cannot be verified to evaluate to units of SBML `substance` per `time`. As a result, some SBML interpreters may not be able to verify the consistency of the units on quantities in the model. Please check if

- parameters without an unit definition are involved or

- volume correction is necessary because the `hasOnlySubstanceUnits` flag may be set to `false` and `spacialDimensions` > 0 for certain species.

## 9.1 Species `NULL`

**Name** NULL

**SBO:0000291** empty set

**Initial amount** 0 item

This species takes part in five reactions (as a reactant in `R50f` and as a product in `R50r1`, `R50r2`, `R50r3`, `R50r4`), which do not influence its rate of change because this constant species is on the boundary of the reaction system:

$$\frac{d}{dt}\text{NULL} = 0 \tag{1749}$$

## 9.2 Species `Ins`

**Name** Ins

**Initial amount** 0 item

This species takes part in nine reactions (as a reactant in `R1f`, `R3f`, `R34f` and as a product in `R1r`, `R3r`, `R34f` and as a modifier in `R1f`, `R3f`, `R34f`), which do not influence its rate of change because this constant species is on the boundary of the reaction system:

$$\frac{d}{dt}\text{Ins} = 0 \tag{1750}$$

## 9.3 Species `InR`

**Name** InR

**Initial amount** 90000 item

This species takes part in seven reactions (as a reactant in `R1f`, `R5f` and as a product in `R1r`, `R4`, `R5r` and as a modifier in `R1f`, `R5f`).

$$\frac{d}{dt}\text{InR} = v_2 + v_6 + v_8 - v_1 - v_7 \tag{1751}$$

## 9.4 Species `Ins_InR`

**Name** Ins_InR

**Initial amount** 0 item

This species takes part in five reactions (as a reactant in `R1r`, `R2` and as a product in `R1f` and as a modifier in `R1r`, `R2`).

$$\frac{d}{dt}\text{Ins\_InR} = v_1 - v_2 - v_3 \tag{1752}$$

## 9.5 Species `Ins_InR_P`

**Name** Ins_InR_P

**Initial amount** 0 item

This species takes part in eleven reactions (as a reactant in R3f, R4, R7f and as a product in R2, R3r, R7r and as a modifier in R3f, R4, R7f, R12f, R12f).

$$\frac{d}{dt}\text{Ins\_InR\_P} = v_3 + v_5 + v_{12} - v_4 - v_6 - v_{11} \tag{1753}$$

## 9.6 Species `Ins_2_InR_P`

**Name** Ins_2_InR_P

**Initial amount** 0 item

This species takes part in eight reactions (as a reactant in R3r, R6f and as a product in R3f, R6r and as a modifier in R3r, R6f, R12f, R12f).

$$\frac{d}{dt}\text{Ins\_2\_InR\_P} = v_4 + v_{10} - v_5 - v_9 \tag{1754}$$

## 9.7 Species `cytoplasm_InR`

**Name** cytoplasm_InR

**Initial amount** 10000 item

This species takes part in eight reactions (as a reactant in R5r, R401 and as a product in R5f, R10, R11, R400 and as a modifier in R5r, R401).

$$\frac{d}{dt}\text{cytoplasm\_InR} = v_7 + v_{13} + v_{14} + v_{361} - v_8 - v_{362} \tag{1755}$$

## 9.8 Species `cytoplasm_Ins_2_InR_P`

**Name** cytoplasm_Ins_2_InR_P

**Initial amount** 0 item

This species takes part in five reactions (as a reactant in R6r, R10 and as a product in R6f and as a modifier in R6r, R10).

$$\frac{d}{dt}\text{cytoplasm\_Ins\_2\_InR\_P} = v_9 - v_{10} - v_{13} \tag{1756}$$

## 9.9 Species `cytoplasm_Ins_InR_P`

**Name** cytoplasm_Ins_InR_P

**Initial amount** 0 item

This species takes part in five reactions (as a reactant in `R7r`, `R11` and as a product in `R7f` and as a modifier in `R7r`, `R11`).

$$\frac{d}{dt}\text{cytoplasm\_Ins\_InR\_P} = v_{11} - v_{12} - v_{14} \tag{1757}$$

## 9.10 Species `InR_tot`

**Name** InR_tot

**Initial amount** 100000 item

**Involved in rule** `InR_tot`

One rule determines the species' quantity.

## 9.11 Species `InR_bound`

**Name** InR_bound

**Initial amount** 0 item

**Involved in rule** `InR_bound`

One rule determines the species' quantity.

## 9.12 Species `InR_active`

**Name** InR_active

**Initial amount** 0 item

**Involved in rule** `InR_active`

One rule determines the species' quantity.

## 9.13 Species `PTP1B`

**Name** PTP1B

**Initial amount** 100000 item

This species takes part in eleven reactions (as a reactant in `R30f` and as a product in `R30r` and as a modifier in `R4`, `R4`, `R10`, `R10`, `R11`, `R11`, `R30f`, `R12r`, `R12r`).

$$\frac{d}{dt}\text{PTP1B} = v_{26} - v_{25} \tag{1758}$$

## 9.14 Species `IRS1_TyrP_PI3K`

**Name** IRS1_TyrP_PI3K

**Initial amount** 0 item

This species takes part in five reactions (as a reactant in `R13r` and as a product in `R13f` and as a modifier in `R14f`, `R14f`, `R13r`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{IRS1\_TyrP\_PI3K} = v_{46} - v_{47} \tag{1759}$$

## 9.15 Species `PI345P3`

**Name** PI345P3

**Initial amount** 1000 item

This species takes part in seven reactions (as a reactant in `R14r` and as a product in `R14f` and as a modifier in `R14r`, `R16f`, `R16f`, `R17f`, `R17f`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{PI345P3} = v_{15} - v_{16} \tag{1760}$$

## 9.16 Species `PIP2`

**Name** PIP2

**Initial amount** 200000 item

This species takes part in three reactions (as a reactant in `R14f` and as a product in `R14r` and as a modifier in `R14f`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{PIP2} = v_{16} - v_{15} \tag{1761}$$

## 9.17 Species `PI345P3_mol`

**Name** PI345P3_mol

**Initial amount** 1000000 item

**Involved in rule** `PI345P3_mol`

One rule determines the species' quantity.

## 9.18 Species `PIP2_mol`

**Name** PIP2_mol

**Initial amount** $2 \cdot 10^8$ item

**Involved in rule** `PIP2_mol`

One rule determines the species' quantity.

## 9.19 Species `Akt`

**Name** Akt

**Initial amount** 100000 item

This species takes part in three reactions (as a reactant in `R16f` and as a product in `R16r` and as a modifier in `R16f`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Akt} = v_{18} - v_{17} \tag{1762}$$

## 9.20 Species `Akt_P2`

**Name** Akt_P2

**Initial amount** 0 item

This species takes part in 53 reactions (as a reactant in `R16r` and as a product in `R16f` and as a modifier in `R16r`, `R16a_f`, `R16a_f`, `R165`, `R165`, `R166`, `R166`, `R167`, `R167`, `R168`, `R168`, `R169`, `R169`, `R170`, `R170`, `R171`, `R171`, `R172`, `R172`, `R173`, `R173`, `R174`, `R174`, `R175`, `R175`, `R176`, `R176`, `R177`, `R177`, `R178`, `R178`, `R179`, `R179`, `R180`, `R180`, `R181`, `R181`, `R182`, `R182`, `R183`, `R183`, `R184`, `R184`, `R185`, `R185`, `R186`, `R186`, `R187`, `R187`, `R188`, `R188`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Akt\_P2} = v_{17} - v_{18} \tag{1763}$$

## 9.21 Species `PKC`

**Name** PKC

**Initial amount** 100000 item

This species takes part in three reactions (as a reactant in `R17f` and as a product in `R17r` and as a modifier in `R17f`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PKC} = v_{22} - v_{21} \tag{1764}$$

## 9.22 Species `PKC_P`

**Name** PKC_P

**Initial amount** 0 item

This species takes part in seven reactions (as a reactant in `R17r` and as a product in `R17f` and as a modifier in `R17r`, `R12_a_f`, `R12_a_f`, `R12_b_f`, `R12_b_f`).

$$\frac{d}{dt}\text{PKC\_P} = v_{21} - v_{22} \tag{1765}$$

## 9.23 Species `AS160`

**Name** AS160

**Initial amount** 20000 item

This species takes part in three reactions (as a reactant in `R16a_f` and as a product in `R16a_r` and as a modifier in `R16a_f`).

$$\frac{d}{dt}\text{AS160} = v_{20} - v_{19} \tag{1766}$$

## 9.24 Species `AS160_P`

**Name** AS160_P

**Initial amount** 0 item

This species takes part in five reactions (as a reactant in `R16a_r` and as a product in `R16a_f` and as a modifier in `R16a_r`, `R20f`, `R20f`).

$$\frac{d}{dt}\text{AS160\_P} = v_{19} - v_{20} \tag{1767}$$

## 9.25 Species `cytoplasm_GLUT4`

**Name** cytoplasm_GLUT4

**Initial amount** 96000 item

This species takes part in three reactions (as a reactant in `R20f` and as a product in `R20r` and as a modifier in `R20f`).

$$\frac{d}{dt}\text{cytoplasm\_GLUT4} = v_{24} - v_{23} \tag{1768}$$

## 9.26 Species `cellsurface_GLUT4`

**Name** cellsurface_GLUT4

**Initial amount** 4000 item

This species takes part in three reactions (as a reactant in `R20r` and as a product in `R20f` and as a modifier in `R20r`).

$$\frac{d}{dt}\text{cellsurface\_GLUT4} = v_{23} - v_{24} \tag{1769}$$

## 9.27 Species `PTEN`

**Name** PTEN

**Initial amount** 100000 item

This species takes part in five reactions (as a reactant in `R31f` and as a product in `R31r` and as a modifier in `R14r`, `R14r`, `R31f`).

$$\frac{d}{dt}\text{PTEN} = v_{28} - v_{27} \tag{1770}$$

## 9.28 Species `PP2A`

**Name** PP2A

**Initial amount** 500000 item

This species takes part in 154 reactions (as a modifier in `R16r`, `R16r`, `R16a_r`, `R16a_r`, `R17r`, `R17r`, `R12_a_r`, `R12_a_r`, `R12_b_r`, `R12_b_r`, `R213`, `R213`, `R214`, `R214`, `R215`, `R215`, `R216`, `R216`, `R217`, `R217`, `R218`, `R218`, `R219`, `R219`, `R220`, `R220`, `R221`, `R221`, `R222`, `R222`, `R223`, `R223`, `R224`, `R224`, `R225`, `R225`, `R226`, `R226`, `R227`, `R227`, `R228`, `R228`, `R229`, `R229`, `R230`, `R230`, `R231`, `R231`, `R232`, `R232`, `R233`, `R233`, `R234`, `R234`, `R235`, `R235`, `R236`, `R236`, `R249`, `R249`, `R250`, `R250`, `R251`, `R251`, `R252`, `R252`, `R253`, `R253`, `R254`, `R254`, `R255`, `R255`, `R256`, `R256`, `R257`, `R257`, `R258`, `R258`, `R259`, `R259`, `R260`, `R260`, `R273`, `R273`, `R274`, `R274`, `R275`, `R275`, `R276`, `R276`, `R277`, `R277`, `R278`, `R278`, `R279`, `R279`, `R280`, `R280`, `R281`, `R281`, `R282`, `R282`, `R283`, `R283`, `R284`, `R284`, `R291`, `R291`, `R292`, `R292`, `R293`, `R293`, `R294`, `R294`, `R295`, `R295`, `R296`, `R296`, `R303`, `R303`, `R304`, `R304`, `R305`, `R305`, `R306`, `R306`, `R307`, `R307`, `R308`, `R308`, `R315`, `R315`, `R316`, `R316`, `R317`, `R317`, `R318`, `R318`, `R319`, `R319`, `R320`, `R320`, `R327`, `R327`, `R328`, `R328`, `R329`, `R329`, `R330`, `R330`, `R331`, `R331`, `R332`, `R332`).

$$\frac{d}{dt}\text{PP2A} = 0 \tag{1771}$$

## 9.29 Species `extracellular_ROS`

**Name** extracellular_ROS

**Initial amount** 0 item

This species takes part in three reactions (as a reactant in `R37f` and as a product in `R37r` and as a modifier in `R37f`), which do not influence its rate of change because this constant species is on the boundary of the reaction system:

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{extracellular\_ROS} = 0 \qquad (1772)$$

## 9.30 Species `PTP1B_ox`

**Name** PTP1B_ox

**Initial amount** 0 item

This species takes part in three reactions (as a reactant in `R30r` and as a product in `R30f` and as a modifier in `R30r`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{PTP1B\_ox} = v_{25} - v_{26} \qquad (1773)$$

## 9.31 Species `PTP1B_plus_PTP1B_ox`

**Name** PTP1B_plus_PTP1B_ox

**Initial amount** 100000 item

**Involved in rule** `PTP1B_plus_PTP1B_ox`

One rule determines the species' quantity.

## 9.32 Species `PTEN_ox`

**Name** PTEN_ox

**Initial amount** 0 item

This species takes part in three reactions (as a reactant in `R31r` and as a product in `R31f` and as a modifier in `R31r`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{PTEN\_ox} = v_{27} - v_{28} \qquad (1774)$$

## 9.33 Species `PTEN_plus_PTEN_ox`

**Name** PTEN_plus_PTEN_ox

**Initial amount** 100000 item

**Involved in rule** `PTEN_plus_PTEN_ox`

One rule determines the species' quantity.

## 9.34 Species `ROS`

**Name** ROS

**Initial amount** 0 item

This species takes part in 22 reactions (as a reactant in R30f, R31f, R35r, R37r, R32f and as a product in R30f, R31f, R35f, R36f, R37f, R32f and as a modifier in R30f, R31f, R35r, R37r, R38f, R38f, R42f, R42f, R43f, R43f, R32f).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{ROS} = v_{25} + v_{27} + v_{33} + v_{35} + v_{36} + v_{59} - v_{25} - v_{27} - v_{34} - v_{37} - v_{59} \quad (1775)$$

## 9.35 Species `GSH`

**Name** GSH

**Initial amount** 100 item

This species takes part in twelve reactions (as a reactant in R30r, R31r, R38f, R32r and as a product in R30r, R31r, R38r, R32r and as a modifier in R30r, R31r, R38f, R32r).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{GSH} = v_{26} + v_{28} + v_{39} + v_{60} - v_{26} - v_{28} - v_{38} - v_{60} \quad (1776)$$

## 9.36 Species `GSSG`

**Name** GSSG

**Initial amount** 0 item

This species takes part in three reactions (as a reactant in R38r and as a product in R38f and as a modifier in R38r).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{GSSG} = v_{38} - v_{39} \quad (1777)$$

## 9.37 Species `cytoplasm_SOD2`

**Name** cytoplasm_SOD2

**Initial amount** 41700 item

This species takes part in six reactions (as a reactant in R35r, R406 and as a product in R35r, R405 and as a modifier in R35r, R406).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{cytoplasm\_SOD2} = v_{34} + v_{366} - v_{34} - v_{367} \tag{1778}$$

## 9.38 Species `NOX_inact`

**Name** NOX_inact

**Initial amount** 100 item

This species takes part in four reactions (as a reactant in R34f and as a product in R34r2, R34r3 and as a modifier in R34f).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{NOX\_inact} = v_{31} + v_{32} - v_{29} \tag{1779}$$

## 9.39 Species `NOX`

**Name** NOX

**Initial amount** 0 item

This species takes part in eight reactions (as a reactant in R34r1, R34r2, R35f and as a product in R34f, R35f and as a modifier in R34r1, R34r2, R35f).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{NOX} = v_{29} + v_{33} - v_{30} - v_{31} - v_{33} \tag{1780}$$

## 9.40 Species `NOX_deact`

**Name** NOX_deact

**Initial amount** 0 item

This species takes part in three reactions (as a reactant in R34r3 and as a product in R34r1 and as a modifier in R34r3).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{NOX\_deact} = v_{30} - v_{32} \tag{1781}$$

### 9.41 Species `NOX_total`

**Name** NOX_total

**Initial amount** 100 item

**Involved in rule** `NOX_total`

One rule determines the species' quantity.

### 9.42 Species `Mt`

**Name** Mt

**Initial amount** 50 item

This species takes part in three reactions (as a reactant in `R36f` and as a product in `R36f` and as a modifier in `R36f`), which do not influence its rate of change because this constant species is on the boundary of the reaction system:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Mt} = 0 \tag{1782}$$

### 9.43 Species `IRS1`

**Name** IRS1

**Initial amount** 100000 item

This species takes part in 13 reactions (as a reactant in `R12f`, `R12_a_f`, `R50r1`, `R51f`, `R52f` and as a product in `R12r`, `R12_a_r`, `R50f` and as a modifier in `R12f`, `R12_a_f`, `R50r1`, `R51f`, `R52f`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{IRS1} = v_{41} + v_{43} + v_{48} - v_{40} - v_{42} - v_{49} - v_{53} - v_{54} \tag{1783}$$

### 9.44 Species `IRS1_TyrP`

**Name** IRS1_TyrP

**Initial amount** 0 item

This species takes part in eleven reactions (as a reactant in `R12r`, `R12_b_f`, `R13f`, `R50r2` and as a product in `R12f`, `R12_b_r`, `R13r` and as a modifier in `R12r`, `R12_b_f`, `R13f`, `R50r2`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{IRS1\_TyrP} = v_{40} + v_{45} + v_{47} - v_{41} - v_{44} - v_{46} - v_{50} \tag{1784}$$

## 9.45 Species `IRS1_PolySerP`

**Name** IRS1_PolySerP

**Initial amount** 0 item

This species takes part in seven reactions (as a reactant in `R12_a_r`, `R50r3` and as a product in `R12_a_f`, `R51f`, `R52f` and as a modifier in `R12_a_r`, `R50r3`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{IRS1\_PolySerP} = v_{42} + v_{53} + v_{54} - v_{43} - v_{51} \tag{1785}$$

## 9.46 Species `IRS1_TyrP_PolySerP`

**Name** IRS1_TyrP_PolySerP

**Initial amount** 0 item

This species takes part in five reactions (as a reactant in `R12_b_r`, `R50r4` and as a product in `R12_b_f` and as a modifier in `R12_b_r`, `R50r4`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{IRS1\_TyrP\_PolySerP} = v_{44} - v_{45} - v_{52} \tag{1786}$$

## 9.47 Species `IRS_total`

**Name** IRS_total

**Initial amount** 100000 item

**Involved in rule** `IRS_total`

One rule determines the species' quantity.

## 9.48 Species `PI3K`

**Name** PI3K

**Initial amount** 10000 item

This species takes part in three reactions (as a reactant in `R13f` and as a product in `R13r` and as a modifier in `R13f`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{PI3K} = v_{47} - v_{46} \tag{1787}$$

## 9.49 Species `JNK_P`

**Name** JNK_P

**Initial amount** 0 item

This species takes part in 53 reactions (as a reactant in R42r and as a product in R42f and as a modifier in R52f, R52f, R42r, R285, R285, R286, R286, R287, R287, R288, R288, R289, R289, R290, R290, R297, R297, R298, R298, R299, R299, R300, R300, R301, R301, R302, R302, R309, R309, R310, R310, R311, R311, R312, R312, R313, R313, R314, R314, R321, R321, R322, R322, R323, R323, R324, R324, R325, R325, R326, R326).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{JNK\_P} = v_{55} - v_{56} \tag{1788}$$

## 9.50 Species `IKK_P`

**Name** IKK_P

**Initial amount** 0 item

This species takes part in 53 reactions (as a reactant in R43r and as a product in R43f and as a modifier in R51f, R51f, R43r, R237, R237, R238, R238, R239, R239, R240, R240, R241, R241, R242, R242, R243, R243, R244, R244, R245, R245, R246, R246, R247, R247, R248, R248, R261, R261, R262, R262, R263, R263, R264, R264, R265, R265, R266, R266, R267, R267, R268, R268, R269, R269, R270, R270, R271, R271, R272, R272).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{IKK\_P} = v_{57} - v_{58} \tag{1789}$$

## 9.51 Species `JNK`

**Name** JNK

**Initial amount** 16000 item

This species takes part in three reactions (as a reactant in R42f and as a product in R42r and as a modifier in R42f).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{JNK} = v_{56} - v_{55} \tag{1790}$$

## 9.52 Species `JNK_plus_JNK_P`

**Name** JNK_plus_JNK_P

**Initial amount** 16000 item

**Involved in rule** `JNK_plus_JNK_P`

One rule determines the species' quantity.

## 9.53 Species IKK

**Name** IKK

**Initial amount** 2000 item

This species takes part in three reactions (as a reactant in R43f and as a product in R43r and as a modifier in R43f).

$$\frac{d}{dt}IKK = v_{58} - v_{57} \tag{1791}$$

## 9.54 Species IKK_plus_IKK_P

**Name** IKK_plus_IKK_P

**Initial amount** 2000 item

**Involved in rule** IKK_plus_IKK_P

One rule determines the species' quantity.

## 9.55 Species DUSP

**Name** DUSP

**Initial amount** 100000 item

This species takes part in seven reactions (as a reactant in R32f and as a product in R32r and as a modifier in R42r, R42r, R43r, R43r, R32f).

$$\frac{d}{dt}DUSP = v_{60} - v_{59} \tag{1792}$$

## 9.56 Species DUSP_ox

**Name** DUSP_ox

**Initial amount** 0 item

This species takes part in three reactions (as a reactant in R32r and as a product in R32f and as a modifier in R32r).

$$\frac{d}{dt}DUSP\_ox = v_{59} - v_{60} \tag{1793}$$

## 9.57 Species `DUSP_plus_DUSP_ox`

**Name** DUSP_plus_DUSP_ox

**Initial amount** 100000 item

**Involved in rule** `DUSP_plus_DUSP_ox`

One rule determines the species' quantity.

## 9.58 Species `null`

**Name** null

**SBO:0000291** empty set

**Initial amount** 0 item

This species takes part in 41 reactions (as a reactant in R100, R365, R366, R367, R368, R369, R370, R371, R372, R373, R374, R375, R376, R377, R378, R379, R380, R381, R382, R383, R384, R385, R386, R387, R388, R389, R390, R391, R392, R393, R394, R395, R396, R397, R400, R402, R405 and as a product in R399, R401, R404, R406), which do not influence its rate of change because this constant species is on the boundary of the reaction system:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{null} = 0 \tag{1794}$$

## 9.59 Species `degr_Foxo1`

**Name** degr_Foxo1

**SBO:0000291** empty set

**Initial amount** 0 item

This species takes part in eight reactions (as a product in R357, R358, R359, R360, R361, R362, R363, R364).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{degr\_Foxo1} = v_{318} + v_{319} + v_{320} + v_{321} + v_{322} + v_{323} + v_{324} + v_{325} \tag{1795}$$

## 9.60 Species `cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0`

**Name** cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb0

**Initial amount** 1000 item

This species takes part in 17 reactions (as a reactant in R101, R165, R189, R237, R285, R333 and as a product in R100, R102, R213, R249, R291 and as a modifier in R101, R165, R189, R237, R285, R333).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} = v_{61} + v_{63} + v_{174} + v_{210} + v_{252} - v_{62} \qquad (1796)$$
$$- v_{126} - v_{150} - v_{198} - v_{246} - v_{294}$$

## 9.61 Species `nucleus_Foxo1_Pa0_Pd0_Pe0_pUb0`

**Name** nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R102, R103, R166, R190, R238, R286, R334 and as a product in R101, R104, R214, R250, R292 and as a modifier in R102, R103, R166, R190, R238, R286, R334).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} = v_{62} + v_{65} + v_{175} + v_{211} + v_{253} - v_{63} \qquad (1797)$$
$$- v_{64} - v_{127} - v_{151} - v_{199} - v_{247} - v_{295}$$

## 9.62 Species `dnabound_Foxo1_Pa0_Pd0_Pe0_pUb0`

**Name** dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0

**Initial amount** 0 item

This species takes part in 20 reactions (as a reactant in R104, R167, R191, R239, R287, R335 and as a product in R103, R215, R251, R293 and as a modifier in R104, R167, R191, R239, R287, R335, R365, R365, R366, R366).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb0} = v_{64} + v_{176} + v_{212} + v_{254} - v_{65} \qquad (1798)$$
$$- v_{128} - v_{152} - v_{200} - v_{248} - v_{296}$$

## 9.63 Species `cytoplasm_Foxo1_Pa0_Pd0_Pe0_pUb1`

**Name** cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1

**Initial amount** 0 item

This species takes part in 17 reactions (as a reactant in R105, R168, R192, R240, R288, R357 and as a product in R106, R216, R252, R294, R333 and as a modifier in R105, R168, R192, R240, R288, R357).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} = v_{67} + v_{177} + v_{213} + v_{255} + v_{294} - v_{66} \qquad (1799)$$
$$- v_{129} - v_{153} - v_{201} - v_{249} - v_{318}$$

## 9.64 Species `nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1`

**Name** nucleus_Foxo1_Pa0_Pd0_Pe0_pUb1

**Initial amount** 0 item

This species takes part in 18 reactions (as a reactant in R106, R107, R169, R193, R241, R289 and as a product in R105, R108, R217, R253, R295, R334 and as a modifier in R106, R107, R169, R193, R241, R289).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} = v_{66} + v_{69} + v_{178} + v_{214} + v_{256} + v_{295} \quad (1800)$$
$$- v_{67} - v_{68} - v_{130} - v_{154} - v_{202} - v_{250}$$

## 9.65 Species `dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1`

**Name** dnabound_Foxo1_Pa0_Pd0_Pe0_pUb1

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R108, R170, R194, R242, R290 and as a product in R107, R218, R254, R296, R335 and as a modifier in R108, R170, R194, R242, R290, R367, R367, R368, R368).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe0\_pUb1} = v_{68} + v_{179} + v_{215} + v_{257} + v_{296} \quad (1801)$$
$$- v_{69} - v_{131} - v_{155} - v_{203} - v_{251}$$

## 9.66 Species `cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0`

**Name** cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb0

**Initial amount** 0 item

This species takes part in 16 reactions (as a reactant in R109, R171, R195, R243, R291, R336 and as a product in R110, R219, R255, R285 and as a modifier in R109, R171, R195, R243, R291, R336).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} = v_{71} + v_{180} + v_{216} + v_{246} - v_{70} \quad (1802)$$
$$- v_{132} - v_{156} - v_{204} - v_{252} - v_{297}$$

## 9.67 Species `nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0`

**Name** nucleus_Foxo1_Pa0_Pd0_Pe1_pUb0

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R110, R111, R172, R196, R244, R292, R337 and as a product in R109, R112, R220, R256, R286 and as a modifier in R110, R111, R172, R196, R244, R292, R337).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} = v_{70} + v_{73} + v_{181} + v_{217} + v_{247} - v_{71} \qquad (1803)$$
$$- v_{72} - v_{133} - v_{157} - v_{205} - v_{253} - v_{298}$$

## 9.68 Species `dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0`

**Name** dnabound_Foxo1_Pa0_Pd0_Pe1_pUb0

**Initial amount** 0 item

This species takes part in 20 reactions (as a reactant in R112, R173, R197, R245, R293, R338 and as a product in R111, R221, R257, R287 and as a modifier in R112, R173, R197, R245, R293, R338, R369, R369, R370, R370).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb0} = v_{72} + v_{182} + v_{218} + v_{248} - v_{73} \qquad (1804)$$
$$- v_{134} - v_{158} - v_{206} - v_{254} - v_{299}$$

## 9.69 Species `cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1`

**Name** cytoplasm_Foxo1_Pa0_Pd0_Pe1_pUb1

**Initial amount** 0 item

This species takes part in 17 reactions (as a reactant in R113, R174, R198, R246, R294, R358 and as a product in R114, R222, R258, R288, R336 and as a modifier in R113, R174, R198, R246, R294, R358).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{cytoplasm\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} = v_{75} + v_{183} + v_{219} + v_{249} + v_{297} - v_{74} \qquad (1805)$$
$$- v_{135} - v_{159} - v_{207} - v_{255} - v_{319}$$

## 9.70 Species `nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1`

**Name** nucleus_Foxo1_Pa0_Pd0_Pe1_pUb1

**Initial amount** 0 item

This species takes part in 18 reactions (as a reactant in R114, R115, R175, R199, R247, R295 and as a product in R113, R116, R223, R259, R289, R337 and as a modifier in R114, R115, R175, R199, R247, R295).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{nucleus\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} = v_{74} + v_{77} + v_{184} + v_{220} + v_{250} + v_{298} \quad (1806)$$
$$- v_{75} - v_{76} - v_{136} - v_{160} - v_{208} - v_{256}$$

## 9.71 Species `dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1`

**Name** dnabound_Foxo1_Pa0_Pd0_Pe1_pUb1

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R116, R176, R200, R248, R296 and as a product in R115, R224, R260, R290, R338 and as a modifier in R116, R176, R200, R248, R296, R371, R371, R372, R372).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{dnabound\_Foxo1\_Pa0\_Pd0\_Pe1\_pUb1} = v_{76} + v_{185} + v_{221} + v_{251} + v_{299} \quad (1807)$$
$$- v_{77} - v_{137} - v_{161} - v_{209} - v_{257}$$

## 9.72 Species `cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0`

**Name** cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb0

**Initial amount** 0 item

This species takes part in 16 reactions (as a reactant in R117, R177, R201, R249, R297, R339 and as a product in R118, R225, R237, R303 and as a modifier in R117, R177, R201, R249, R297, R339).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} = v_{79} + v_{186} + v_{198} + v_{264} - v_{78} \quad (1808)$$
$$- v_{138} - v_{162} - v_{210} - v_{258} - v_{300}$$

*Produced by SBML2LATEX*

## 9.73 Species `nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0`

**Name** nucleus_Foxo1_Pa0_Pd1_Pe0_pUb0

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R118, R119, R178, R202, R250, R298, R340 and as a product in R117, R120, R226, R238, R304 and as a modifier in R118, R119, R178, R202, R250, R298, R340).

$$
\frac{d}{dt}\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} = v_{78} + v_{81} + v_{187} + v_{199} + v_{265} - v_{79} \quad (1809)
$$
$$
- v_{80} - v_{139} - v_{163} - v_{211} - v_{259} - v_{301}
$$

## 9.74 Species `dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0`

**Name** dnabound_Foxo1_Pa0_Pd1_Pe0_pUb0

**Initial amount** 0 item

This species takes part in 20 reactions (as a reactant in R120, R179, R203, R251, R299, R341 and as a product in R119, R227, R239, R305 and as a modifier in R120, R179, R203, R251, R299, R341, R373, R373, R374, R374).

$$
\frac{d}{dt}\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb0} = v_{80} + v_{188} + v_{200} + v_{266} - v_{81} \quad (1810)
$$
$$
- v_{140} - v_{164} - v_{212} - v_{260} - v_{302}
$$

## 9.75 Species `cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1`

**Name** cytoplasm_Foxo1_Pa0_Pd1_Pe0_pUb1

**Initial amount** 0 item

This species takes part in 17 reactions (as a reactant in R121, R180, R204, R252, R300, R359 and as a product in R122, R228, R240, R306, R339 and as a modifier in R121, R180, R204, R252, R300, R359).

$$
\frac{d}{dt}\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} = v_{83} + v_{189} + v_{201} + v_{267} + v_{300} - v_{82} \quad (1811)
$$
$$
- v_{141} - v_{165} - v_{213} - v_{261} - v_{320}
$$

### 9.76 Species `nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1`

**Name** nucleus_Foxo1_Pa0_Pd1_Pe0_pUb1

**Initial amount** 0 item

This species takes part in 18 reactions (as a reactant in R122, R123, R181, R205, R253, R301 and as a product in R121, R124, R229, R241, R307, R340 and as a modifier in R122, R123, R181, R205, R253, R301).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} = v_{82} + v_{85} + v_{190} + v_{202} + v_{268} + v_{301} \qquad (1812)$$
$$- v_{83} - v_{84} - v_{142} - v_{166} - v_{214} - v_{262}$$

### 9.77 Species `dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1`

**Name** dnabound_Foxo1_Pa0_Pd1_Pe0_pUb1

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R124, R182, R206, R254, R302 and as a product in R123, R230, R242, R308, R341 and as a modifier in R124, R182, R206, R254, R302, R375, R375, R376, R376).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe0\_pUb1} = v_{84} + v_{191} + v_{203} + v_{269} + v_{302} \qquad (1813)$$
$$- v_{85} - v_{143} - v_{167} - v_{215} - v_{263}$$

### 9.78 Species `cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0`

**Name** cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb0

**Initial amount** 0 item

This species takes part in 16 reactions (as a reactant in R125, R183, R207, R255, R303, R342 and as a product in R126, R231, R243, R297 and as a modifier in R125, R183, R207, R255, R303, R342).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} = v_{87} + v_{192} + v_{204} + v_{258} - v_{86} \qquad (1814)$$
$$- v_{144} - v_{168} - v_{216} - v_{264} - v_{303}$$

## 9.79 Species `nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0`

**Name** nucleus_Foxo1_Pa0_Pd1_Pe1_pUb0

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R126, R127, R184, R208, R256, R304, R343 and as a product in R125, R128, R232, R244, R298 and as a modifier in R126, R127, R184, R208, R256, R304, R343).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} = v_{86} + v_{89} + v_{193} + v_{205} + v_{259} - v_{87} \quad (1815)$$
$$- v_{88} - v_{145} - v_{169} - v_{217} - v_{265} - v_{304}$$

## 9.80 Species `dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0`

**Name** dnabound_Foxo1_Pa0_Pd1_Pe1_pUb0

**Initial amount** 0 item

This species takes part in 20 reactions (as a reactant in R128, R185, R209, R257, R305, R344 and as a product in R127, R233, R245, R299 and as a modifier in R128, R185, R209, R257, R305, R344, R377, R377, R378, R378).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb0} = v_{88} + v_{194} + v_{206} + v_{260} - v_{89} \quad (1816)$$
$$- v_{146} - v_{170} - v_{218} - v_{266} - v_{305}$$

## 9.81 Species `cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1`

**Name** cytoplasm_Foxo1_Pa0_Pd1_Pe1_pUb1

**Initial amount** 0 item

This species takes part in 17 reactions (as a reactant in R129, R186, R210, R258, R306, R360 and as a product in R130, R234, R246, R300, R342 and as a modifier in R129, R186, R210, R258, R306, R360).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{cytoplasm\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} = v_{91} + v_{195} + v_{207} + v_{261} + v_{303} - v_{90} \quad (1817)$$
$$- v_{147} - v_{171} - v_{219} - v_{267} - v_{321}$$

## 9.82 Species `nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1`

**Name** nucleus_Foxo1_Pa0_Pd1_Pe1_pUb1

**Initial amount** 0 item

This species takes part in 18 reactions (as a reactant in R130, R131, R187, R211, R259, R307 and as a product in R129, R132, R235, R247, R301, R343 and as a modifier in R130, R131, R187, R211, R259, R307).

$$
\frac{d}{dt} \text{nucleus\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} = v_{90} + v_{93} + v_{196} + v_{208} + v_{262} + v_{304} \tag{1818}
$$
$$
- v_{91} - v_{92} - v_{148} - v_{172} - v_{220} - v_{268}
$$

## 9.83 Species `dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1`

**Name** dnabound_Foxo1_Pa0_Pd1_Pe1_pUb1

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R132, R188, R212, R260, R308 and as a product in R131, R236, R248, R302, R344 and as a modifier in R132, R188, R212, R260, R308, R379, R379, R380, R380).

$$
\frac{d}{dt} \text{dnabound\_Foxo1\_Pa0\_Pd1\_Pe1\_pUb1} = v_{92} + v_{197} + v_{209} + v_{263} + v_{305} \tag{1819}
$$
$$
- v_{93} - v_{149} - v_{173} - v_{221} - v_{269}
$$

## 9.84 Species `cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0`

**Name** cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb0

**Initial amount** 0 item

This species takes part in 15 reactions (as a reactant in R133, R213, R261, R309, R345 and as a product in R134, R165, R189, R273, R315 and as a modifier in R133, R213, R261, R309, R345).

$$
\frac{d}{dt} \text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} = v_{95} + v_{126} + v_{150} + v_{234} + v_{276} \tag{1820}
$$
$$
- v_{94} - v_{174} - v_{222} - v_{270} - v_{306}
$$

## 9.85 Species `nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0`

**Name** nucleus_Foxo1_Pa1_Pd0_Pe0_pUb0

**Initial amount** 0 item

This species takes part in 18 reactions (as a reactant in R134, R135, R214, R262, R310, R346 and as a product in R133, R136, R166, R190, R274, R316 and as a modifier in R134, R135, R214, R262, R310, R346).

$$\frac{d}{dt}\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} = v_{94} + v_{97} + v_{127} + v_{151} + v_{235} + v_{277} \quad (1821)$$
$$- v_{95} - v_{96} - v_{175} - v_{223} - v_{271} - v_{307}$$

## 9.86 Species `dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0`

**Name** dnabound_Foxo1_Pa1_Pd0_Pe0_pUb0

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R136, R215, R263, R311, R347 and as a product in R135, R167, R191, R275, R317 and as a modifier in R136, R215, R263, R311, R347, R381, R381, R382, R382).

$$\frac{d}{dt}\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb0} = v_{96} + v_{128} + v_{152} + v_{236} + v_{278} \quad (1822)$$
$$- v_{97} - v_{176} - v_{224} - v_{272} - v_{308}$$

## 9.87 Species `cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1`

**Name** cytoplasm_Foxo1_Pa1_Pd0_Pe0_pUb1

**Initial amount** 0 item

This species takes part in 16 reactions (as a reactant in R137, R216, R264, R312, R361 and as a product in R138, R168, R192, R276, R318, R345 and as a modifier in R137, R216, R264, R312, R361).

$$\frac{d}{dt}\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} = v_{99} + v_{129} + v_{153} + v_{237} + v_{279} + v_{306} \quad (1823)$$
$$- v_{98} - v_{177} - v_{225} - v_{273} - v_{322}$$

## 9.88 Species `nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1`

**Name** nucleus_Foxo1_Pa1_Pd0_Pe0_pUb1

**Initial amount** 0 item

This species takes part in 17 reactions (as a reactant in R138, R139, R217, R265, R313 and as a product in R137, R140, R169, R193, R277, R319, R346 and as a modifier in R138, R139, R217, R265, R313).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} = v_{98} + v_{101} + v_{130} + v_{154} + v_{238} + v_{280} \quad (1824)$$
$$+ v_{307} - v_{99} - v_{100} - v_{178} - v_{226} - v_{274}$$

## 9.89 Species `dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1`

**Name** dnabound_Foxo1_Pa1_Pd0_Pe0_pUb1

**Initial amount** 0 item

This species takes part in 18 reactions (as a reactant in R140, R218, R266, R314 and as a product in R139, R170, R194, R278, R320, R347 and as a modifier in R140, R218, R266, R314, R383, R383, R384, R384).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe0\_pUb1} = v_{100} + v_{131} + v_{155} + v_{239} + v_{281} \quad (1825)$$
$$+ v_{308} - v_{101} - v_{179} - v_{227} - v_{275}$$

## 9.90 Species `cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0`

**Name** cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb0

**Initial amount** 0 item

This species takes part in 15 reactions (as a reactant in R141, R219, R267, R315, R348 and as a product in R142, R171, R195, R279, R309 and as a modifier in R141, R219, R267, R315, R348).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} = v_{103} + v_{132} + v_{156} + v_{240} + v_{270} \quad (1826)$$
$$- v_{102} - v_{180} - v_{228} - v_{276} - v_{309}$$

*Produced by* SBML2LATEX

### 9.91 Species `nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0`

**Name** nucleus_Foxo1_Pa1_Pd0_Pe1_pUb0

**Initial amount** 0 item

This species takes part in 18 reactions (as a reactant in R142, R143, R220, R268, R316, R349 and as a product in R141, R144, R172, R196, R280, R310 and as a modifier in R142, R143, R220, R268, R316, R349).

$$\frac{d}{dt}\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} = v_{102} + v_{105} + v_{133} + v_{157} + v_{241} + v_{271}$$
$$- v_{103} - v_{104} - v_{181} - v_{229} - v_{277} - v_{310}$$

(1827)

### 9.92 Species `dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0`

**Name** dnabound_Foxo1_Pa1_Pd0_Pe1_pUb0

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R144, R221, R269, R317, R350 and as a product in R143, R173, R197, R281, R311 and as a modifier in R144, R221, R269, R317, R350, R385, R385, R386, R386).

$$\frac{d}{dt}\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb0} = v_{104} + v_{134} + v_{158} + v_{242} + v_{272}$$
$$- v_{105} - v_{182} - v_{230} - v_{278} - v_{311}$$

(1828)

### 9.93 Species `cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1`

**Name** cytoplasm_Foxo1_Pa1_Pd0_Pe1_pUb1

**Initial amount** 0 item

This species takes part in 16 reactions (as a reactant in R145, R222, R270, R318, R362 and as a product in R146, R174, R198, R282, R312, R348 and as a modifier in R145, R222, R270, R318, R362).

$$\frac{d}{dt}\text{cytoplasm\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} = v_{107} + v_{135} + v_{159} + v_{243} + v_{273} + v_{309}$$
$$- v_{106} - v_{183} - v_{231} - v_{279} - v_{323}$$

(1829)

## 9.94 Species `nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1`

**Name** nucleus_Foxo1_Pa1_Pd0_Pe1_pUb1

**Initial amount** 0 item

This species takes part in 17 reactions (as a reactant in R146, R147, R223, R271, R319 and as a product in R145, R148, R175, R199, R283, R313, R349 and as a modifier in R146, R147, R223, R271, R319).

$$
\frac{d}{dt}\text{nucleus\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} = v_{106} + v_{109} + v_{136} + v_{160} + v_{244} + v_{274}
$$
$$
+ v_{310} - v_{107} - v_{108} - v_{184} - v_{232} - v_{280}
$$
(1830)

## 9.95 Species `dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1`

**Name** dnabound_Foxo1_Pa1_Pd0_Pe1_pUb1

**Initial amount** 0 item

This species takes part in 18 reactions (as a reactant in R148, R224, R272, R320 and as a product in R147, R176, R200, R284, R314, R350 and as a modifier in R148, R224, R272, R320, R387, R387, R388, R388).

$$
\frac{d}{dt}\text{dnabound\_Foxo1\_Pa1\_Pd0\_Pe1\_pUb1} = v_{108} + v_{137} + v_{161} + v_{245} + v_{275}
$$
$$
+ v_{311} - v_{109} - v_{185} - v_{233} - v_{281}
$$
(1831)

## 9.96 Species `cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0`

**Name** cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb0

**Initial amount** 0 item

This species takes part in 15 reactions (as a reactant in R149, R225, R273, R321, R351 and as a product in R150, R177, R201, R261, R327 and as a modifier in R149, R225, R273, R321, R351).

$$
\frac{d}{dt}\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} = v_{111} + v_{138} + v_{162} + v_{222} + v_{288}
$$
$$
- v_{110} - v_{186} - v_{234} - v_{282} - v_{312}
$$
(1832)

## 9.97 Species `nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0`

**Name** nucleus_Foxo1_Pa1_Pd1_Pe0_pUb0

**Initial amount** 0 item

This species takes part in 18 reactions (as a reactant in R150, R151, R226, R274, R322, R352 and as a product in R149, R152, R178, R202, R262, R328 and as a modifier in R150, R151, R226, R274, R322, R352).

$$
\frac{d}{dt}\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} = v_{110} + v_{113} + v_{139} + v_{163} + v_{223} + v_{289}
$$
$$
- v_{111} - v_{112} - v_{187} - v_{235} - v_{283} - v_{313}
$$
$$(1833)$$

## 9.98 Species `dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0`

**Name** dnabound_Foxo1_Pa1_Pd1_Pe0_pUb0

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R152, R227, R275, R323, R353 and as a product in R151, R179, R203, R263, R329 and as a modifier in R152, R227, R275, R323, R353, R389, R389, R390, R390).

$$
\frac{d}{dt}\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb0} = v_{112} + v_{140} + v_{164} + v_{224} + v_{290}
$$
$$
- v_{113} - v_{188} - v_{236} - v_{284} - v_{314}
$$
$$(1834)$$

## 9.99 Species `cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1`

**Name** cytoplasm_Foxo1_Pa1_Pd1_Pe0_pUb1

**Initial amount** 0 item

This species takes part in 16 reactions (as a reactant in R153, R228, R276, R324, R363 and as a product in R154, R180, R204, R264, R330, R351 and as a modifier in R153, R228, R276, R324, R363).

$$
\frac{d}{dt}\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} = v_{115} + v_{141} + v_{165} + v_{225} + v_{291} + v_{312}
$$
$$
- v_{114} - v_{189} - v_{237} - v_{285} - v_{324}
$$
$$(1835)$$

### 9.100 Species `nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1`

**Name** nucleus_Foxo1_Pa1_Pd1_Pe0_pUb1

**Initial amount** 0 item

This species takes part in 17 reactions (as a reactant in R154, R155, R229, R277, R325 and as a product in R153, R156, R181, R205, R265, R331, R352 and as a modifier in R154, R155, R229, R277, R325).

$$
\frac{\mathrm{d}}{\mathrm{d}t}\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} = v_{114} + v_{117} + v_{142} + v_{166} + v_{226} + v_{292}
$$
$$
+ v_{313} - v_{115} - v_{116} - v_{190} - v_{238} - v_{286}
$$
(1836)

### 9.101 Species `dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1`

**Name** dnabound_Foxo1_Pa1_Pd1_Pe0_pUb1

**Initial amount** 0 item

This species takes part in 18 reactions (as a reactant in R156, R230, R278, R326 and as a product in R155, R182, R206, R266, R332, R353 and as a modifier in R156, R230, R278, R326, R391, R391, R392, R392).

$$
\frac{\mathrm{d}}{\mathrm{d}t}\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe0\_pUb1} = v_{116} + v_{143} + v_{167} + v_{227} + v_{293}
$$
$$
+ v_{314} - v_{117} - v_{191} - v_{239} - v_{287}
$$
(1837)

### 9.102 Species `cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0`

**Name** cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb0

**Initial amount** 0 item

This species takes part in 15 reactions (as a reactant in R157, R231, R279, R327, R354 and as a product in R158, R183, R207, R267, R321 and as a modifier in R157, R231, R279, R327, R354).

$$
\frac{\mathrm{d}}{\mathrm{d}t}\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} = v_{119} + v_{144} + v_{168} + v_{228} + v_{282}
$$
$$
- v_{118} - v_{192} - v_{240} - v_{288} - v_{315}
$$
(1838)

### 9.103 Species `nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0`

**Name** nucleus_Foxo1_Pa1_Pd1_Pe1_pUb0

**Initial amount** 0 item

This species takes part in 18 reactions (as a reactant in R158, R159, R232, R280, R328, R355 and as a product in R157, R160, R184, R208, R268, R322 and as a modifier in R158, R159, R232, R280, R328, R355).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} = v_{118} + v_{121} + v_{145} + v_{169} + v_{229} + v_{283}$$
$$- v_{119} - v_{120} - v_{193} - v_{241} - v_{289} - v_{316}$$

$$(1839)$$

### 9.104 Species `dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0`

**Name** dnabound_Foxo1_Pa1_Pd1_Pe1_pUb0

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R160, R233, R281, R329, R356 and as a product in R159, R185, R209, R269, R323 and as a modifier in R160, R233, R281, R329, R356, R393, R393, R394, R394).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb0} = v_{120} + v_{146} + v_{170} + v_{230} + v_{284}$$
$$- v_{121} - v_{194} - v_{242} - v_{290} - v_{317}$$

$$(1840)$$

### 9.105 Species `cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1`

**Name** cytoplasm_Foxo1_Pa1_Pd1_Pe1_pUb1

**Initial amount** 0 item

This species takes part in 16 reactions (as a reactant in R161, R234, R282, R330, R364 and as a product in R162, R186, R210, R270, R324, R354 and as a modifier in R161, R234, R282, R330, R364).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{cytoplasm\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} = v_{123} + v_{147} + v_{171} + v_{231} + v_{285} + v_{315}$$
$$- v_{122} - v_{195} - v_{243} - v_{291} - v_{325}$$

$$(1841)$$

## 9.106 Species `nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1`

**Name** nucleus_Foxo1_Pa1_Pd1_Pe1_pUb1

**Initial amount** 0 item

This species takes part in 17 reactions (as a reactant in R162, R163, R235, R283, R331 and as a product in R161, R164, R187, R211, R271, R325, R355 and as a modifier in R162, R163, R235, R283, R331).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{nucleus\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} = v_{122} + v_{125} + v_{148} + v_{172} + v_{232} + v_{286} \\ + v_{316} - v_{123} - v_{124} - v_{196} - v_{244} - v_{292}$$

(1842)

## 9.107 Species `dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1`

**Name** dnabound_Foxo1_Pa1_Pd1_Pe1_pUb1

**Initial amount** 0 item

This species takes part in 18 reactions (as a reactant in R164, R236, R284, R332 and as a product in R163, R188, R212, R272, R326, R356 and as a modifier in R164, R236, R284, R332, R395, R395, R396, R396).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{dnabound\_Foxo1\_Pa1\_Pd1\_Pe1\_pUb1} = v_{124} + v_{149} + v_{173} + v_{233} + v_{287} \\ + v_{317} - v_{125} - v_{197} - v_{245} - v_{293}$$

(1843)

## 9.108 Species `Foxo1_Pa0_tot`

**Name** Foxo1_Pa0_tot

**Initial amount** 1000 item

**Involved in rule** `Foxo1_Pa0_tot`

One rule determines the species' quantity.

## 9.109 Species `Foxo1_Pa1_tot`

**Name** Foxo1_Pa1_tot

**Initial amount** 0 item

**Involved in rule** `Foxo1_Pa1_tot`

One rule determines the species' quantity.

## 9.110 Species Foxo1_Pd0_tot

**Name** Foxo1_Pd0_tot

**Initial amount** 1000 item

**Involved in rule** Foxo1_Pd0_tot

One rule determines the species' quantity.

## 9.111 Species Foxo1_Pd1_tot

**Name** Foxo1_Pd1_tot

**Initial amount** 0 item

**Involved in rule** Foxo1_Pd1_tot

One rule determines the species' quantity.

## 9.112 Species Foxo1_Pe0_tot

**Name** Foxo1_Pe0_tot

**Initial amount** 1000 item

**Involved in rule** Foxo1_Pe0_tot

One rule determines the species' quantity.

## 9.113 Species Foxo1_Pe1_tot

**Name** Foxo1_Pe1_tot

**Initial amount** 0 item

**Involved in rule** Foxo1_Pe1_tot

One rule determines the species' quantity.

## 9.114 Species Foxo1_pUb0_tot

**Name** Foxo1_pUb0_tot

**Initial amount** 1000 item

**Involved in rule** Foxo1_pUb0_tot

One rule determines the species' quantity.

### 9.115 Species Foxo1_pUb1_tot

**Name** Foxo1_pUb1_tot

**Initial amount** 0 item

**Involved in rule** Foxo1_pUb1_tot

One rule determines the species' quantity.

### 9.116 Species cytoplasm_Foxo1_tot

**Name** cytoplasm_Foxo1_tot

**Initial amount** 1000 item

**Involved in rule** cytoplasm_Foxo1_tot

One rule determines the species' quantity.

### 9.117 Species nucleus_Foxo1_tot

**Name** nucleus_Foxo1_tot

**Initial amount** 0 item

**Involved in rule** nucleus_Foxo1_tot

One rule determines the species' quantity.

### 9.118 Species dnabound_Foxo1_tot

**Name** dnabound_Foxo1_tot

**Initial amount** 0 item

**Involved in rule** dnabound_Foxo1_tot

One rule determines the species' quantity.

### 9.119 Species Foxo1_all

**Name** Foxo1_all

**Initial amount** 1000 item

**Involved in rule** Foxo1_all

One rule determines the species' quantity.

*Produced by* SBML2LATEX

## 9.120 Species `nucleus_RNA_InR`

**Name** nucleus_RNA_InR

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R398 and as a product in R365, R367, R369, R371, R373, R375, R377, R379, R381, R383, R385, R387, R389, R391, R393, R395, R397 and as a modifier in R398).

$$\frac{d}{dt}\text{nucleus\_RNA\_InR} = v_{326} + v_{328} + v_{330} + v_{332} + v_{334} + v_{336} + v_{338} + v_{340} + v_{342}$$
$$+ v_{344} + v_{346} + v_{348} + v_{350} + v_{352} + v_{354} + v_{356} + v_{358} - v_{359}$$

(1844)

## 9.121 Species `cytoplasm_RNA_InR`

**Name** cytoplasm_RNA_InR

**Initial amount** 0 item

This species takes part in five reactions (as a reactant in R399 and as a product in R398 and as a modifier in R399, R400, R400).

$$\frac{d}{dt}\text{cytoplasm\_RNA\_InR} = v_{359} - v_{360}$$

(1845)

## 9.122 Species `nucleus_RNA_SOD2`

**Name** nucleus_RNA_SOD2

**Initial amount** 0 item

This species takes part in 19 reactions (as a reactant in R403 and as a product in R366, R368, R370, R372, R374, R376, R378, R380, R382, R384, R386, R388, R390, R392, R394, R396, R402 and as a modifier in R403).

$$\frac{d}{dt}\text{nucleus\_RNA\_SOD2} = v_{327} + v_{329} + v_{331} + v_{333} + v_{335} + v_{337} + v_{339} + v_{341} + v_{343}$$
$$+ v_{345} + v_{347} + v_{349} + v_{351} + v_{353} + v_{355} + v_{357} + v_{363} - v_{364}$$

(1846)

## 9.123 Species `cytoplasm_RNA_SOD2`

**Name** cytoplasm_RNA_SOD2

**Initial amount** 0 item

This species takes part in five reactions (as a reactant in R404 and as a product in R403 and as a modifier in R404, R405, R405).

$$\frac{d}{dt}\text{cytoplasm\_RNA\_SOD2} = v_{364} - v_{365}$$

(1847)

## 9.124 Species `E2F1`

**Name** E2F1

**Initial amount** 300 item

This species takes part in two reactions (as a modifier in `R100`, `R100`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{E2F1} = 0 \tag{1848}$$

## 9.125 Species `SGK`

**Name** SGK

**Initial amount** 0 item

This species takes part in 48 reactions (as a modifier in `R189`, `R189`, `R190`, `R190`, `R191`, `R191`, `R192`, `R192`, `R193`, `R193`, `R194`, `R194`, `R195`, `R195`, `R196`, `R196`, `R197`, `R197`, `R198`, `R198`, `R199`, `R199`, `R200`, `R200`, `R201`, `R201`, `R202`, `R202`, `R203`, `R203`, `R204`, `R204`, `R205`, `R205`, `R206`, `R206`, `R207`, `R207`, `R208`, `R208`, `R209`, `R209`, `R210`, `R210`, `R211`, `R211`, `R212`, `R212`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SGK} = 0 \tag{1849}$$

## 9.126 Species `CDK2`

**Name** CDK2

**Initial amount** 0 item

This species does not take part in any reactions. Its quantity does hence not change over time:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{CDK2} = 0 \tag{1850}$$

## 9.127 Species `AMPK`

**Name** AMPK

**Initial amount** 0 item

This species does not take part in any reactions. Its quantity does hence not change over time:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{AMPK} = 0 \tag{1851}$$

### 9.128 Species CBPP300

**Name** CBPP300

**Initial amount** 10 item

This species does not take part in any reactions. Its quantity does hence not change over time:

$$\frac{d}{dt}\text{CBPP300} = 0 \qquad (1852)$$

### 9.129 Species SIRT1

**Name** SIRT1

**Initial amount** 1000 item

This species does not take part in any reactions. Its quantity does hence not change over time:

$$\frac{d}{dt}\text{SIRT1} = 0 \qquad (1853)$$

### 9.130 Species E3

**Name** E3

**Initial amount** 0 item

This species does not take part in any reactions. Its quantity does hence not change over time:

$$\frac{d}{dt}\text{E3} = 0 \qquad (1854)$$

### 9.131 Species USP7

**Name** USP7

**Initial amount** 1000 item

This species does not take part in any reactions. Its quantity does hence not change over time:

$$\frac{d}{dt}\text{USP7} = 0 \qquad (1855)$$

### 9.132 Species SCF

**Name** SCF

**Initial amount** 1000 item

This species takes part in 48 reactions (as a modifier in R333, R333, R334, R334, R335, R335, R336, R336, R337, R337, R338, R338, R339, R339, R340, R340, R341, R341, R342, R342, R343, R343, R344, R344, R345, R345, R346, R346, R347, R347, R348, R348, R349, R349, R350, R350, R351, R351, R352, R352, R353, R353, R354, R354, R355, R355, R356, R356).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SCF} = 0 \tag{1856}$$

### 9.133 Species Proteasome

**Name** Proteasome

**Initial amount** 1000 item

This species takes part in 16 reactions (as a modifier in R357, R357, R358, R358, R359, R359, R360, R360, R361, R361, R362, R362, R363, R363, R364, R364).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Proteasome} = 0 \tag{1857}$$

## A  Glossary of Systems Biology Ontology Terms

**SBO:0000290  physical compartment:** Specific location of space, that can be bounded or not. A physical compartment can have 1, 2 or 3 dimensions

**SBO:0000291  empty set:** Entity defined by the absence of any actual object. An empty set is often used to represent the source of a creation process or the result of a degradation process.