SBML Model Report

Model name:
"Sivakumar2011_WntSignalingPathway"

June 2, 2014

1 General Overview

This is a document in SBML Level 2 Version 1 format. This model was created by the following two authors: Vijayalakshmi Chelliah[1] and KC Sivakumar[2] at November second 2011 at 2:46 p. m. and last time modified at June second 2014 at 2:12 p. m. Table 1 shows 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	4
species types	0	species	50
events	0	constraints	0
reactions	29	function definitions	0
global parameters	56	unit definitions	0
rules	0	initial assignments	0

Model Notes

Sivakumar2011_WntSignalingPathwayThe secreted protein Wnt activates theheptahelical receptor Frizzled on nieghboring cells. Activation ofFrizzled causes the recruitment of additional membrane proteinswhich in turn result in 1) the activation of the proteinDishevelled via phosphorylation and 2) the activation of aheterotrimeric G protein of unknown type. Activation

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of Dishevelledresults in the down-regulation of the Beta-Catenin destructioncomplex which causes ubiquitination of Beta-Catenin and itsultimate degradation via the proteasome. Inhibition of theBeta-Catenin destruction complex yields a higher cytosolicconcentration of Beta-Catenin, which enters the nucleus, bindsvarious transcriptional regulatory molecules including the TCF/LEFclass of proteins, and results in the transcription of TCF/LEFtarget genes. Activation of the heterotrimeric G-protein pathway inturn activates Phospholipase C which in turn catalyzes thecatalysis of PI(4,5)P2 into DAG and IP3.

Reference:

- The Wnt signalling pathway.

- You Wnt some, you lose some: oncogenes in the Wnt signaling pathway.

- Wnt signaling pathway.

This model is described in the article:A systems biology approach to model neural stem cell regulation by notch, shh, wnt, and EGF signaling pathways.Sivakumar KC, Dhanesh SB, Shobana S, James J, Mundayoor S.OMICS 2011 Oct; 15(10): 729-737

Abstract:

The Notch, Sonic Hedgehog (Shh), Wnt, and EGF pathways have long been known to influence cell fate specification in the developing nervous system. Here we attempted to evaluate the contemporary knowledge about neural stem cell differentiation promoted by various drug-based regulations through a systems biology approach. Our model showed the phenomenon of DAPT-mediated antagonism of Enhancer of split [E(spl)] genes and enhancement of Shh target genes by a SAG agonist that were effectively demonstrated computationally and were consistent with experimental studies. However, in the case of model simulation of Wnt and EGF pathways, the model network did not supply any concurrent results with experimental data despite the fact that drugs were added at the appropriate positions. This paves insight into the potential of crosstalks between pathways considered in our study. Therefore, we manually developed a map of signaling crosstalk, which included the species connected by representatives from Notch, Shh, Wnt, and EGF pathways and highlighted the regulation of a single target gene, Hes-1, based on drug-induced simulations. These simulations provided results that matched with experimental studies. Therefore, these signaling crosstalk models complement as a tool toward the discovery of novel regulatory processes involved in neural stem cell maintenance, proliferation, and differentiation during mammalian central nervous system development. To our knowledge, this is the first report of a simple crosstalk map that highlights the differential regulation of neural stem cell differentiation and underscores the flow of positive and negative regulatory signals modulated by drugs.

This model is hosted on BioModels Database and identified by: BIOMD0000000397.

To cite BioModels Database, please use: BioModels Database: An enhanced, curated and annotated resource for published quantitative kinetic models.

2 Unit Definitions

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

2.1 Unit `substance`

Notes Mole is the predefined SBML unit for `substance`.

Definition mol

2.2 Unit `volume`

Notes Litre is the predefined SBML unit for `volume`.

Definition l

2.3 Unit `area`

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

Definition m^2

2.4 Unit `length`

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

Definition m

2.5 Unit `time`

Notes Second is the predefined SBML unit for `time`.

Definition s

3 Compartments

This model contains four compartments.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial Dimensions	Size	Unit	Constant	Outside
default			3	1	litre	✓	
c1	Plasma Membrane		3	1	litre	✓	default
c3	Nucleus		3	1	litre	✓	c1
c4	Cell Membrane		3	1	litre	✓	default

3.1 Compartment `default`

This is a three dimensional compartment with a constant size of one litre.

3.2 Compartment `c1`

This is a three dimensional compartment with a constant size of one litre, which is surrounded by `default`.

Name Plasma Membrane

3.3 Compartment `c3`

This is a three dimensional compartment with a constant size of one litre, which is surrounded by `c1` (Plasma Membrane).

Name Nucleus

3.4 Compartment `c4`

This is a three dimensional compartment with a constant size of one litre, which is surrounded by `default`.

Name Cell Membrane

4 Species

This model contains 50 species. Section 7 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
s5	Wnt	default	$mol \cdot l^{-1}$	☐	☐
s16	Complex_br_(Wnt/Frizzled)	c1	$mol \cdot l^{-1}$	☐	☐
s1	Frizzled	c1	$mol \cdot l^{-1}$	☐	☐
s27	Complex_br_(Frizzled/Wnt/_br_LRP5/6)	c1	$mol \cdot l^{-1}$	☐	☐
s28	LRP5/6	c1	$mol \cdot l^{-1}$	☐	☐
s30	Casein Kinase 1	c1	$mol \cdot l^{-1}$	☐	☐
s31	Casein Kinase 2	c1	$mol \cdot l^{-1}$	☐	☐
s32	ATP	c1	$mol \cdot l^{-1}$	☐	☐
s33	ADP	c1	$mol \cdot l^{-1}$	☐	☐
s37	Glycogen Synthase Kinase-3_Beta_	c1	$mol \cdot l^{-1}$	☐	☐
s46	Diversin	c1	$mol \cdot l^{-1}$	☐	☐
s75	Complex_br_(Ebi/Siah-1)	c1	$mol \cdot l^{-1}$	☐	☐
s101	Complex_br_(Siah-1/Ebi)	c1	$mol \cdot l^{-1}$	☐	☐
s102	FRAT	c1	$mol \cdot l^{-1}$	☐	☐
s107	Complex_br_(Dishevelled/Beta-Arrestin/-_br_Frodo)	c1	$mol \cdot l^{-1}$	☐	☐
s121	Complex_br_(Axin/PP2A/_br-_Adenomatous Polyposis Coli)	c1	$mol \cdot l^{-1}$	☐	☐
s155	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_Diversin/Casein Kinase 1/_br_Glycogen Synthase Kinase-3_Beta-_/PP2A)	c1	$mol \cdot l^{-1}$	☐	☐

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
s164	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A)	c1	$mol \cdot l^{-1}$	⊟	⊟
s171	Pygo	c3	$mol \cdot l^{-1}$	⊟	⊟
s172	CBP	c3	$mol \cdot l^{-1}$	⊟	⊟
s173	SWI/SNF	c3	$mol \cdot l^{-1}$	⊟	⊟
s170	Bcl9	c3	$mol \cdot l^{-1}$	⊟	⊟
s195	Wnt Target Genes	c3	$mol \cdot l^{-1}$	⊟	⊟
s174	Complex_br_(TCF/Smad4)	c3	$mol \cdot l^{-1}$	⊟	⊟
s239	Wnt	c4	$mol \cdot l^{-1}$	⊟	⊟
s36	_Beta_-Catenin	c1	$mol \cdot l^{-1}$	⊟	⊟
s123	Complex_br_(Adenomatous Polyposis Coli/Axin/_br__Beta_-Catenin/PP2A)	c1	$mol \cdot l^{-1}$	⊟	⊟
s129	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_Diversin/_Beta_-Catenin/-_br_PP2A)	c1	$mol \cdot l^{-1}$	⊟	⊟
s159	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A/_Beta_-Catenin/_br-_Siah-1/Ebi)	c1	$mol \cdot l^{-1}$	⊟	⊟
s232	_Beta_-Catenin	c3	$mol \cdot l^{-1}$	⊟	⊟
s176	Complex_br_(TCF/Smad4/_br__Beta_-Catenin)	c3	$mol \cdot l^{-1}$	⊟	⊟
s179	Complex_br_(TCF/_Beta_-Catenin/_br-_Smad4/Bcl9)	c3	$mol \cdot l^{-1}$	⊟	⊟
s183	Complex_br_(Bcl9/_Beta_-Catenin/_br-_TCF/Smad4/_br_Pygo)	c3	$mol \cdot l^{-1}$	⊟	⊟
s188	Complex_br_(_Beta_-Catenin/TCF/_br-_Smad4/Bcl9/_br_Pygo/SWI/_br_SNF)	c3	$mol \cdot l^{-1}$	⊟	⊟

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
s245	Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Axin/PP2A/_br-_Diversin/Casein Kinase 1)	c1	$mol \cdot l^{-1}$	⊟	⊟
s252	Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Glycogen Synthase Kinase-3_Beta_/Axin/_br-_PP2A/Diversin/_br_Casein Kinase 1)	c1	$mol \cdot l^{-1}$	⊟	⊟
s268	Ubiquitin	c1	$mol \cdot l^{-1}$	⊟	⊟
s260	_Beta_-Catenin	c1	$mol \cdot l^{-1}$	⊟	⊟
s270	_Beta_-Catenin	c1	$mol \cdot l^{-1}$	⊟	⊟
s275	Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Siah-1/Ebi/_br-_Axin/PP2A)	c1	$mol \cdot l^{-1}$	⊟	⊟
s278	Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Axin/PP2A)	c1	$mol \cdot l^{-1}$	⊟	⊟
s286	Complex_br_(Dishevelled/Beta-Arrestin/-_br_Frodo)	c1	$mol \cdot l^{-1}$	⊟	⊟
s288	Complex_br_(Dishevelled/Beta-Arrestin/-_br_Frodo/Casein Kinase 2)	c1	$mol \cdot l^{-1}$	⊟	⊟
s292	Complex_br_(Dishevelled/Casein Kinase 2/_br_Beta-Arrestin/Frodo/_br_FRAT)	c1	$mol \cdot l^{-1}$	⊟	⊟
s61	_beta_TrCP	c1	$mol \cdot l^{-1}$	⊟	⊟
s259	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A/Diversin/_br_Casein Kinase 1/_Beta_-Catenin/_br_beta-_TrCP/Glycogen Synthase Kinase-3_Beta-_)	c1	$mol \cdot l^{-1}$	⊟	⊟

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
s266	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A/Diversin/_br_Casein Kinase 1/_Beta_-Catenin/_br__beta-_TrCP/Glycogen Synthase Kinase-3_Beta-_)	c1	$mol \cdot l^{-1}$	⊟	⊟
s267	Complex_br_(_beta_TrCP/_Beta_-Catenin)	c1	$mol \cdot l^{-1}$	⊟	⊟
s304	6 bromoindirubin 3'oxime	c1	$mol \cdot l^{-1}$	⊟	⊟
s305	Complex_br_(Bcl9/Pygo/../Smad4)	c3	$mol \cdot l^{-1}$	⊟	⊟

5 Parameters

This model contains 56 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kass_r1			0.784		✓
kdiss_r1			0.820		✓
kass_r5			1.150		✓
kdiss_r5			0.920		✓
kass_r47			1.310		✓
kdiss_r47			0.810		✓
kass_r48			0.850		✓
kdiss_r48			1.360		✓
kass_r54			0.800		✓
kdiss_r54			1.700		✓
kass_r58			1.740		✓
kdiss_r58			0.250		✓
kass_r63			1.770		✓
kdiss_r63			0.610		✓
kass_r64			1.290		✓
kdiss_r64			0.720		✓
kass_r65			1.800		✓
kdiss_r65			0.004		✓
kass_r66			1.990		✓
kdiss_r66			0.036		✓
kass_r68			2.000		✓
kass_r88			0.200		✓
kdiss_r88			1.090		✓
kass_r90			0.270		✓
kdiss_r90			1.028		✓
kass_r91			0.360		✓
kdiss_r91			1.160		✓
kass_r92			0.580		✓
kdiss_r92			0.920		✓
kass_r96			1.450		✓
kdiss_r96			0.183		✓
kass_r98			1.970		✓
kdiss_r98			1.090		✓
kass_r99			0.510		✓
kdiss_r99			0.854		✓
kass_r102			0.163		✓
kdiss_r102			1.650		✓

Id	Name	SBO	Value	Unit	Constant
kass_r103			0.450		☑
kdiss_r103			1.277		☑
kass_r105			0.480		☑
kdiss_r105			1.620		☑
kass_r106			0.050		☑
kdiss_r106			1.130		☑
kass_r107			0.910		☑
kdiss_r107			1.056		☑
kass_r104-_s30			0.390		☑
kdiss_r104-_s30			1.278		☑
kass_r85_s30			0.700		☑
kdiss_r85-_s30			0.649		☑
kass_re65			1.680		☑
kass_re64			0.830		☑
kass_r86_s37			0.870		☑
kdiss_r86-_s37			1.320		☑
kass_r67			0.860		☑
kdiss_r67			0.700		☑
kI_r86_s304			1.430		☑

6 Reactions

This model contains 29 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	r68		$s305 \longrightarrow s195$	
2	r1		$s5 + s1 \rightleftharpoons s16$	
3	r5		$s28 + s16 \rightleftharpoons s27$	
4	r47		$s121 + s36 \rightleftharpoons s123$	
5	r48		$s123 + s46 \rightleftharpoons s129$	
6	r54		$s123 + s75 \rightleftharpoons s159$	
7	r58		$s36 \rightleftharpoons s232$	
8	r63		$s174 + s232 \rightleftharpoons s176$	
9	r66		$s183 + s173 \rightleftharpoons s188$	
10	r88		$s252 + s61 \rightleftharpoons s259$	
11	r90		$s259 + s268 \rightleftharpoons s266$	
12	r91		$s266 \rightleftharpoons s155 + s267$	
13	r92		$s267 \rightleftharpoons s61 + s260$	
14	r96		$s159 + s268 \rightleftharpoons s275$	
15	r98		$s275 \rightleftharpoons s101 + s278$	
16	r99		$s278 \rightleftharpoons s164 + s270$	
17	r102		$s286 + s31 \rightleftharpoons s288$	
18	r103		$s288 + s102 \rightleftharpoons s292$	
19	r105		$s292 \rightleftharpoons s37$	
20	r106		$s286 \rightleftharpoons s30$	
21	r107		$s239 \rightleftharpoons s5$	
22	r104		$s107 + s32 \xrightleftharpoons{s27,\ s30} s286 + s33$	

№	Id	Name	Reaction Equation	SBO
23	r85		$s129 + s32 \xrightleftharpoons{s30} s245 + s33$	
24	r65		$s179 + s171 \rightleftharpoons s183$	
25	r64		$s176 + s170 \rightleftharpoons s179$	
26	re65		$s260 \longrightarrow s232$	
27	re64		$s270 \longrightarrow s232$	
28	r67		$s188 + s172 \rightleftharpoons s305$	
29	r86		$s245 + s32 + s32 + s32 \xrightleftharpoons{s37,\ s304} s252 + s33 + s33 + s33$	

6.1 Reaction `r68`

This is an irreversible reaction of one reactant forming one product.

Reaction equation

$$s305 \longrightarrow s195 \tag{1}$$

Reactant

Table 6: Properties of each reactant.

Id	Name	SBO
s305	Complex_br_(Bcl9/Pygo/../Smad4)	

Product

Table 7: Properties of each product.

Id	Name	SBO
s195	Wnt Target Genes	

Kinetic Law

Derived unit contains undeclared units

$$v_1 = \text{kass\_r68} \cdot [s305] \tag{2}$$

6.2 Reaction `r1`

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$s5 + s1 \rightleftharpoons s16 \tag{3}$$

Reactants

Table 8: Properties of each reactant.

Id	Name	SBO
s5	Wnt	
s1	Frizzled	

Product

Table 9: Properties of each product.

Id	Name	SBO
s16	Complex_br_(Wnt/Frizzled)	

Kinetic Law

Derived unit contains undeclared units

$$v_2 = \text{kass\_r1} \cdot [\text{s5}] \cdot [\text{s1}] - \text{kdiss\_r1} \cdot [\text{s16}] \tag{4}$$

6.3 Reaction r5

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$\text{s28} + \text{s16} \rightleftharpoons \text{s27} \tag{5}$$
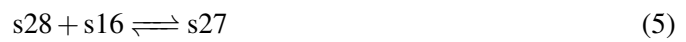
Reactants

Table 10: Properties of each reactant.

Id	Name	SBO
s28	LRP5/6	
s16	Complex_br_(Wnt/Frizzled)	

Product

Table 11: Properties of each product.

Id	Name	SBO
s27	Complex_br_(Frizzled/Wnt/_br_LRP5/6)	

Kinetic Law

Derived unit contains undeclared units

$$v_3 = \text{kass\_r5} \cdot [\text{s28}] \cdot [\text{s16}] - \text{kdiss\_r5} \cdot [\text{s27}] \tag{6}$$

6.4 Reaction `r47`

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$\text{s121} + \text{s36} \rightleftharpoons \text{s123} \tag{7}$$

Reactants

Table 12: Properties of each reactant.

Id	Name	SBO
s121	Complex_br_(Axin/PP2A/_br_Adenomatous Polyposis Coli)	
s36	_Beta_-Catenin	

Product

Table 13: Properties of each product.

Id	Name	SBO
s123	Complex_br_(Adenomatous Polyposis Coli/Axin/_br__Beta_-Catenin/PP2A)	

Kinetic Law

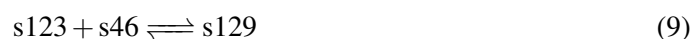**Derived unit** contains undeclared units

$$v_4 = \text{kass\_r47} \cdot [\text{s121}] \cdot [\text{s36}] - \text{kdiss\_r47} \cdot [\text{s123}] \tag{8}$$

6.5 Reaction r48

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$s123 + s46 \rightleftharpoons s129 \qquad (9)$$

Reactants

Table 14: Properties of each reactant.

Id	Name	SBO
s123	Complex_br_(Adenomatous Polyposis Coli/Axin/_br__Beta_-Catenin/PP2A)	
s46	Diversin	

Product

Table 15: Properties of each product.

Id	Name	SBO
s129	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_Diversin/_Beta_-Catenin/_br_PP2A)	

Kinetic Law

Derived unit contains undeclared units

$$v_5 = \text{kass\_r48} \cdot [s123] \cdot [s46] - \text{kdiss\_r48} \cdot [s129] \qquad (10)$$

6.6 Reaction r54

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$s123 + s75 \rightleftharpoons s159 \qquad (11)$$

Reactants

Table 16: Properties of each reactant.

Id	Name	SBO
s123	Complex_br_(Adenomatous Polyposis Coli/Axin/_br__Beta_-Catenin/PP2A)	
s75	Complex_br_(Ebi/Siah-1)	

Product

Table 17: Properties of each product.

Id	Name	SBO
s159	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A/_Beta_-Catenin/_br_Siah-1/Ebi)	

Kinetic Law

Derived unit contains undeclared units

$$v_6 = \text{kass\_r54} \cdot [\text{s123}] \cdot [\text{s75}] - \text{kdiss\_r54} \cdot [\text{s159}] \tag{12}$$

6.7 Reaction r58

This is a reversible reaction of one reactant forming one product.

Notes mass action rate law for first order forward, first order reverse, reversible reactions, continuous scheme

Reaction equation

$$\text{s36} \rightleftharpoons \text{s232} \tag{13}$$
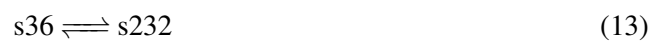
Reactant

Table 18: Properties of each reactant.

Id	Name	SBO
s36	_Beta_-Catenin	

Product

Table 19: Properties of each product.

Id	Name	SBO
s232	_Beta_-Catenin	

Kinetic Law

Derived unit contains undeclared units

$$v_7 = \text{kass\_r58} \cdot [\text{s36}] - \text{kdiss\_r58} \cdot [\text{s232}] \tag{14}$$

6.8 Reaction `r63`

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$\text{s174} + \text{s232} \rightleftharpoons \text{s176} \tag{15}$$

Reactants

Table 20: Properties of each reactant.

Id	Name	SBO
s174	Complex_br_(TCF/Smad4)	
s232	_Beta_-Catenin	

Product

Table 21: Properties of each product.

Id	Name	SBO
s176	Complex_br_(TCF/Smad4/_br__Beta_-Catenin)	

Kinetic Law

Derived unit contains undeclared units

$$v_8 = \text{kass\_r63} \cdot [\text{s174}] \cdot [\text{s232}] - \text{kdiss\_r63} \cdot [\text{s176}] \tag{16}$$

6.9 Reaction r66

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$s183 + s173 \rightleftharpoons s188 \tag{17}$$

Reactants

Table 22: Properties of each reactant.

Id	Name	SBO
s183	Complex_br_(Bcl9/_Beta_-Catenin/_br_TCF/Smad4/_br_Pygo)	
s173	SWI/SNF	

Product

Table 23: Properties of each product.

Id	Name	SBO
s188	Complex_br_(_Beta_-Catenin/TCF/_br_Smad4/Bcl9/_br_Pygo/SWI/_br_SNF)	

Kinetic Law

Derived unit contains undeclared units

$$v_9 = \text{kass\_r66} \cdot [s183] \cdot [s173] - \text{kdiss\_r66} \cdot [s188] \tag{18}$$

6.10 Reaction r88

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$s252 + s61 \rightleftharpoons s259 \tag{19}$$

Reactants

Table 24: Properties of each reactant.

Id	Name
s252	Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Glycogen Synthase Kinase-3_Beta_/Axin/_b
s61	_beta_TrCP

Product

Table 25: Properties of each product.

Id	Name
s259	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A/Diversin/_br_Casein Kinase 1/_Beta_-Catenin/_

Kinetic Law

Derived unit contains undeclared units

$$v_{10} = \text{kass\_r88} \cdot [\text{s252}] \cdot [\text{s61}] - \text{kdiss\_r88} \cdot [\text{s259}] \qquad (20)$$

6.11 Reaction `r90`

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$\text{s259} + \text{s268} \rightleftharpoons \text{s266} \qquad (21)$$

Reactants

Table 26: Properties of each reactant.

Id	Name
s259	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A/Diversin/_br_Casein Kinase 1/_Beta_-Catenin/_
s268	Ubiquitin

Product

Produced by SBML2LATEX

Id	Name
s266	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A/Diversin/_br_Casein Kinase 1/_Beta_-Catenin/_

Kinetic Law

Derived unit contains undeclared units

$$v_{11} = \text{kass\_r90} \cdot [\text{s259}] \cdot [\text{s268}] - \text{kdiss\_r90} \cdot [\text{s266}] \tag{22}$$

6.12 Reaction `r91`

This is a reversible reaction of one reactant forming two products.

Notes mass action rate law for first order forward, second order reverse, reversible reactions, two products, continuous scheme

Reaction equation

$$\text{s266} \rightleftharpoons \text{s155} + \text{s267} \tag{23}$$

Reactant

Table 28: Properties of each reactant.

Id	Name
s266	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A/Diversin/_br_Casein Kinase 1/_Beta_-Catenin/_

Products

Table 29: Properties of each product.

Id	Name
s155	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_Diversin/Casein Kinase 1/_br_Glycogen Synthase Kir
s267	Complex_br_(_beta_TrCP/_Beta_-Catenin)

Kinetic Law

Derived unit contains undeclared units

$$v_{12} = \text{kass\_r91} \cdot [\text{s266}] - \text{kdiss\_r91} \cdot [\text{s155}] \cdot [\text{s267}] \tag{24}$$

6.13 Reaction `r92`

This is a reversible reaction of one reactant forming two products.

Notes mass action rate law for first order forward, second order reverse, reversible reactions, two products, continuous scheme

Reaction equation

$$s267 \rightleftharpoons s61 + s260 \tag{25}$$

Reactant

Table 30: Properties of each reactant.

Id	Name	SBO
s267	Complex_br_(_beta_TrCP/_Beta_-Catenin)	

Products

Table 31: Properties of each product.

Id	Name	SBO
s61	_beta_TrCP	
s260	_Beta_-Catenin	

Kinetic Law

Derived unit contains undeclared units

$$v_{13} = \text{kass\_r92} \cdot [s267] - \text{kdiss\_r92} \cdot [s61] \cdot [s260] \tag{26}$$

6.14 Reaction `r96`

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$s159 + s268 \rightleftharpoons s275 \tag{27}$$

Reactants

Id	Name	SBO
s159	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A/_Beta_-Catenin/_br_Siah-1/Ebi)	
s268	Ubiquitin	

Product

Table 33: Properties of each product.

Id	Name	SBO
s275	Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Siah-1/Ebi/_br_Axin/PP2A)	

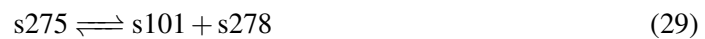**Kinetic Law**

Derived unit contains undeclared units

$$v_{14} = \text{kass\_r96} \cdot [\text{s159}] \cdot [\text{s268}] - \text{kdiss\_r96} \cdot [\text{s275}] \tag{28}$$

6.15 Reaction r98

This is a reversible reaction of one reactant forming two products.

Notes mass action rate law for first order forward, second order reverse, reversible reactions, two products, continuous scheme

Reaction equation

$$\text{s275} \rightleftharpoons \text{s101} + \text{s278} \tag{29}$$

Reactant

Table 34: Properties of each reactant.

Id	Name	SBO
s275	Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Siah-1/Ebi/_br_Axin/PP2A)	

Products

Table 35: Properties of each product.

Id	Name	SBO
s101	Complex_br_(Siah-1/Ebi)	
s278	Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Axin/PP2A)	

Kinetic Law

Derived unit contains undeclared units

$$v_{15} = \text{kass\_r98} \cdot [\text{s275}] - \text{kdiss\_r98} \cdot [\text{s101}] \cdot [\text{s278}] \tag{30}$$

6.16 Reaction `r99`

This is a reversible reaction of one reactant forming two products.

Notes mass action rate law for first order forward, second order reverse, reversible reactions, two products, continuous scheme

Reaction equation

$$\text{s278} \rightleftharpoons \text{s164} + \text{s270} \tag{31}$$

Reactant

Table 36: Properties of each reactant.

Id	Name	SBO
s278	Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Axin/PP2A)	

Products

Table 37: Properties of each product.

Id	Name	SBO
s164	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A)	
s270	_Beta_-Catenin	

Kinetic Law

Derived unit contains undeclared units

$$v_{16} = \text{kass\_r99} \cdot [\text{s278}] - \text{kdiss\_r99} \cdot [\text{s164}] \cdot [\text{s270}] \tag{32}$$

6.17 Reaction r102

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$s286 + s31 \rightleftharpoons s288 \tag{33}$$

Reactants

Table 38: Properties of each reactant.

Id	Name	SBO
s286	Complex_br_(Dishevelled/Beta-Arrestin/_br_Frodo)	
s31	Casein Kinase 2	

Product

Table 39: Properties of each product.

Id	Name	SBO
s288	Complex_br_(Dishevelled/Beta-Arrestin/_br_Frodo/Casein Kinase 2)	

Kinetic Law

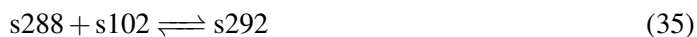**Derived unit** contains undeclared units

$$v_{17} = \text{kass\_r102} \cdot [s286] \cdot [s31] - \text{kdiss\_r102} \cdot [s288] \tag{34}$$

6.18 Reaction r103

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$s288 + s102 \rightleftharpoons s292 \tag{35}$$

Reactants

Table 40: Properties of each reactant.

Id	Name	SBO
s288	Complex_br_(Dishevelled/Beta-Arrestin/_br_Frodo/Casein Kinase 2)	
s102	FRAT	

Product

Table 41: Properties of each product.

Id	Name	SBO
s292	Complex_br_(Dishevelled/Casein Kinase 2/_br_Beta-Arrestin/Frodo/_br_FRAT)	

Kinetic Law

Derived unit contains undeclared units

$$v_{18} = \text{kass\_r103} \cdot [\text{s288}] \cdot [\text{s102}] - \text{kdiss\_r103} \cdot [\text{s292}] \tag{36}$$

6.19 Reaction r105

This is a reversible reaction of one reactant forming one product.

Notes mass action rate law for first order forward, first order reverse, reversible reactions, continuous scheme

Reaction equation

$$\text{s292} \rightleftharpoons \text{s37} \tag{37}$$

Reactant

Table 42: Properties of each reactant.

Id	Name	SBO
s292	Complex_br_(Dishevelled/Casein Kinase 2/_br_Beta-Arrestin/Frodo/_br_FRAT)	

Product

Produced by SBML2LATEX

Table 43: Properties of each product.

Id	Name	SBO
s37	Glycogen Synthase Kinase-3_Beta_	

Kinetic Law

Derived unit contains undeclared units

$$v_{19} = \text{kass\_r105} \cdot [s292] - \text{kdiss\_r105} \cdot [s37] \tag{38}$$

6.20 Reaction r106

This is a reversible reaction of one reactant forming one product.

Notes mass action rate law for first order forward, first order reverse, reversible reactions, continuous scheme

Reaction equation

$$s286 \rightleftharpoons s30 \tag{39}$$

Reactant

Table 44: Properties of each reactant.

Id	Name	SBO
s286	Complex_br_(Dishevelled/Beta-Arrestin/_br_Frodo)	

Product

Table 45: Properties of each product.

Id	Name	SBO
s30	Casein Kinase 1	

Kinetic Law

Derived unit contains undeclared units
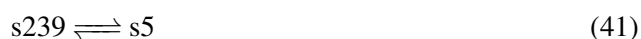
$$v_{20} = \text{kass\_r106} \cdot [s286] - \text{kdiss\_r106} \cdot [s30] \tag{40}$$

6.21 Reaction `r107`

This is a reversible reaction of one reactant forming one product.

Notes mass action rate law for first order forward, first order reverse, reversible reactions, continuous scheme

Reaction equation

$$\text{s239} \rightleftharpoons \text{s5} \tag{41}$$

Reactant

Table 46: Properties of each reactant.

Id	Name	SBO
s239	Wnt	

Product

Table 47: Properties of each product.

Id	Name	SBO
s5	Wnt	

Kinetic Law

Derived unit contains undeclared units

$$v_{21} = \text{kass\_r107} \cdot [\text{s239}] - \text{kdiss\_r107} \cdot [\text{s5}] \tag{42}$$

6.22 Reaction `r104`

This is a reversible reaction of two reactants forming two products influenced by two modifiers.

Notes reversible rapid-equilibrium random order ternary-complex mechanism with two products

Reaction equation

$$\text{s107} + \text{s32} \xrightleftharpoons{\text{s27, s30}} \text{s286} + \text{s33} \tag{43}$$
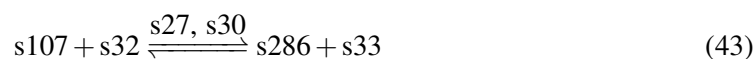
Reactants

Table 48: Properties of each reactant.

Id	Name	SBO
s107	Complex_br_(Dishevelled/Beta-Arrestin/_br_Frodo)	
s32	ATP	

Modifiers

Table 49: Properties of each modifier.

Id	Name	SBO
s27	Complex_br_(Frizzled/Wnt/_br_LRP5/6)	
s30	Casein Kinase 1	

Products

Table 50: Properties of each product.

Id	Name	SBO
s286	Complex_br_(Dishevelled/Beta-Arrestin/_br_Frodo)	
s33	ADP	

Kinetic Law

Derived unit contains undeclared units

$$v_{22} = [s30] \cdot (kass\_r104\_s30 \cdot [s107] \cdot [s32] - kdiss\_r104\_s30 \cdot [s286] \cdot [s33]) \tag{44}$$

6.23 Reaction r85

This is a reversible reaction of two reactants forming two products influenced by one modifier.

Notes reversible rapid-equilibrium random order ternary-complex mechanism with two products

Reaction equation

$$s129 + s32 \overset{s30}{\rightleftharpoons} s245 + s33 \tag{45}$$

Reactants

Table 51: Properties of each reactant.

Id	Name	SBO
s129	Complex_br_(Adenomatous Polyposis Coli/Axin/_br_Diversin/_Beta_-Catenin/_br_PP2A)	
s32	ATP	

Modifier

Table 52: Properties of each modifier.

Id	Name	SBO
s30	Casein Kinase 1	

Products

Table 53: Properties of each product.

Id	Name
s245	Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Axin/PP2A/_br_Diversin/Casein Kinase 1)
s33	ADP

Kinetic Law

Derived unit contains undeclared units

$$v_{23} = [\text{s30}] \cdot (\text{kass\_r85\_s30} \cdot [\text{s129}] \cdot [\text{s32}] - \text{kdiss\_r85\_s30} \cdot [\text{s245}] \cdot [\text{s33}]) \qquad (46)$$

6.24 Reaction r65

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$\text{s179} + \text{s171} \rightleftharpoons \text{s183} \qquad (47)$$

Reactants

Table 54: Properties of each reactant.

Id	Name	SBO
s179	Complex_br_(TCF/_Beta_-Catenin/_br_Smad4/Bcl9)	
s171	Pygo	

Product

Table 55: Properties of each product.

Id	Name	SBO
s183	Complex_br_(Bcl9/_Beta_-Catenin/_br_TCF/Smad4/_br_Pygo)	

Kinetic Law

Derived unit contains undeclared units

$$v_{24} = \text{kass\_r65} \cdot [s179] \cdot [s171] - \text{kdiss\_r65} \cdot [s183] \tag{48}$$

6.25 Reaction r64

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$s176 + s170 \rightleftharpoons s179 \tag{49}$$

Reactants

Table 56: Properties of each reactant.

Id	Name	SBO
s176	Complex_br_(TCF/Smad4/_br__Beta_-Catenin)	
s170	Bcl9	

Product

Table 57: Properties of each product.

Id	Name	SBO
s179	Complex_br_(TCF/_Beta_-Catenin/_br_Smad4/Bcl9)	

Kinetic Law

Derived unit contains undeclared units

$$v_{25} = \text{kass\_r64} \cdot [\text{s176}] \cdot [\text{s170}] - \text{kdiss\_r64} \cdot [\text{s179}] \tag{50}$$

6.26 Reaction `re65`

This is an irreversible reaction of one reactant forming one product.

Notes mass action rate law for first order irreversible reactions, continuous scheme

Reaction equation

$$\text{s260} \longrightarrow \text{s232} \tag{51}$$

Reactant

Table 58: Properties of each reactant.

Id	Name	SBO
s260	_Beta_-Catenin	

Product

Table 59: Properties of each product.

Id	Name	SBO
s232	_Beta_-Catenin	

Kinetic Law

Derived unit contains undeclared units

$$v_{26} = \text{kass\_re65} \cdot [\text{s260}] \tag{52}$$

6.27 Reaction `re64`

This is an irreversible reaction of one reactant forming one product.

Notes mass action rate law for first order irreversible reactions, continuous scheme

Reaction equation

$$s270 \longrightarrow s232 \tag{53}$$

Reactant

Table 60: Properties of each reactant.

Id	Name	SBO
s270	_Beta_-Catenin	

Product

Table 61: Properties of each product.

Id	Name	SBO
s232	_Beta_-Catenin	

Kinetic Law

Derived unit contains undeclared units

$$v_{27} = \text{kass\_re64} \cdot [\text{s270}] \tag{54}$$

6.28 Reaction `r67`

This is a reversible reaction of two reactants forming one product.

Notes mass action rate law for second order forward, first order reverse, reversible reactions, two reactants, continuous scheme

Reaction equation

$$s188 + s172 \rightleftharpoons s305 \tag{55}$$

Reactants

Table 62: Properties of each reactant.

Id	Name	SBO
s188	Complex_br_(_Beta_-Catenin/TCF/_br_Smad4/Bcl9/_br_Pygo/SWI/_br_SNF)	
s172	CBP	

Product

Table 63: Properties of each product.

Id	Name	SBO
s305	Complex_br_(Bcl9/Pygo/../Smad4)	

Kinetic Law

Derived unit contains undeclared units

$$v_{28} = \text{kass\_r67} \cdot [\text{s188}] \cdot [\text{s172}] - \text{kdiss\_r67} \cdot [\text{s305}] \tag{56}$$

6.29 Reaction r86

This is a reversible reaction of four reactants forming four products influenced by two modifiers.

Notes reversible thermodynamically independent convenience kinetics

Reaction equation

$$\text{s245} + \text{s32} + \text{s32} + \text{s32} \xrightleftharpoons{\text{s37, s304}} \text{s252} + \text{s33} + \text{s33} + \text{s33} \tag{57}$$
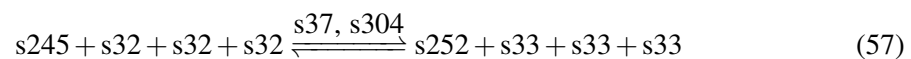
Reactants

Table 64: Properties of each reactant.

Id	Name
s245	Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Axin/PP2A/_br_Diversin/Casein Kinase 1)
s32	ATP
s32	ATP
s32	ATP

Modifiers

Table 65: Properties of each modifier.

Id	Name	SBO
s37	Glycogen Synthase Kinase-3 Beta	
s304	6 bromoindirubin 3'oxime	

Products

Table 66: Properties of each product.

Id	Name
s252	Complex br (Adenomatous Polyposis Coli/ Beta -Catenin/ br Glycogen Synthase Kinase-3 Beta /Axin/ b
s33	ADP
s33	ADP
s33	ADP

Kinetic Law

Derived unit contains undeclared units

$$
v_{29} = \frac{\text{kI\_r86\_s304}}{\text{kI\_r86\_s304} + [\text{s304}]} \cdot [\text{s37}]
$$
$$
\cdot (\text{kass\_r86\_s37} \cdot [\text{s245}] \cdot [\text{s32}] \cdot [\text{s32}] \cdot [\text{s32}] - \text{kdiss\_r86\_s37} \cdot [\text{s252}] \cdot [\text{s33}] \cdot [\text{s33}] \cdot [\text{s33}]) \tag{58}
$$

7 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.

7.1 Species s5

Name Wnt

Notes Long Name: Wingless-type MMTV integration site family memberSynonym: WinglessAccession: P01444

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in `r1` and as a product in `r107`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}5 = v_{21} - v_2 \tag{59}$$

7.2 Species `s16`

Name Complex_br_(Wnt/Frizzled)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05624Heterodimer Member Info: Frizzled#PROTEIN#Frizzled#P01428##;Wnt#PROTEIN# type MMTV integration site family member#P01444#Wingless#

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in `r5` and as a product in `r1`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}16 = v_2 - v_3 \tag{60}$$

7.3 Species `s1`

Name Frizzled

Notes Long Name: FrizzledSynonym: Synonym not specifiedAccession: P01428

Initial amount 3 mol

Charge 0

This species takes part in one reaction (as a reactant in `r1`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}1 = - v_2 \tag{61}$$

7.4 Species `s27`

Name Complex_br_(Frizzled/Wnt/_br_LRP5/6)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05626Heterodimer Member Info: Frizzled#PROTEIN#Frizzled#P01428##;LRP5/6#PROTEI density lipoprotein receptor related protein#P01431#Arrow#;Wnt#PROTEIN#Wingless-type MMTV integration site family member#P01444#Wingless#

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a product in r5 and as a modifier in r104).

$$\frac{d}{dt}s27 = v_3 \tag{62}$$

7.5 Species s28

Name LRP5/6

Notes Long Name: Low density lipoprotein receptor related proteinSynonym: ArrowAccession: P01431

Initial amount 3 mol

Charge 0

This species takes part in one reaction (as a reactant in r5).

$$\frac{d}{dt}s28 = -v_3 \tag{63}$$

7.6 Species s30

Name Casein Kinase 1

Notes Long Name: Casein Kinase 1Synonym: CK1Accession: P01460

Initial amount 1 mol

Charge 0

This species takes part in three reactions (as a product in r106 and as a modifier in r104, r85).

$$\frac{d}{dt}s30 = v_{20} \tag{64}$$

7.7 Species s31

Name Casein Kinase 2

Notes Long Name: Casein Kinase 2Synonym: Casein Kinase II,Protein Kinase CK2Accession: P01459

Initial amount 3 mol

Charge 0

This species takes part in one reaction (as a reactant in r102).

$$\frac{d}{dt}s31 = -v_{17} \tag{65}$$

7.8 Species s32

Name ATP

Notes Long Name: ATPSynonym: Synonym not specifiedAccession: S01878

Initial amount 1 mol

Charge 0

This species takes part in five reactions (as a reactant in r104, r85, r86, r86, r86).

$$\frac{d}{dt}s32 = -v_{22} - v_{23} - v_{29} - v_{29} - v_{29} \tag{66}$$

7.9 Species s33

Name ADP

Notes Long Name: ADPSynonym: Synonym not specifiedAccession: S01880

Initial amount 0 mol

Charge 0

This species takes part in five reactions (as a product in r104, r85, r86, r86, r86).

$$\frac{d}{dt}s33 = v_{22} + v_{23} + v_{29} + v_{29} + v_{29} \tag{67}$$

7.10 Species s37

Name Glycogen Synthase Kinase-3_Beta_

Notes Long Name: Glycogen Synthase Kinase-3BetaSynonym: GSK3B,GSK3Beta,Sgg,Shaggy,Zeste White 3,Zw3Accession: P01441

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a product in r105 and as a modifier in r86).

$$\frac{d}{dt}s37 = v_{19} \tag{68}$$

7.11 Species s46

Name Diversin

Notes Long Name: DiversinSynonym: Ankrd6Accession: P01466

Initial amount 1 mol

Charge 0

This species takes part in one reaction (as a reactant in r48).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s46} = -\,v_5 \tag{69}$$

7.12 Species s75

Name Complex_br_(Ebi/Siah-1)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05622Heterodimer Member Info: Siah-1#PROTEIN#Seven in absentia homolog 1#P01433#seven in absentia—seven in absentia homolog—siah—sina#;Ebi#PROTEIN#Ebi#P01453

Initial amount 3 mol

Charge 0

This species takes part in one reaction (as a reactant in r54).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s75} = -\,v_6 \tag{70}$$

7.13 Species s101

Name Complex_br_(Siah-1/Ebi)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05612Heterodimer Member Info: Siah-1#PROTEIN#Seven in absentia homolog 1#P01433#seven in absentia—seven in absentia homolog—siah—sina#;Ebi#PROTEIN#Ebi#P01453

Initial amount 0 mol

Charge 0

This species takes part in one reaction (as a product in r98).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s101} = v_{15} \tag{71}$$

7.14 Species s102

Name FRAT

Notes Long Name: Frequently rearranged in advanced T-cell lymphomasSynonym: Frequently rearranged in advanced T-cell lymphomasAccession: P01467

Initial amount 3 mol

Charge 0

This species takes part in one reaction (as a reactant in r103).

$$\frac{d}{dt} s102 = - v_{18} \tag{72}$$

7.15 Species s107

Name Complex_br_(Dishevelled/Beta-Arrestin/_br_Frodo)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05637Heterodimer Member Info: Dishevelled#PROTEIN#Dishevelled#P01447#Dvl#;Beta-Arrestin#PROTEIN#Beta-Arrestin#P01456#BetaArr1—BetaArr2#;Frodo#PROTEIN#Frodo#P01470#frd#

Initial amount 3 mol

Charge 0

This species takes part in one reaction (as a reactant in r104).

$$\frac{d}{dt} s107 = - v_{22} \tag{73}$$

7.16 Species s121

Name Complex_br_(Axin/PP2A/_br_Adenomatous Polyposis Coli)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05614Heterodimer Member Info: Axin#PROTEIN#Axin#P01429#Axis Inhibitor Protein—Conductin#;PP2A#PROTEIN#Protein phosphatase 2A#P01438#PP2A—PP2A B56 subunit—Protein Phosphatase 2A#;Adenomatous Polyposis Coli#PROTEIN#Adenomatous Polyposis Coli#P01468#APC#

Initial amount 4 mol

Charge 0

This species takes part in one reaction (as a reactant in r47).

$$\frac{d}{dt} s121 = - v_4 \tag{74}$$

7.17 Species `s155`

Name Complex_br_(Adenomatous Polyposis Coli/Axin/_br_Diversin/Casein Kinase 1/_br_Glycogen Synthase Kinase-3_Beta_/PP2A)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05615Heterodimer Member Info: Axin#PROTEIN#Axin#P01429#Axis Inhibitor Protein—Conductin#;PP2A#PROTEIN#Protein phosphatase 2A#P01438#PP2A—PP2A B56 subunit—Protein Phosphatase 2A#;Glycogen Synthase Kinase-3Beta#PROTEIN#Glycogen Synthase Kinase-3Beta#P01441#GSK3B—GSK3Beta—Sgg—Shaggy—Zeste White 3—Zw3#;Casein Kinase 1#PROTEIN#Casein Kinase 1#P01460#CK1#;Diversin#PROTEIN#Diversin#P01466#Ankrd6#;Adeno Polyposis Coli#PROTEIN#Adenomatous Polyposis Coli#P01468#APC#

Initial amount 0 mol

Charge 0

This species takes part in one reaction (as a product in `r91`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{s155} = v_{12} \qquad (75)$$

7.18 Species `s164`

Name Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05611Heterodimer Member Info: Axin#PROTEIN#Axin#P01429#Axis Inhibitor Protein—Conductin#;PP2A#PROTEIN#Protein phosphatase 2A#P01438#PP2A—PP2A B56 subunit—Protein Phosphatase 2A#;Adenomatous Polyposis Coli#PROTEIN#Adenomatous Polyposis Coli#P01468#APC#

Initial amount 0 mol

Charge 0

This species takes part in one reaction (as a product in `r99`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{s164} = v_{16} \qquad (76)$$

7.19 Species `s171`

Name Pygo

Notes Long Name: PygopusSynonym: PygopusAccession: P01464

Initial amount 2 mol

Charge 0

This species takes part in one reaction (as a reactant in r65).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}171 = -\ v_{24} \tag{77}$$

7.20 Species s172

Name CBP

Notes Long Name: CREB binding proteinSynonym: CREB binding proteinAccession: P01448

Initial amount 2 mol

Charge 0

This species takes part in one reaction (as a reactant in r67).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}172 = -\ v_{28} \tag{78}$$

7.21 Species s173

Name SWI/SNF

Notes Long Name: Switched/Sucrose Non FermentationSynonym: Switched/Sucrose Non FermentationAccession: P01435

Initial amount 2 mol

Charge 0

This species takes part in one reaction (as a reactant in r66).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}173 = -\ v_{9} \tag{79}$$

7.22 Species s170

Name Bcl9

Notes Long Name: B-cell lymphoma 9Synonym: B-cell lymphoma 9,Legless,LgsAccession: P01450

Initial amount 2 mol

Charge 0

This species takes part in one reaction (as a reactant in r64).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}170 = -\ v_{25} \tag{80}$$

7.23 Species s195

Name Wnt Target Genes

Notes Long Name: Wnt Target GenesSynonym: Axin,Conductin,CyclinD1,En-2,ID2,MMP7,Myc,Naked,Nkd,PPA Delta,Siamois,TCF-1,Twin,Ubx,Xbra,Xnr3Accession: G01558

Initial amount 0 mol

Charge 0

This species takes part in one reaction (as a product in r68).

$$\frac{d}{dt}s195 = v_1 \tag{81}$$

7.24 Species s174

Name Complex_br_(TCF/Smad4)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05613Heterodimer Member Info: TCF#PROTEIN#T cell factor#P01437#LEF—Lymphocyte Enhance Binding Factor—Pangolin—T Cell Factor#;Smad4#PROTEIN#Mothers against decapentaplegic homolog 4#P01455#MAD homolog 1—MAD homolog 4—Mothers against decapentaplegic homolog 1—Mothers against decapentaplegic homolog 4—Smad1#

Initial amount 4 mol

Charge 0

This species takes part in one reaction (as a reactant in r63).

$$\frac{d}{dt}s174 = -v_8 \tag{82}$$

7.25 Species s239

Name Wnt

Notes Long Name: Wingless-type MMTV integration site family memberSynonym: WinglessAccession: P01444

Initial amount 5 mol

Charge 0

This species takes part in one reaction (as a reactant in r107).

$$\frac{d}{dt}s239 = -v_{21} \tag{83}$$

7.26 Species s36

Name _Beta_-Catenin

Notes Long Name: Beta-CateninSynonym: ArmadilloAccession: P01432

Initial amount 5 mol

Charge 0

This species takes part in two reactions (as a reactant in r47, r58).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}36 = -\ v_4\ -\ v_7 \tag{84}$$

7.27 Species s123

Name Complex_br_(Adenomatous Polyposis Coli/Axin/_br__Beta_-Catenin/PP2A)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05633Heterodimer Member Info: Axin#PROTEIN#Axin#P01429#Axis Inhibitor Protein—Conductin#;Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadillo#;PP2A#PROTEIN phosphatase 2A#P01438#PP2A—PP2A B56 subunit—Protein Phosphatase 2A#;Adenomatous Polyposis Coli#PROTEIN#Adenomatous Polyposis Coli#P01468#APC#

Initial amount 0 mol

Charge 0

This species takes part in three reactions (as a reactant in r48, r54 and as a product in r47).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}123 = v_4\ -\ v_5\ -\ v_6 \tag{85}$$

7.28 Species s129

Name Complex_br_(Adenomatous Polyposis Coli/Axin/_br_Diversin/_Beta_-Catenin/_br_PP2A)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05625Heterodimer Member Info: Axin#PROTEIN#Axin#P01429#Axis Inhibitor Protein—Conductin#;Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadillo#;PP2A#PROTEIN phosphatase 2A#P01438#PP2A—PP2A B56 subunit—Protein Phosphatase 2A#;Diversin#PROTEIN#Diversin Polyposis Coli#PROTEIN#Adenomatous Polyposis Coli#P01468#APC#

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in r85 and as a product in r48).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}129 = v_5\ -\ v_{23} \tag{86}$$

7.29 Species s159

Name Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A/_Beta_-Catenin/_br_Siah-1/Ebi)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05617Heterodimer Member Info: Axin#PROTEIN#Axin#P01429#Axis Inhibitor Protein—Conductin#;Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadillo#;Siah-1#PROTEIN#Seven in absentia homolog 1#P01433#seven in absentia—seven in absentia homolog—siah—sina#;PP2A#PROTEIN#Protein phosphatase 2A#P01438#PP2A—PP2A B56 subunit—Protein Phosphatase 2A#;Ebi#PROTEIN#Ebi#P01453#IRA1#;Adenomatous Polyposis Coli#PROTEIN#Adenomatous Polyposis Coli#P01468#APC#

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in r96 and as a product in r54).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}159 = v_6 - v_{14} \tag{87}$$

7.30 Species s232

Name _Beta_-Catenin

Notes Long Name: Beta-CateninSynonym: ArmadilloAccession: P01432

Initial amount 0 mol

Charge 0

This species takes part in four reactions (as a reactant in r63 and as a product in r58, re65, re64).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}232 = v_7 + v_{26} + v_{27} - v_8 \tag{88}$$

7.31 Species s176

Name Complex_br_(TCF/Smad4/_br__Beta_-Catenin)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05606Heterodimer Member Info: Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadillo cell factor#P01437#LEF—Lymphocyte Enhance Binding Factor—Pangolin—T Cell Factor#;Smad4#PROTEIN#Mothers against decapentaplegic homolog 4#P01455#MAD homolog 1—MAD homolog 4—Mothers against decapentaplegic homolog 1—Mothers against decapentaplegic homolog 4—Smad1#

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in r64 and as a product in r63).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}176 = v_8 - v_{25} \tag{89}$$

7.32 Species s179

Name Complex_br_(TCF/_Beta_-Catenin/_br_Smad4/Bcl9)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05636Heterodimer Member Info: Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadill
cell factor#P01437#LEF—Lymphocyte Enhance Binding Factor—Pangolin—T Cell Factor#;Bcl9#PROTEIN#
cell lymphoma 9#P01450#B-cell lymphoma 9—Legless—Lgs#;Smad4#PROTEIN#Mothers
against decapentaplegic homolog 4#P01455#MAD homolog 1—MAD homolog 4—Mothers against decapentaplegic homolog 1—Mothers against decapentaplegic homolog 4—Smad1#

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in r65 and as a product in r64).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}179 = v_{25} - v_{24} \tag{90}$$

7.33 Species s183

Name Complex_br_(Bcl9/_Beta_-Catenin/_br_TCF/Smad4/_br_Pygo)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05619Heterodimer Member Info: Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadill
cell factor#P01437#LEF—Lymphocyte Enhance Binding Factor—Pangolin—T Cell Factor#;Bcl9#PROTEIN#
cell lymphoma 9#P01450#B-cell lymphoma 9—Legless—Lgs#;Smad4#PROTEIN#Mothers
against decapentaplegic homolog 4#P01455#MAD homolog 1—MAD homolog 4—Mothers against decapentaplegic homolog 1—Mothers against decapentaplegic homolog 4—Smad1#;Pygo#PROTE

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in r66 and as a product in r65).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}183 = v_{24} - v_9 \tag{91}$$

7.34 Species s188

Name Complex_br_(_Beta_-Catenin/TCF/_br_Smad4/Bcl9/_br_Pygo/SWI/_br_SNF)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not speci-
fiedAccession: U05623Heterodimer Member Info: Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadillo
Non Fermentation#P01435#Switched/Sucrose Non Fermentation#;TCF#PROTEIN#T cell
factor#P01437#LEF—Lymphocyte Enhance Binding Factor—Pangolin—T Cell Factor#;Bcl9#PROTEIN#B-
cell lymphoma 9#P01450#B-cell lymphoma 9—Legless—Lgs#;Smad4#PROTEIN#Mothers
against decapentaplegic homolog 4#P01455#MAD homolog 1—MAD homolog 4—Moth-
ers against decapentaplegic homolog 1—Mothers against decapentaplegic homolog 4—Smad1#;Pygo#PROTE

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in r67 and as a product in r66).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}188 = v_9 - v_{28} \tag{92}$$

7.35 Species s245

Name Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Axin/PP2A/_br_Diversin/Casein
Kinase 1)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not speci-
fiedAccession: U05616Heterodimer Member Info: Axin#PROTEIN#Axin#P01429#Axis
Inhibitor Protein—Conductin#;Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadillo#;PP2A#PROTEIN
phosphatase 2A#P01438#PP2A—PP2A B56 subunit—Protein Phosphatase 2A#;Casein
Kinase 1#PROTEIN#Casein Kinase 1#P01460#CK1#;Diversin#PROTEIN#Diversin#P01466#Ankrd6#;Adeno
Polyposis Coli#PROTEIN#Adenomatous Polyposis Coli#P01468#APC#

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in r86 and as a product in r85).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}245 = v_{23} - v_{29} \tag{93}$$

7.36 Species s252

Name Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Glycogen Synthase Kinase-
3_Beta_/Axin/_br_PP2A/Diversin/_br_Casein Kinase 1)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05639Heterodimer Member Info: Axin#PROTEIN#Axin#P01429#Axis Inhibitor Protein—Conductin#;Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadillo#;PP2A#PROTEIN phosphatase 2A#P01438#PP2A—PP2A B56 subunit—Protein Phosphatase 2A#;Glycogen Synthase Kinase-3Beta#PROTEIN#Glycogen Synthase Kinase-3Beta#P01441#GSK3B—GSK3Beta—Sgg— White 3—Zw3#;Casein Kinase 1#PROTEIN#Casein Kinase 1#P01460#CK1#;Diversin#PROTEIN#Diversin# Polyposis Coli#PROTEIN#Adenomatous Polyposis Coli#P01468#APC#

Initial amount 5 mol

Charge 0

This species takes part in two reactions (as a reactant in r88 and as a product in r86).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}252 = v_{29} - v_{10} \tag{94}$$

7.37 **Species** s268

Name Ubiquitin

Notes Long Name: UbiquitinSynonym: Synonym not specifiedAccession: S01883

Initial amount 1 mol

Charge 0

This species takes part in two reactions (as a reactant in r90, r96).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}268 = -v_{11} - v_{14} \tag{95}$$

7.38 **Species** s260

Name _Beta_-Catenin

Notes Long Name: Beta-CateninSynonym: ArmadilloAccession: P01432

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in re65 and as a product in r92).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}260 = v_{13} - v_{26} \tag{96}$$

7.39 Species s270

Name _Beta_-Catenin

Notes Long Name: Beta-CateninSynonym: ArmadilloAccession: P01432

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in re64 and as a product in r99).

$$\frac{d}{dt}s270 = v_{16} - v_{27} \tag{97}$$

7.40 Species s275

Name Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Siah-1/Ebi/_br_Axin/PP2A)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05609Heterodimer Member Info: Axin#PROTEIN#Axin#P01429#Axis Inhibitor Protein—Conductin#;Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadillo#;Siah-1#PROTEIN#Seven in absentia homolog 1#P01433#seven in absentia—seven in absentia homolog—siah—sina#;PP2A#PROTEIN#Protein phosphatase 2A#P01438#PP2A—PP2A B56 subunit—Protein Phosphatase 2A#;Ebi#PROTEIN#Ebi#P01453#IRA1#;Adenomatous Polyposis Coli#PROTEIN#Adenomatous Polyposis Coli#P01468#APC#

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in r98 and as a product in r96).

$$\frac{d}{dt}s275 = v_{14} - v_{15} \tag{98}$$

7.41 Species s278

Name Complex_br_(Adenomatous Polyposis Coli/_Beta_-Catenin/_br_Axin/PP2A)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05635Heterodimer Member Info: Axin#PROTEIN#Axin#P01429#Axis Inhibitor Protein—Conductin#;Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadillo#;PP2A#PROTEIN#Protein phosphatase 2A#P01438#PP2A—PP2A B56 subunit—Protein Phosphatase 2A#;Adenomatous Polyposis Coli#PROTEIN#Adenomatous Polyposis Coli#P01468#APC#

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in r99 and as a product in r98).

$$\frac{d}{dt}s278 = v_{15} - v_{16} \tag{99}$$

7.42 Species s286

Name Complex_br_(Dishevelled/Beta-Arrestin/_br_Frodo)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05629Heterodimer Member Info: Dishevelled#PROTEIN#Dishevelled#P01447#Dvl#;Beta-Arrestin#PROTEIN#Beta-Arrestin#P01456#BetaArr1—BetaArr2#;Frodo#PROTEIN#Frodo#P01470#frd#

Initial amount 0 mol

Charge 0

This species takes part in three reactions (as a reactant in r102, r106 and as a product in r104).

$$\frac{d}{dt}s286 = v_{22} - v_{17} - v_{20} \tag{100}$$

7.43 Species s288

Name Complex_br_(Dishevelled/Beta-Arrestin/_br_Frodo/Casein Kinase 2)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05641Heterodimer Member Info: Dishevelled#PROTEIN#Dishevelled#P01447#Dvl#;Beta-Arrestin#PROTEIN#Beta-Arrestin#P01456#BetaArr1—BetaArr2#;Casein Kinase 2#PROTEIN#Casein Kinase 2#P01459#Casein Kinase II—Protein Kinase CK2#;Frodo#PROTEIN#Frodo#P01470#fr

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in r103 and as a product in r102).

$$\frac{d}{dt}s288 = v_{17} - v_{18} \tag{101}$$

7.44 Species s292

Name Complex_br_(Dishevelled/Casein Kinase 2/_br_Beta-Arrestin/Frodo/_br_FRAT)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05620Heterodimer Member Info: Dishevelled#PROTEIN#Dishevelled#P01447#Dvl#;Beta-Arrestin#PROTEIN#Beta-Arrestin#P01456#BetaArr1—BetaArr2#;Casein Kinase 2#PROTEIN#Casein Kinase 2#P01459#Casein Kinase II—Protein Kinase CK2#;FRAT#PROTEIN#Frequently rearranged in advanced T-cell lymphomas#P01467#Frequently rearranged in advanced T-cell lymphomas#;Frodo#PROTEIN#Frodo#P01470#frd#

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in `r105` and as a product in `r103`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}292 = v_{18} - v_{19} \tag{102}$$

7.45 Species s61

Name _beta_TrCP

Notes Long Name: betaTransducin repeat-containing proteinSynonym: BTrCP,Beta Transducin Repeat-Containing Protein,SlimbAccession: P01454

Initial amount 2 mol

Charge 0

This species takes part in two reactions (as a reactant in `r88` and as a product in `r92`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}61 = v_{13} - v_{10} \tag{103}$$

7.46 Species s259

Name Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A/Diversin/_br_Casein Kinase 1/_Beta_-Catenin/_br__beta_TrCP/Glycogen Synthase Kinase-3_Beta_)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05608Heterodimer Member Info: Axin#PROTEIN#Axin#P01429#Axis Inhibitor Protein—Conductin#;Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadillo#;PP2A#PROTEIN phosphatase 2A#P01438#PP2A—PP2A B56 subunit—Protein Phosphatase 2A#;Glycogen Synthase Kinase-3Beta#PROTEIN#Glycogen Synthase Kinase-3Beta#P01441#GSK3B—GSK3Beta—Sgg— White 3—Zw3#;betaTrCP#PROTEIN#betaTransducin repeat-containing protein#P01454#BTrCP—Beta Transducin Repeat-Containing Protein—Slimb#;Casein Kinase 1#PROTEIN#Casein Kinase 1#P01460#CK1#;Diversin#PROTEIN#Diversin#P01466#Ankrd6#;Adenomatous Polyposis Coli#PROTEIN#Adenomatous Polyposis Coli#P01468#APC#

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in `r90` and as a product in `r88`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}259 = v_{10} - v_{11} \tag{104}$$

7.47 Species s266

Name Complex_br_(Adenomatous Polyposis Coli/Axin/_br_PP2A/Diversin/_br_Casein Kinase 1/_Beta_-Catenin/_br__beta_TrCP/Glycogen Synthase Kinase-3_Beta_)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05607Heterodimer Member Info: Axin#PROTEIN#Axin#P01429#Axis Inhibitor Protein—Conductin#;Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadillo#;PP2A#PROTEIN phosphatase 2A#P01438#PP2A—PP2A B56 subunit—Protein Phosphatase 2A#;Glycogen Synthase Kinase-3Beta#PROTEIN#Glycogen Synthase Kinase-3Beta#P01441#GSK3B—GSK3Beta—Sgg— White 3—Zw3#;betaTrCP#PROTEIN#betaTransducin repeat-containing protein#P01454#BTrCP—Beta Transducin Repeat-Containing Protein—Slimb#;Casein Kinase 1#PROTEIN#Casein Kinase 1#P01460#CK1#;Diversin#PROTEIN#Diversin#P01466#Ankrd6#;Adenomatous Polyposis Coli#PROTEIN#Adenomatous Polyposis Coli#P01468#APC#

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in r91 and as a product in r90).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}266 = v_{11} - v_{12} \tag{105}$$

7.48 Species s267

Name Complex_br_(_beta_TrCP/_Beta_-Catenin)

Notes Long Name: Long Name: Long name not specifiedSynonym: Synonym not specifiedAccession: U05627Heterodimer Member Info: Beta-Catenin#PROTEIN#Beta-Catenin#P01432#Armadillo repeat-containing protein#P01454#BTrCP—Beta Transducin Repeat-Containing Protein—Slimb#

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in r92 and as a product in r91).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}267 = v_{12} - v_{13} \tag{106}$$

7.49 Species s304

Name 6 bromoindirubin 3'oxime

Initial amount 0.5 mol

Charge 0

This species takes part in one reaction (as a modifier in r86).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}304 = 0 \tag{107}$$

Produced by SBML2LATEX

7.50 Species s305

Name Complex_br_(Bcl9/Pygo/../Smad4)

Initial amount 0 mol

Charge 0

This species takes part in two reactions (as a reactant in r68 and as a product in r67).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{s}305 = v_{28} - v_1 \tag{108}$$