SBML Model Report

Model name: "Proctor2013 - Cartilage breakdown, interventions to reduce collagen release"

March 16, 2015

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 Carole Proctor[2] at January tenth 2014 at 4:54 p. m. and last time modified at March 16th 2015 at 1:41 p. 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	4
species types	0	species	75
events	0	constraints	0
reactions	132	function definitions	0
global parameters	131	unit definitions	1
rules	0	initial assignments	0

Model Notes

Proctor2013 - Cartilage breakdown, interventions to reduce collagen release

[1]EMBL-EBI, viji@ebi.ac.uk
[2]Newcastle University, carole.proctor@ncl.ac.uk

The molecular pathways involved in cartilage breakdown is studied using this model to examine possible interventions to reduce cartilage collagen release. The model contains three separate submodels, one which describes the IL-1/JNK signalling pathway, secondly the OSM/STAT3 signalling pathway, and lastly a module which includes proMMP (Matrix matalloproteinase) activation, and aggrecan and collagen release.

This model is described in the article:A computer simulation approach for assessing therapeutic intervention points to prevent cytokine-induced cartilage breakdown.Proctor CJ, Macdonald C, Milner JM, Rowan AD, Cawston TE.Arthritis Rheum. 2013 Nov 27.

Abstract:

Objective. To use a novel computational approach to examine the molecular pathways involved in cartilage breakdown and to use computer simulation to test possible interventions to reduce collagen release. Methods. We constructed a computational model of the relevant molecular pathways using the Systems Biology Markup Language (SBML), a computer-readable format of a biochemical network. The model was constructed using our experimental data showing that interleukin-1 (IL-1) and oncostatin M (OSM) act synergistically to up-regulate collagenase protein and activity and initiate cartilage collagen breakdown. Simulations were performed in the COPASI software package. Results. The model predicted that simulated inhibition of c-Jun N-terminal kinase (JNK) or p38 mitogen-activated protein kinase, and over-expression of tissue inhibitor of metalloproteinases 3 (TIMP-3) led to a reduction in collagen release. Over-expression of TIMP-1 was much less effective than TIMP-3 and led to a delay, rather than a reduction, in collagen release. Simulated interventions of receptor antagonists and inhibition of Janus kinase 1 (JAK1), the first kinase in the OSM pathway, were ineffective. So, importantly, the model predicts that it is more effective to intervene at targets which are downstream, such as the JNK pathway, rather than close to the cytokine signal. In vitro experiments confirmed the effectiveness of JNK inhibition. Conclusion. Our study shows the value of computer modelling as a tool for examining possible interventions to reduce cartilage collagen breakdown. The model predicts interventions that either prevent transcription or inhibit activity of collagenases are promising strategies and should be investigated further in an experimental setting. 2013 American College of Rheumatology.

This model is hosted on BioModels Database and identifiedby: BIOMD0000000504 .

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

2 Unit Definitions

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

2.1 Unit substance

Definition item

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
cytoplasm		0000290	3	1	litre	☑	
nucleus		0000290	3	1	litre	☑	
membrane			3	1	litre	☑	
ecm		0000290	3	1	litre	☑	

3.1 Compartment cytoplasm

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

SBO:0000290 physical compartment

3.2 Compartment `nucleus`

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

SBO:0000290 physical compartment

3.3 Compartment `membrane`

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

3.4 Compartment `ecm`

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

SBO:0000290 physical compartment

4 Species

This model contains 75 species. The boundary condition of two of these species is set to `true` so that these species' amount cannot be changed by any reaction. 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
ADAMTS4_mRNA		cytoplasm	item	⊟	⊟
cFos		cytoplasm	item	⊟	⊟
cFos_mRNA		cytoplasm	item	⊟	⊟
cJun		cytoplasm	item	⊟	⊟
cJun_mRNA		cytoplasm	item	⊟	⊟
DUSP16		cytoplasm	item	⊟	⊟
IRAK2		cytoplasm	item	⊟	⊟
IRAK2_TRAF6		cytoplasm	item	⊟	⊟
IRAK2_TRAF6_PP4		cytoplasm	item	⊟	⊟
JAK1		cytoplasm	item	⊟	⊟
JAK1_P		cytoplasm	item	⊟	⊟
JNK		cytoplasm	item	⊟	⊟
JNK_P		cytoplasm	item	⊟	⊟
Matriptase		cytoplasm	item	⊟	⊟
MKP1		cytoplasm	item	⊟	⊟
MMP1_mRNA		cytoplasm	item	⊟	⊟
MMP3_mRNA		cytoplasm	item	⊟	⊟
MMP13_mRNA		cytoplasm	item	⊟	⊟
p38		cytoplasm	item	⊟	⊟
p38_P		cytoplasm	item	⊟	⊟
PP4		cytoplasm	item	⊟	⊟

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
proMMP1		cytoplasm	item	⊟	⊟
proMMP3		cytoplasm	item	⊟	⊟
proMMP13		cytoplasm	item	⊟	⊟
PTPRT		cytoplasm	item	⊟	⊟
SOCS3		cytoplasm	item	⊟	⊟
SOCS3_mRNA		cytoplasm	item	⊟	⊟
STAT3_cyt		cytoplasm	item	⊟	⊟
STAT3_P_cyt		cytoplasm	item	⊟	⊟
TIMP1_mRNA		cytoplasm	item	⊟	⊟
TIMP3_mRNA		cytoplasm	item	⊟	⊟
TRAF6		cytoplasm	item	⊟	⊟
TRAF6_PP4		cytoplasm	item	⊟	⊟
ADAMTS4		ecm	item	⊟	⊟
ADAMTS4_TIMP1		ecm	item	⊟	⊟
ADAMTS4_TIMP3		ecm	item	⊟	⊟
Aggrecan		ecm	item	⊟	⊟
Aggrecan-_Collagen2		ecm	item	⊟	⊟
AggFrag		ecm	item	⊟	⊟
ColFrag		ecm	item	⊟	⊟
Collagen2		ecm	item	⊟	⊟
IL1		ecm	item	⊟	⊟
MMP1		ecm	item	⊟	⊟
MMP1_TIMP1		ecm	item	⊟	⊟
MMP1_TIMP3		ecm	item	⊟	⊟
MMP3		ecm	item	⊟	⊟
MMP3_TIMP1		ecm	item	⊟	⊟

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
MMP3_TIMP3		ecm	item	⊟	⊟
MMP13		ecm	item	⊟	⊟
MMP13_TIMP1		ecm	item	⊟	⊟
MMP13_TIMP3		ecm	item	⊟	⊟
OSM		ecm	item	⊟	⊟
TIMP1		ecm	item	⊟	⊟
TIMP3		ecm	item	⊟	⊟
IL1_IL1R		membrane	item	⊟	⊟
IL1_IL1Ra		membrane	item	⊟	⊟
IL1_IL1R_IRAK2		membrane	item	⊟	⊟
IL1R		membrane	item	⊟	⊟
IL1Ra		membrane	item	⊟	⊟
OSM_OSMR		membrane	item	⊟	⊟
OSM_OSMRa		membrane	item	⊟	⊟
OSMR_SOCS3		membrane	item	⊟	⊟
OSMR		membrane	item	⊟	⊟
OSMRa		membrane	item	⊟	⊟
cFos_cJun		nucleus	item	⊟	⊟
cFos_P		nucleus	item	⊟	⊟
cJun_P		nucleus	item	⊟	⊟
cJun_dimer		nucleus	item	⊟	⊟
SP1		nucleus	item	⊟	⊟
SP1_TIMP1_DNA		nucleus	item	⊟	⊟
STAT3_nuc		nucleus	item	⊟	⊟
STAT3_P_nuc		nucleus	item	⊟	⊟
TIMP1_DNA		nucleus	item	⊟	⊟
Source		cytoplasm	item	☑	☑

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
Sink		cytoplasm	item	☑	☑

5 Parameters

This model contains 131 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
kactMMP13mmp3			$5 \cdot 10^{-8}$		☑
kactMMP1mat			10^{-9}		☑
kactMMP1mmp3			10^{-8}		☑
kactMMP3mat			$4 \cdot 10^{-6}$		☑
kAP1activity			1.000		☑
kbincFoscJun			$5 \cdot 10^{-5}$		☑
kbinIL1IL1R			10^{-4}		☑
kbinIL1IL1Ra			10^{-4}		☑
kbinIRAK2			$5 \cdot 10^{-5}$		☑
kbinOSMOSMR			10^{-5}		☑
kbinOSMOSMRa			10^{-4}		☑
kbinSOCS3OSMR			0.005		☑
kbinSP1TIMP1DNA			10^{-5}		☑
kbinTRAF6			10^{-5}		☑
kcyt2nucSTAT3			0.001		☑
kdedimercJun			0.010		☑
kdegADAMTS4			$5 \cdot 10^{-5}$		☑
kdegADAMTS4mRNA			$1.4 \cdot 10^{-5}$		☑
kdegAggrecan			$3 \cdot 10^{-8}$		☑
kdegcFos			$2 \cdot 10^{-4}$		☑
kdegcFosmRNA			0.003		☑
kdegcJun			$1.3 \cdot 10^{-4}$		☑
kdegcJunmRNA			0.003		☑
kdegCollagen2mmp1			$5 \cdot 10^{-12}$		☑
kdegCollagen2mmp13			$5 \cdot 10^{-11}$		☑
kdegDUSP16			$1.3 \cdot 10^{-4}$		☑
kdegIL1			$2 \cdot 10^{-4}$		☑
kdegMatriptase			$8 \cdot 10^{-6}$		☑
kdegMKP1			10^{-4}		☑
kdegMMP1			10^{-6}		☑
kdegMMP13			10^{-6}		☑
kdegMMP13mRNA			$6.4 \cdot 10^{-6}$		☑
kdegMMP1mRNA			$6.4 \cdot 10^{-6}$		☑
kdegMMP3			10^{-6}		☑
kdegMMP3mRNA			$6.4 \cdot 10^{-6}$		☑
kdegOSM			$4.8 \cdot 10^{-5}$		☑
kdegPP4			10^{-4}		☑

Id	Name	SBO	Value	Unit	Constant
kdegPTPRT			$5 \cdot 10^{-5}$		☑
kdegSOCS3			$8 \cdot 10^{-4}$		☑
kdegSOCS3mRNA			$4 \cdot 10^{-4}$		☑
kdegSP1			$2 \cdot 10^{-5}$		☑
kdegTIMP1			$2 \cdot 10^{-5}$		☑
kdegTIMP1mRNA			$1.4 \cdot 10^{-5}$		☑
kdegTIMP3			$2 \cdot 10^{-5}$		☑
kdegTIMP3mRNA			$1.4 \cdot 10^{-5}$		☑
kdephoscFos			10^{-4}		☑
kdephoscFosDUSP16			10^{-4}		☑
kdephoscJun			0.010		☑
kdephosJAK1			$4 \cdot 10^{-4}$		☑
kdephosJAK1PTPRT			0.004		☑
kdephosJNK			0.001		☑
kdephosJNKDUSP16			0.001		☑
kdephosp38			0.001		☑
kdephosp38MKP1			10^{-5}		☑
kdephosSTAT3			10^{-5}		☑
kdephosSTAT3nuc			10^{-7}		☑
kdephosSTAT3nucPTPRT			$5 \cdot 10^{-4}$		☑
kdephosSTAT3PTPRT			$8 \cdot 10^{-4}$		☑
kdimercJun			$5 \cdot 10^{-5}$		☑
kinhibADAMTS4TIMP1			$3 \cdot 10^{-6}$		☑
kinhibADAMTS4TIMP3			$5 \cdot 10^{-4}$		☑
kinhibMMP13TIMP1			$3 \cdot 10^{-7}$		☑
kinhibMMP13TIMP3			10^{-8}		☑
kinhibMMP1TIMP1			$3 \cdot 10^{-7}$		☑
kinhibMMP1TIMP3			10^{-8}		☑
kinhibMMP3TIMP1			$3 \cdot 10^{-7}$		☑
kinhibMMP3TIMP3			10^{-8}		☑
kinhibTRAF6			0.500		☑
knuc2cytSTAT3			0.001		☑
kphoscFos			$5 \cdot 10^{-7}$		☑
kphoscJun			10^{-4}		☑
kphosJAK1			10^{-5}		☑
kphosJNK			10^{-4}		☑
kphosp38			10^{-4}		☑
kphosSTAT3			0.005		☑
krelADAMTS4TIMP1			0.001		☑
krelADAMTS4TIMP3			0.001		☑
krelcFoscJun			$4 \cdot 10^{-5}$		☑
krelIL1IL1R			0.001		☑

Id	Name	SBO	Value	Unit	Constant
krelIL1IL1Ra			10^{-4}		☑
krelIRAK2			0.001		☑
krelMMP1			0.001		☑
krelMMP13			0.001		☑
krelMMP13TIMP3			0.001		☑
krelMMP1TIMP3			0.001		☑
krelMMP3			0.001		☑
krelMMP3TIMP3			0.001		☑
krelOSMOSMR			10^{-5}		☑
krelOSMOSMRa			10^{-5}		☑
krelSOCS3OSMR			10^{-5}		☑
krelSP1TIMP1DNA			$5 \cdot 10^{-6}$		☑
krelTRAF6			10^{-4}		☑
krelTRAF6PP4			10^{-6}		☑
ksynADAMTS4			$5 \cdot 10^{-4}$		☑
ksynADAMTS4mRNA			$5 \cdot 10^{-4}$		☑
ksynADAMTS4mRNAcJun			$4 \cdot 10^{-6}$		☑
ksynbasalcJunmRNA			0.015		☑
ksynbasalTIMP1mRNA			$1.4 \cdot 10^{-4}$		☑
ksynbasalTIMP3mRNA			$2.8 \cdot 10^{-4}$		☑
ksyncFos			0.001		☑
ksyncFosmRNA			$5 \cdot 10^{-6}$		☑
ksyncFosmRNAStat3			0.050		☑
ksyncJun			0.003		☑
ksyncJunmRNA			0.013		☑
ksyncJunmRNAcJun			0.005		☑
ksynDUSP16			0.005		☑
ksynDUSP16cJun			$2 \cdot 10^{-4}$		☑
ksynMatriptase			$9 \cdot 10^{-10}$		☑
ksynMKP1			$2.5 \cdot 10^{-5}$		☑
ksynMKP1cJun			10^{-6}		☑
ksynMMP1			$1.5 \cdot 10^{-4}$		☑
ksynMMP13			$1.5 \cdot 10^{-5}$		☑
ksynMMP13mRNA			$5 \cdot 10^{-4}$		☑
ksynMMP13mRNAcJun			$2 \cdot 10^{-5}$		☑
ksynMMP1mRNA			0.005		☑
ksynMMP1mRNAcJun			$2 \cdot 10^{-4}$		☑
ksynMMP3			$3 \cdot 10^{-5}$		☑
ksynMMP3mRNA			0.005		☑
ksynMMP3mRNAcJun			$2 \cdot 10^{-4}$		☑
ksynPP4			0.005		☑
ksynPP4cJun			$2 \cdot 10^{-4}$		☑

Id	Name	SBO	Value	Unit	Constant
ksynPTPRT			10^{-4}		☑
ksynSOCS3			0.001		☑
ksynSOCS3mRNA			0.006		☑
ksynSP1			$2 \cdot 10^{-5}$		☑
ksynTIMP1			$2 \cdot 10^{-4}$		☑
ksynTIMP1mRNA			$5 \cdot 10^{-7}$		☑
ksynTIMP1mRNAStat3			$4 \cdot 10^{-5}$		☑
ksynTIMP3			$4 \cdot 10^{-4}$		☑
ksynTIMP3mRNA			$5 \cdot 10^{-7}$		☑
ksynTIMP3mRNAStat3			$4 \cdot 10^{-5}$		☑

6 Reactions

This model contains 132 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	IL1binding		$\mathrm{IL1} + \mathrm{IL1R} \xrightarrow{\mathrm{IL1,\ IL1R}} \mathrm{IL1\_IL1R}$	
2	IL1release		$\mathrm{IL1\_IL1R} \xrightarrow{\mathrm{IL1\_IL1R}} \mathrm{IL1} + \mathrm{IL1R}$	
3	IL1antagonistbinding		$\mathrm{IL1} + \mathrm{IL1Ra} \xrightarrow{\mathrm{IL1,\ IL1Ra}} \mathrm{IL1\_IL1Ra}$	
4	IL1antagonistrelease		$\mathrm{IL1\_IL1Ra} \xrightarrow{\mathrm{IL1\_IL1Ra}} \mathrm{IL1} + \mathrm{IL1Ra}$	
5	IL1degradation		$\mathrm{IL1} \xrightarrow{\mathrm{IL1}} \mathrm{Sink}$	
6	IRAK2binding		$\mathrm{IL1\_IL1R} + \mathrm{IRAK2} \xrightarrow{\mathrm{IL1\_IL1R,\ IRAK2}} \mathrm{IL1\_IL1R\_IRAK2}$	
7	IRAK2release		$\mathrm{IL1\_IL1R\_IRAK2} \xrightarrow{\mathrm{IL1\_IL1R\_IRAK2}} \mathrm{IL1\_IL1R} + \mathrm{IRAK2}$	
8	TRAF6binding		$\mathrm{IL1\_IL1R\_IRAK2} + \mathrm{TRAF6} \xrightarrow{\mathrm{IL1\_IL1R\_IRAK2,\ TRAF6}} \mathrm{IL1\_IL1R} + \mathrm{IRAK2\_TRAF6}$	
9	TRAF6release		$\mathrm{IRAK2\_TRAF6} \xrightarrow{\mathrm{IRAK2\_TRAF6}} \mathrm{IRAK2} + \mathrm{TRAF6}$	
10	JNKphosphorylation		$\mathrm{JNK} + \mathrm{IRAK2\_TRAF6} \xrightarrow{\mathrm{JNK,\ IRAK2\_TRAF6}} \mathrm{JNK\_P} + \mathrm{IRAK2\_TRAF6}$	
11	JNKdephosphorylation		$\mathrm{JNK\_P} \xrightarrow{\mathrm{JNK\_P}} \mathrm{JNK}$	
12	JNKdephosphorylationByDUSP16		$\mathrm{JNK\_P} + \mathrm{DUSP16} \xrightarrow{\mathrm{JNK\_P,\ DUSP16}} \mathrm{JNK} + \mathrm{DUSP16}$	
13	cJunPhosphorylation		$\mathrm{cJun} + \mathrm{JNK\_P} \xrightarrow{\mathrm{cJun,\ JNK\_P}} \mathrm{cJun\_P} + \mathrm{JNK\_P}$	

№	Id	Name	Reaction Equation	SBO
14	cJunDephosphorylation		$\text{cJun\_P} \xrightarrow{\text{cJun\_P}} \text{cJun}$	
15	cJunDimerisation		$2\,\text{cJun\_P} \xrightarrow{\text{cJun\_P}} \text{cJun\_dimer}$	
16	cJunDedimerisation		$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} 2\,\text{cJun\_P}$	
17	cJunTranscriptionAP1		$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cJun\_mRNA} + \text{cFos\_cJun}$	
18	cJunTranscriptioncJun		$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_mRNA} + \text{cJun\_dimer}$	
19	cJunBasalTranscription		$\text{Source} \xrightarrow{\text{Source}} \text{cJun\_mRNA}$	
20	cJunmRNADegradation		$\text{cJun\_mRNA} \xrightarrow{\text{cJun\_mRNA}} \text{Sink}$	
21	cJunTranslation		$\text{cJun\_mRNA} \xrightarrow{\text{cJun\_mRNA}} \text{cJun\_mRNA} + \text{cJun}$	
22	cJunDegradation		$\text{cJun} \xrightarrow{\text{cJun}} \text{Sink}$	
23	p38phosphorylation		$\text{p38} + \text{IRAK2\_TRAF6} \xrightarrow{\text{p38, IRAK2\_TRAF6}} \text{p38\_P} + \text{IRAK2\_TRAF6}$	
24	p38dephosphorylation		$\text{p38\_P} \xrightarrow{\text{p38\_P}} \text{p38}$	
25	p38dephosphorylationMKP1		$\text{p38\_P} + \text{MKP1} \xrightarrow{\text{p38\_P, MKP1}} \text{p38} + \text{MKP1}$	
26	MMP1Transcription-_AP1		$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{MMP1\_mRNA}$	
27	MMP1Transcription-_cJun_dimer		$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_dimer} + \text{MMP1\_mRNA}$	
28	MMP1Translation		$\text{MMP1\_mRNA} \xrightarrow{\text{MMP1\_mRNA}} \text{MMP1\_mRNA} + \text{proMMP1}$	
29	MMP1mRNADegradation		$\text{MMP1\_mRNA} \xrightarrow{\text{MMP1\_mRNA}} \text{Sink}$	
30	proMMP1cleavageByMatriptase		$\text{proMMP1} + \text{Matriptase} \xrightarrow{\text{proMMP1, Matriptase}} \text{MMP1} + \text{Matriptase}$	

№	Id	Name	Reaction Equation	SBO
31	proMMP1cleavageByMMP3		$\text{proMMP1} + \text{MMP3} \xrightarrow{\text{proMMP1, MMP3}} \text{MMP1} + \text{MMP3}$	
32	MMP1Degradation		$\text{MMP1} \xrightarrow{\text{MMP1}} \text{Sink}$	
33	MMP3Transcription_AP1		$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{MMP3\_mRNA}$	
34	MMP3Transcription_cJun_dimer		$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_dimer} + \text{MMP3\_mRNA}$	
35	MMP3Translation		$\text{MMP3\_mRNA} \xrightarrow{\text{MMP3\_mRNA}} \text{MMP3\_mRNA} + \text{proMMP3}$	
36	MMP3mRNADegradation		$\text{MMP3\_mRNA} \xrightarrow{\text{MMP3\_mRNA}} \text{Sink}$	
37	proMMP3cleavageByMatriptase		$\text{proMMP3} + \text{Matriptase} \xrightarrow{\text{proMMP3, Matriptase}} \text{MMP3} + \text{Matriptase}$	
38	MMP3Degradation		$\text{MMP3} \xrightarrow{\text{MMP3}} \text{Sink}$	
39	MMP13Transcription_AP1		$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{MMP13\_mRNA}$	
40	MMP13Transcription_cJun_dimer		$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_dimer} + \text{MMP13\_mRNA}$	
41	MMP13Translation		$\text{MMP13\_mRNA} \xrightarrow{\text{MMP13\_mRNA}} \text{MMP13\_mRNA} + \text{proMMP13}$	
42	MMP13mRNADegradation		$\text{MMP13\_mRNA} \xrightarrow{\text{MMP13\_mRNA}} \text{Sink}$	
43	proMMP13cleavageByMMP3		$\text{proMMP13} + \text{MMP3} \xrightarrow{\text{proMMP13, MMP3}} \text{MMP13} + \text{MMP3}$	
44	MMP13Degradation		$\text{MMP13} \xrightarrow{\text{MMP13}} \text{Sink}$	

№	Id	Name	Reaction Equation	SBO
45	TIMP1Translation		$\text{TIMP1\_mRNA} \xrightarrow{\text{TIMP1\_mRNA}} \text{TIMP1\_mRNA} + \text{TIMP1}$	
46	TIMP1mRNADegradation		$\text{TIMP1\_mRNA} \xrightarrow{\text{TIMP1\_mRNA}} \text{Sink}$	
47	TIMP1Degradation		$\text{TIMP1} \xrightarrow{\text{TIMP1}} \text{Sink}$	
48	ADAMTS4Transcription-_AP1		$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{ADAMTS4\_mRNA}$	
49	ADAMTS4Transcription-_cJun_dimer		$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_dimer} + \text{ADAMTS4\_mRNA}$	
50	ADAMTS4Translation		$\text{ADAMTS4\_mRNA} \xrightarrow{\text{ADAMTS4\_mRNA}} \text{ADAMTS4\_mRNA} + \text{ADAMTS4}$	
51	ADAMTS4mRNADegradation		$\text{ADAMTS4\_mRNA} \xrightarrow{\text{ADAMTS4\_mRNA}} \text{Sink}$	
52	ADAMTS4Degradation		$\text{ADAMTS4} \xrightarrow{\text{ADAMTS4}} \text{Sink}$	
53	PP4Synthesis		$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{PP4}$	
54	PP4Synthesis-_cJun_dimer		$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_dimer} + \text{PP4}$	
55	DUSP16Synthesis		$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{DUSP16}$	
56	DUSP16Synthesis-_cJun_dimer		$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_dimer} + \text{DUSP16}$	
57	PP4Degradation		$\text{PP4} \xrightarrow{\text{PP4}} \text{Sink}$	
58	DUSP16Degradation		$\text{DUSP16} \xrightarrow{\text{DUSP16}} \text{Sink}$	
59	TRAF6Inhibition		$\text{TRAF6} + \text{PP4} \xrightarrow{\text{TRAF6, PP4}} \text{TRAF6\_PP4}$	
60	BoundTRAF6Inhibition		$\text{IRAK2\_TRAF6} + \text{PP4} \xrightarrow{\text{IRAK2\_TRAF6, PP4}} \text{IRAK2\_TRAF6\_PP4}$	

№	Id	Name	Reaction Equation	SBO
61	TRAF6PP4Disassociation		$\text{TRAF6\_PP4} \xrightarrow{\text{TRAF6\_PP4}} \text{TRAF6} + \text{PP4}$	
62	IRAK2-_TRAF6PP4Disassociation		$\text{IRAK2\_TRAF6\_PP4} \xrightarrow{\text{IRAK2\_TRAF6\_PP4}} \text{IRAK2\_TRAF6} + \text{PP4}$	
63	Transcription-_cFos_byAP1		$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{cFos\_mRNA}$	
64	cFosmRNA-_Degradation		$\text{cFos\_mRNA} \xrightarrow{\text{cFos\_mRNA}} \text{Sink}$	
65	cFosSynthesis		$\text{cFos\_mRNA} \xrightarrow{\text{cFos\_mRNA}} \text{cFos\_mRNA} + \text{cFos}$	
66	cFosDegradation		$\text{cFos} \xrightarrow{\text{cFos}} \text{Sink}$	
67	cFosPhosphorylation-_p38		$\text{p38\_P} + \text{cFos} \xrightarrow{\text{p38\_P, cFos}} \text{p38\_P} + \text{cFos\_P}$	
68	cFosDephosphorylation		$\text{cFos\_P} \xrightarrow{\text{cFos\_P}} \text{cFos}$	
69	MKP1Synthesis		$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{MKP1} + \text{cFos\_cJun}$	
70	MKP1Synthesis-_cJun_dimer		$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{MKP1} + \text{cJun\_dimer}$	
71	MKP1Degradation		$\text{MKP1} \xrightarrow{\text{MKP1}} \text{Sink}$	
72	cFosDephosphorylationByDusp16		$\text{cFos\_P} + \text{DUSP16} \xrightarrow{\text{cFos\_P, DUSP16}} \text{cFos} + \text{DUSP16}$	
73	cFoscJunBinding		$\text{cFos\_P} + \text{cJun\_P} \xrightarrow{\text{cFos\_P, cJun\_P}} \text{cFos\_cJun}$	
74	cFoscJunRelease		$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_P} + \text{cJun\_P}$	
75	OSM_OSMR-_binding		$\text{OSM} + \text{OSMR} \xrightarrow{\text{OSM, OSMR}} \text{OSM\_OSMR}$	

№	Id	Name	Reaction Equation	SBO
76	OSM_OSMR-_release		$\text{OSM\_OSMR} \xrightarrow{\text{OSM\_OSMR}} \text{OSM} + \text{OSMR}$	
77	OSM_OSMRa-_binding		$\text{OSM} + \text{OSMRa} \xrightarrow{\text{OSM, OSMRa}} \text{OSM\_OSMRa}$	
78	OSM_OSMRa-_release		$\text{OSM\_OSMRa} \xrightarrow{\text{OSM\_OSMRa}} \text{OSM} + \text{OSMRa}$	
79	JAK1-_Phosphorylation		$\text{JAK1} + \text{OSM\_OSMR} \xrightarrow{\text{JAK1, OSM\_OSMR}} \text{JAK1\_P} + \text{OSM\_OSMR}$	
80	JAK1-_Dephosphorylation		$\text{JAK1\_P} \xrightarrow{\text{JAK1\_P}} \text{JAK1}$	
81	JAK1-_DephosphorylationByPTPRT		$\text{JAK1\_P} + \text{PTPRT} \xrightarrow{\text{JAK1\_P, PTPRT}} \text{JAK1} + \text{PTPRT}$	
82	STAT3-_Phosphorylation		$\text{STAT3\_cyt} + \text{JAK1\_P} \xrightarrow{\text{STAT3\_cyt, JAK1\_P}} \text{STAT3\_P\_cyt} + \text{JAK1\_P}$	
83	STAT3_cyt-_Dephosphorylation		$\text{STAT3\_P\_cyt} \xrightarrow{\text{STAT3\_P\_cyt}} \text{STAT3\_cyt}$	
84	STAT3_cyt-_DephosphorylationByPTPRT		$\text{STAT3\_P\_cyt} + \text{PTPRT} \xrightarrow{\text{STAT3\_P\_cyt, PTPRT}} \text{STAT3\_cyt} + \text{PTPRT}$	
85	STAT3_nuc-_Dephosphorylation		$\text{STAT3\_P\_nuc} \xrightarrow{\text{STAT3\_P\_nuc}} \text{STAT3\_nuc}$	
86	STAT3_nuc-_DephosphorylationByPTPRT		$\text{STAT3\_P\_nuc} + \text{PTPRT} \xrightarrow{\text{STAT3\_P\_nuc, PTPRT}} \text{STAT3\_nuc} + \text{PTPRT}$	

№	Id	Name	Reaction Equation	SBO
87	STAT3_transport_to_nucleus		$\text{STAT3\_P\_cyt} \xrightarrow{\text{STAT3\_P\_cyt}} \text{STAT3\_P\_nuc}$	
88	STAT3_transport_from_nucleus		$\text{STAT3\_nuc} \xrightarrow{\text{STAT3\_nuc}} \text{STAT3\_cyt}$	
89	cFos_induction_by_STAT3		$\text{STAT3\_P\_nuc} \xrightarrow{\text{STAT3\_P\_nuc}} \text{STAT3\_P\_nuc} + \text{cFos\_mRNA}$	
90	PTPRT_induction_by_STAT3		$\text{STAT3\_P\_nuc} \xrightarrow{\text{STAT3\_P\_nuc}} \text{STAT3\_P\_nuc} + \text{PTPRT}$	
91	PTPRT_degradation		$\text{PTPRT} \xrightarrow{\text{PTPRT}} \text{Sink}$	
92	STAT3_induction_of_SOCS3		$\text{STAT3\_P\_nuc} \xrightarrow{\text{STAT3\_P\_nuc}} \text{STAT3\_P\_nuc} + \text{SOCS3\_mRNA}$	
93	SOCS3mRNAdegradation		$\text{SOCS3\_mRNA} \xrightarrow{\text{SOCS3\_mRNA}} \text{Sink}$	
94	SOCS3_translation		$\text{SOCS3\_mRNA} \xrightarrow{\text{SOCS3\_mRNA}} \text{SOCS3\_mRNA} + \text{SOCS3}$	
95	SOCS3_degradation		$\text{SOCS3} \xrightarrow{\text{SOCS3}} \text{Sink}$	
96	SOCS3_OSMR_binding		$\text{SOCS3} + \text{OSMR} \xrightarrow{\text{SOCS3, OSMR}} \text{OSMR\_SOCS3}$	
97	SOCS3_OSMR_release		$\text{OSMR\_SOCS3} \xrightarrow{\text{OSMR\_SOCS3}} \text{SOCS3} + \text{OSMR}$	

№	Id	Name	Reaction Equation	SBO
98	OSM_degradation		$\text{OSM} \xrightarrow{\text{OSM}} \text{Sink}$	
99	MMP1InhibtionByTIMP1		$\text{MMP1} + \text{TIMP1} \xrightarrow{\text{MMP1, TIMP1}} \text{MMP1\_TIMP1}$	
100	MMP1-_TIMP1release		$\text{MMP1\_TIMP1} \xrightarrow{\text{MMP1\_TIMP1}} \text{MMP1} + \text{TIMP1}$	
101	MMP3InhibtionByTIMP1		$\text{MMP3} + \text{TIMP1} \xrightarrow{\text{MMP3, TIMP1}} \text{MMP3\_TIMP1}$	
102	MMP3-_TIMP1release		$\text{MMP3\_TIMP1} \xrightarrow{\text{MMP3\_TIMP1}} \text{MMP3} + \text{TIMP1}$	
103	MMP13InhibtionByTIMP1		$\text{MMP13} + \text{TIMP1} \xrightarrow{\text{MMP13, TIMP1}} \text{MMP13\_TIMP1}$	
104	MMP13-_TIMP1release		$\text{MMP13\_TIMP1} \xrightarrow{\text{MMP13\_TIMP1}} \text{MMP13} + \text{TIMP1}$	
105	ADAMTS4InhibtionByTIMP1		$\text{ADAMTS4} + \text{TIMP1} \xrightarrow{\text{ADAMTS4, TIMP1}} \text{ADAMTS4\_TIMP1}$	
106	ADAMTS4-_TIMP1release		$\text{ADAMTS4\_TIMP1} \xrightarrow{\text{ADAMTS4\_TIMP1}} \text{ADAMTS4} + \text{TIMP1}$	
107	Collagen2DegradationByMMP1		$\text{Collagen2} + \text{MMP1} \xrightarrow{\text{Collagen2, MMP1}} \text{MMP1} + \text{ColFrag}$	
108	Collagen2DegradationByMMP13		$\text{Collagen2} + \text{MMP13} \xrightarrow{\text{Collagen2, MMP13}} \text{MMP13} + \text{ColFrag}$	
109	AggrecanDegradationByADAMTS4		$\text{Aggrecan\_Collagen2} + \text{ADAMTS4} \xrightarrow{\text{Aggrecan\_Collagen2, ADAMTS4}} \text{ADAMTS4} + \text{Collagen2} + \text{AggFrag}$	
110	MatriptaseSynthesis		$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{Matriptase} + \text{cFos\_cJun}$	
111	MatriptaseDegradation		$\text{Matriptase} \xrightarrow{\text{Matriptase}} \text{Sink}$	
112	SP1Synthesis		$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{SP1} + \text{cFos\_cJun}$	

№	Id	Name	Reaction Equation	SBO
113	SP1Degradation		$\text{SP1} \xrightarrow{\text{SP1}} \text{Sink}$	
114	SP1_TIMP1-_DNAbinding		$\text{SP1} + \text{TIMP1\_DNA} \xrightarrow{\text{SP1, TIMP1\_DNA}} \text{SP1\_TIMP1\_DNA}$	
115	SP1_TIMP1-_DNArelease		$\text{SP1\_TIMP1\_DNA} \xrightarrow{\text{SP1\_TIMP1\_DNA}} \text{SP1} + \text{TIMP1\_DNA}$	
116	TIMP1-_transcription-_STAT3		$\text{STAT3\_P\_nuc} + \text{TIMP1\_DNA} \xrightarrow{\text{STAT3\_P\_nuc, TIMP1\_DNA}} \text{STAT3\_P\_nuc} + \text{TIMP1\_DNA} + \text{TIMP1\_mRNA}$	
117	TIMP1BasalTranscription		$\text{TIMP1\_DNA} \xrightarrow{\text{TIMP1\_DNA}} \text{TIMP1\_mRNA} + \text{TIMP1\_DNA}$	
118	TIMP1Transcription-_AP1		$\text{cFos\_cJun} + \text{TIMP1\_DNA} \xrightarrow{\text{cFos\_cJun, TIMP1\_DNA}} \text{cFos\_cJun} + \text{TIMP1\_mRNA} + \text{TIMP1\_DNA}$	
119	TIMP3BasalTranscriptionn		$\text{Source} \xrightarrow{\text{Source}} \text{TIMP3\_mRNA}$	
120	TIMP3Transcription-_AP1		$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{TIMP3\_mRNA}$	
121	TIMP3Transcription-_STAT3		$\text{STAT3\_P\_nuc} \xrightarrow{\text{STAT3\_P\_nuc}} \text{STAT3\_P\_nuc} + \text{TIMP3\_mRNA}$	
122	TIMP3Translation		$\text{TIMP3\_mRNA} \xrightarrow{\text{TIMP3\_mRNA}} \text{TIMP3\_mRNA} + \text{TIMP3}$	
123	TIMP3mRNADegradation		$\text{TIMP3\_mRNA} \xrightarrow{\text{TIMP3\_mRNA}} \text{Sink}$	
124	TIMP3Degradation		$\text{TIMP3} \xrightarrow{\text{TIMP3}} \text{Sink}$	
125	ADAMTS4InhibitionByTimp3		$\text{TIMP3} + \text{ADAMTS4} \xrightarrow{\text{TIMP3, ADAMTS4}} \text{ADAMTS4\_TIMP3}$	
126	ADAMTS4-_TIMP3release		$\text{ADAMTS4\_TIMP3} \xrightarrow{\text{ADAMTS4\_TIMP3}} \text{ADAMTS4} + \text{TIMP3}$	

№	Id	Name	Reaction Equation	SBO
127	MMP1InhibtionByTIMP3		$\mathrm{MMP1} + \mathrm{TIMP3} \xrightarrow{\text{MMP1, TIMP3}} \mathrm{MMP1\_TIMP3}$	
128	MMP1-_TIMP3release		$\mathrm{MMP1\_TIMP3} \xrightarrow{\text{MMP1\_TIMP3}} \mathrm{MMP1} + \mathrm{TIMP3}$	
129	MMP3InhibtionByTIMP3		$\mathrm{MMP3} + \mathrm{TIMP3} \xrightarrow{\text{MMP3, TIMP3}} \mathrm{MMP3\_TIMP3}$	
130	MMP3-_TIMP3release		$\mathrm{MMP3\_TIMP3} \xrightarrow{\text{MMP3\_TIMP3}} \mathrm{MMP3} + \mathrm{TIMP3}$	
131	MMP13InhibtionByTIMP3		$\mathrm{MMP13} + \mathrm{TIMP3} \xrightarrow{\text{MMP13, TIMP3}} \mathrm{MMP13\_TIMP3}$	
132	MMP13-_TIMP3release		$\mathrm{MMP13\_TIMP3} \xrightarrow{\text{MMP13\_TIMP3}} \mathrm{MMP13} + \mathrm{TIMP3}$	

6.1 Reaction IL1binding

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\mathrm{IL1} + \mathrm{IL1R} \xrightarrow{\mathrm{IL1,\ IL1R}} \mathrm{IL1\_IL1R} \tag{1}$$

Reactants

Table 6: Properties of each reactant.

Id	Name	SBO
IL1		
IL1R		

Modifiers

Table 7: Properties of each modifier.

Id	Name	SBO
IL1		
IL1R		

Product

Table 8: Properties of each product.

Id	Name	SBO
IL1_IL1R		

Kinetic Law

Derived unit contains undeclared units

$$v_1 = \mathrm{kbinIL1IL1R} \cdot \mathrm{IL1} \cdot \mathrm{IL1R} \tag{2}$$

6.2 Reaction IL1release

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\mathrm{IL1\_IL1R} \xrightarrow{\mathrm{IL1\_IL1R}} \mathrm{IL1} + \mathrm{IL1R} \tag{3}$$

Reactant

Table 9: Properties of each reactant.

Id	Name	SBO
IL1_IL1R		

Modifier

Table 10: Properties of each modifier.

Id	Name	SBO
IL1_IL1R		

Products

Table 11: Properties of each product.

Id	Name	SBO
IL1		
IL1R		

Kinetic Law

Derived unit contains undeclared units

$$v_2 = \mathrm{krelIL1IL1R} \cdot \mathrm{IL1\_IL1R} \tag{4}$$

6.3 Reaction IL1antagonistbinding

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\mathrm{IL1} + \mathrm{IL1Ra} \xrightarrow{\mathrm{IL1,\ IL1Ra}} \mathrm{IL1\_IL1Ra} \tag{5}$$

Reactants

Table 12: Properties of each reactant.

Id	Name	SBO
IL1		
IL1Ra		

Modifiers

Table 13: Properties of each modifier.

Id	Name	SBO
IL1		
IL1Ra		

Product

Table 14: Properties of each product.

Id	Name	SBO
IL1_IL1Ra		

Kinetic Law

Derived unit contains undeclared units

$$v_3 = \text{kbinIL1IL1Ra} \cdot \text{IL1} \cdot \text{IL1Ra} \tag{6}$$

6.4 Reaction IL1antagonistrelease

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{IL1\_IL1Ra} \xrightarrow{\text{IL1\_IL1Ra}} \text{IL1} + \text{IL1Ra} \tag{7}$$

Reactant

Table 15: Properties of each reactant.

Id	Name	SBO
IL1_IL1Ra		

Modifier

Table 16: Properties of each modifier.

Id	Name	SBO
IL1_IL1Ra		

Products

Table 17: Properties of each product.

Id	Name	SBO
IL1		
IL1Ra		

Kinetic Law

Derived unit contains undeclared units

$$v_4 = \text{krelIL1IL1Ra} \cdot \text{IL1\_IL1Ra} \tag{8}$$

6.5 Reaction IL1degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{IL1} \xrightarrow{\text{IL1}} \text{Sink} \tag{9}$$

Reactant

Table 18: Properties of each reactant.

Id	Name	SBO
IL1		

Modifier

Table 19: Properties of each modifier.

Id	Name	SBO
IL1		

Product

Table 20: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_5 = \text{kdegIL1} \cdot \text{IL1} \tag{10}$$

6.6 Reaction IRAK2binding

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{IL1\_IL1R} + \text{IRAK2} \xrightarrow{\text{IL1\_IL1R, IRAK2}} \text{IL1\_IL1R\_IRAK2} \tag{11}$$

Reactants

Table 21: Properties of each reactant.

Id	Name	SBO
IL1_IL1R		
IRAK2		

Modifiers

Table 22: Properties of each modifier.

Id	Name	SBO
IL1_IL1R		
IRAK2		

Product

Table 23: Properties of each product.

Id	Name	SBO
IL1_IL1R_IRAK2		

Kinetic Law

Derived unit contains undeclared units

$$v_6 = \text{kbinIRAK2} \cdot \text{IL1\_IL1R} \cdot \text{IRAK2} \tag{12}$$

6.7 Reaction IRAK2release

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{IL1\_IL1R\_IRAK2} \xrightarrow{\text{IL1\_IL1R\_IRAK2}} \text{IL1\_IL1R} + \text{IRAK2} \tag{13}$$

Reactant

Table 24: Properties of each reactant.

Id	Name	SBO
IL1_IL1R_IRAK2		

Modifier

Table 25: Properties of each modifier.

Id	Name	SBO
IL1_IL1R_IRAK2		

Products

Table 26: Properties of each product.

Id	Name	SBO
IL1_IL1R		

Id	Name	SBO
IRAK2		

Kinetic Law

Derived unit contains undeclared units

$$v_7 = \text{krelIRAK2} \cdot \text{IL1\_IL1R\_IRAK2} \tag{14}$$

6.8 Reaction TRAF6binding

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{IL1\_IL1R\_IRAK2} + \text{TRAF6} \xrightarrow{\text{IL1\_IL1R\_IRAK2, TRAF6}} \text{IL1\_IL1R} + \text{IRAK2\_TRAF6} \tag{15}$$

Reactants

Table 27: Properties of each reactant.

Id	Name	SBO
IL1_IL1R_IRAK2		
TRAF6		

Modifiers

Table 28: Properties of each modifier.

Id	Name	SBO
IL1_IL1R_IRAK2		
TRAF6		

Products

Table 29: Properties of each product.

Id	Name	SBO
IL1_IL1R		
IRAK2_TRAF6		

Id	Name	SBO

Kinetic Law

Derived unit contains undeclared units

$$v_8 = \text{kbinTRAF6} \cdot \text{IL1\_IL1R\_IRAK2} \cdot \text{TRAF6} \tag{16}$$

6.9 Reaction `TRAF6release`

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{IRAK2\_TRAF6} \xrightarrow{\text{IRAK2\_TRAF6}} \text{IRAK2} + \text{TRAF6} \tag{17}$$

Reactant

Table 30: Properties of each reactant.

Id	Name	SBO
IRAK2_TRAF6		

Modifier

Table 31: Properties of each modifier.

Id	Name	SBO
IRAK2_TRAF6		

Products

Table 32: Properties of each product.

Id	Name	SBO
IRAK2		
TRAF6		

Kinetic Law

Derived unit contains undeclared units

$$v_9 = \text{krelTRAF6} \cdot \text{IRAK2\_TRAF6} \tag{18}$$

6.10 Reaction JNKphosphorylation

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{JNK} + \text{IRAK2\_TRAF6} \xrightarrow{\text{JNK, IRAK2\_TRAF6}} \text{JNK\_P} + \text{IRAK2\_TRAF6} \tag{19}$$

Reactants

Table 33: Properties of each reactant.

Id	Name	SBO
JNK		
IRAK2_TRAF6		

Modifiers

Table 34: Properties of each modifier.

Id	Name	SBO
JNK		
IRAK2_TRAF6		

Products

Table 35: Properties of each product.

Id	Name	SBO
JNK_P		
IRAK2_TRAF6		

Kinetic Law

Derived unit contains undeclared units

$$v_{10} = \text{kphosJNK} \cdot \text{JNK} \cdot \text{IRAK2\_TRAF6} \tag{20}$$

6.11 Reaction JNKdephosphorylation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{JNK\_P} \xrightarrow{\text{JNK\_P}} \text{JNK} \tag{21}$$

Reactant

Table 36: Properties of each reactant.

Id	Name	SBO
JNK_P		

Modifier

Table 37: Properties of each modifier.

Id	Name	SBO
JNK_P		

Product

Table 38: Properties of each product.

Id	Name	SBO
JNK		

Kinetic Law

Derived unit contains undeclared units

$$v_{11} = \text{kdephosJNK} \cdot \text{JNK\_P} \tag{22}$$

6.12 Reaction JNKdephosphorylationByDUSP16

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{JNK\_P} + \text{DUSP16} \xrightarrow{\text{JNK\_P, DUSP16}} \text{JNK} + \text{DUSP16} \tag{23}$$

Reactants

Table 39: Properties of each reactant.

Id	Name	SBO
JNK_P		
DUSP16		

Modifiers

Table 40: Properties of each modifier.

Id	Name	SBO
JNK_P		
DUSP16		

Products

Table 41: Properties of each product.

Id	Name	SBO
JNK		
DUSP16		

Kinetic Law

Derived unit contains undeclared units

$$v_{12} = \text{kdephosJNKDUSP16} \cdot \text{JNK\_P} \cdot \text{DUSP16} \tag{24}$$

6.13 Reaction cJunPhosphorylation

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{cJun} + \text{JNK\_P} \xrightarrow{\text{cJun, JNK\_P}} \text{cJun\_P} + \text{JNK\_P} \tag{25}$$

Reactants

Table 42: Properties of each reactant.

Id	Name	SBO
cJun		
JNK_P		

Modifiers

Table 43: Properties of each modifier.

Id	Name	SBO
cJun		
JNK_P		

Products

Table 44: Properties of each product.

Id	Name	SBO
cJun_P		
JNK_P		

Kinetic Law

Derived unit contains undeclared units

$$v_{13} = \text{kphoscJun} \cdot \text{cJun} \cdot \text{JNK\_P} \tag{26}$$

6.14 Reaction cJunDephosphorylation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{cJun\_P} \xrightarrow{\text{cJun\_P}} \text{cJun} \tag{27}$$

Reactant

Table 45: Properties of each reactant.

Id	Name	SBO
cJun_P		

Modifier

Table 46: Properties of each modifier.

Id	Name	SBO
cJun_P		

Product

Table 47: Properties of each product.

Id	Name	SBO
cJun		

Kinetic Law

Derived unit contains undeclared units

$$v_{14} = \text{kdephoscJun} \cdot \text{cJun\_P} \tag{28}$$

6.15 Reaction cJunDimerisation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$2\,\text{cJun\_P} \xrightarrow{\text{cJun\_P}} \text{cJun\_dimer} \tag{29}$$

Reactant

Table 48: Properties of each reactant.

Id	Name	SBO
cJun_P		

Modifier

Table 49: Properties of each modifier.

Id	Name	SBO
cJun_P		

Product

Table 50: Properties of each product.

Id	Name	SBO
cJun_dimer		

Kinetic Law

Derived unit contains undeclared units

$$v_{15} = \text{kdimercJun} \cdot \text{cJun\_P} \cdot (\text{cJun\_P} - 1) \cdot 0.5 \tag{30}$$

6.16 Reaction cJunDedimerisation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} 2\,\text{cJun\_P} \tag{31}$$

Reactant

Table 51: Properties of each reactant.

Id	Name	SBO
cJun_dimer		

Modifier

Table 52: Properties of each modifier.

Id	Name	SBO
cJun_dimer		

Id	Name	SBO

Product

Table 53: Properties of each product.

Id	Name	SBO
cJun_P		

Kinetic Law

Derived unit contains undeclared units

$$v_{16} = \text{kdedimercJun} \cdot \text{cJun\_dimer} \tag{32}$$

6.17 Reaction cJunTranscriptionAP1

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cJun\_mRNA} + \text{cFos\_cJun} \tag{33}$$

Reactant

Table 54: Properties of each reactant.

Id	Name	SBO
cFos_cJun		

Modifier

Table 55: Properties of each modifier.

Id	Name	SBO
cFos_cJun		

Products

Table 56: Properties of each product.

Id	Name	SBO
cJun_mRNA		
cFos_cJun		

Kinetic Law

Derived unit contains undeclared units

$$v_{17} = \text{ksyncJunmRNA} \cdot \text{cFos\_cJun} \cdot \text{kAP1activity} \tag{34}$$

6.18 Reaction cJunTranscriptioncJun

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_mRNA} + \text{cJun\_dimer} \tag{35}$$

Reactant

Table 57: Properties of each reactant.

Id	Name	SBO
cJun_dimer		

Modifier

Table 58: Properties of each modifier.

Id	Name	SBO
cJun_dimer		

Products

Table 59: Properties of each product.

Id	Name	SBO
cJun_mRNA		
cJun_dimer		

Kinetic Law

Derived unit contains undeclared units

$$v_{18} = \text{ksyncJunmRNAcJun} \cdot \text{cJun\_dimer} \tag{36}$$

6.19 Reaction `cJunBasalTranscription`

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{Source} \xrightarrow{\text{Source}} \text{cJun\_mRNA} \tag{37}$$

Reactant

Table 60: Properties of each reactant.

Id	Name	SBO
`Source`		

Modifier

Table 61: Properties of each modifier.

Id	Name	SBO
`Source`		

Product

Table 62: Properties of each product.

Id	Name	SBO
`cJun_mRNA`		

Kinetic Law

Derived unit contains undeclared units

$$v_{19} = \text{ksynbasalcJunmRNA} \cdot \text{Source} \tag{38}$$

6.20 Reaction cJunmRNADegradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{cJun\_mRNA} \xrightarrow{\text{cJun\_mRNA}} \text{Sink} \tag{39}$$

Reactant

Table 63: Properties of each reactant.

Id	Name	SBO
cJun_mRNA		

Modifier

Table 64: Properties of each modifier.

Id	Name	SBO
cJun_mRNA		

Product

Table 65: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{20} = \text{kdegcJunmRNA} \cdot \text{cJun\_mRNA} \tag{40}$$

6.21 Reaction cJunTranslation

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cJun\_mRNA} \xrightarrow{\text{cJun\_mRNA}} \text{cJun\_mRNA} + \text{cJun} \tag{41}$$

Reactant

Table 66: Properties of each reactant.

Id	Name	SBO
cJun_mRNA		

Modifier

Table 67: Properties of each modifier.

Id	Name	SBO
cJun_mRNA		

Products

Table 68: Properties of each product.

Id	Name	SBO
cJun_mRNA		
cJun		

Kinetic Law

Derived unit contains undeclared units

$$v_{21} = \text{ksyncJun} \cdot \text{cJun\_mRNA} \tag{42}$$

6.22 Reaction cJunDegradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{cJun} \xrightarrow{\text{cJun}} \text{Sink} \tag{43}$$

Reactant

Table 69: Properties of each reactant.

Id	Name	SBO
cJun		

Modifier

Table 70: Properties of each modifier.

Id	Name	SBO
cJun		

Product

Table 71: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{22} = \text{kdegcJun} \cdot \text{cJun} \tag{44}$$

6.23 Reaction p38phosphorylation

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{p38} + \text{IRAK2\_TRAF6} \xrightarrow{\text{p38, IRAK2\_TRAF6}} \text{p38\_P} + \text{IRAK2\_TRAF6} \tag{45}$$

Reactants

Table 72: Properties of each reactant.

Id	Name	SBO
p38		
IRAK2_TRAF6		

Modifiers

Table 73: Properties of each modifier.

Id	Name	SBO
p38		
IRAK2_TRAF6		

Products

Table 74: Properties of each product.

Id	Name	SBO
p38_P		
IRAK2_TRAF6		

Kinetic Law

Derived unit contains undeclared units

$$v_{23} = \text{kphosp38} \cdot \text{p38} \cdot \text{IRAK2\_TRAF6} \tag{46}$$

6.24 Reaction p38dephosphorylation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{p38\_P} \xrightarrow{\text{p38\_P}} \text{p38} \tag{47}$$

Reactant

Table 75: Properties of each reactant.

Id	Name	SBO
p38_P		

Modifier

Table 76: Properties of each modifier.

Id	Name	SBO
p38_P		

Product

Table 77: Properties of each product.

Id	Name	SBO
p38		

Kinetic Law

Derived unit contains undeclared units

$$v_{24} = \text{kdephosp38} \cdot \text{p38\_P} \tag{48}$$

6.25 Reaction p38dephosphorylationMKP1

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{p38\_P} + \text{MKP1} \xrightarrow{\text{p38\_P, MKP1}} \text{p38} + \text{MKP1} \tag{49}$$

Reactants

Table 78: Properties of each reactant.

Id	Name	SBO
p38_P		
MKP1		

Modifiers

Table 79: Properties of each modifier.

Id	Name	SBO
p38_P		

Id	Name	SBO
MKP1		

Products

Table 80: Properties of each product.

Id	Name	SBO
p38		
MKP1		

Kinetic Law

Derived unit contains undeclared units

$$v_{25} = \text{kdephosp38MKP1} \cdot \text{p38\_P} \cdot \text{MKP1} \tag{50}$$

6.26 Reaction MMP1Transcription_AP1

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{MMP1\_mRNA} \tag{51}$$

Reactant

Table 81: Properties of each reactant.

Id	Name	SBO
cFos_cJun		

Modifier

Table 82: Properties of each modifier.

Id	Name	SBO
cFos_cJun		

Products

Table 83: Properties of each product.

Id	Name	SBO
cFos_cJun		
MMP1_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{26} = \text{ksynMMP1mRNA} \cdot \text{cFos\_cJun} \cdot \text{kAP1activity} \tag{52}$$

6.27 Reaction MMP1Transcription_cJun_dimer

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_dimer} + \text{MMP1\_mRNA} \tag{53}$$

Reactant

Table 84: Properties of each reactant.

Id	Name	SBO
cJun_dimer		

Modifier

Table 85: Properties of each modifier.

Id	Name	SBO
cJun_dimer		

Products

Table 86: Properties of each product.

Id	Name	SBO
cJun_dimer		
MMP1_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{27} = \text{ksynMMP1mRNAcJun} \cdot \text{cJun\_dimer} \tag{54}$$

6.28 Reaction `MMP1Translation`

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{MMP1\_mRNA} \xrightarrow{\text{MMP1\_mRNA}} \text{MMP1\_mRNA} + \text{proMMP1} \tag{55}$$

Reactant

Table 87: Properties of each reactant.

Id	Name	SBO
`MMP1_mRNA`		

Modifier

Table 88: Properties of each modifier.

Id	Name	SBO
`MMP1_mRNA`		

Products

Table 89: Properties of each product.

Id	Name	SBO
`MMP1_mRNA`		
`proMMP1`		

Kinetic Law

Derived unit contains undeclared units

$$v_{28} = \text{ksynMMP1} \cdot \text{MMP1\_mRNA} \tag{56}$$

6.29 Reaction MMP1mRNADegradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{MMP1\_mRNA} \xrightarrow{\text{MMP1\_mRNA}} \text{Sink} \tag{57}$$

Reactant

Table 90: Properties of each reactant.

Id	Name	SBO
MMP1_mRNA		

Modifier

Table 91: Properties of each modifier.

Id	Name	SBO
MMP1_mRNA		

Product

Table 92: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{29} = \text{kdegMMP1mRNA} \cdot \text{MMP1\_mRNA} \tag{58}$$

6.30 Reaction proMMP1cleavageByMatriptase

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{proMMP1} + \text{Matriptase} \xrightarrow{\text{proMMP1, Matriptase}} \text{MMP1} + \text{Matriptase} \tag{59}$$

Reactants

Table 93: Properties of each reactant.

Id	Name	SBO
proMMP1		
Matriptase		

Modifiers

Table 94: Properties of each modifier.

Id	Name	SBO
proMMP1		
Matriptase		

Products

Table 95: Properties of each product.

Id	Name	SBO
MMP1		
Matriptase		

Kinetic Law

Derived unit contains undeclared units

$$v_{30} = \text{kactMMP1mat} \cdot \text{proMMP1} \cdot \text{Matriptase} \tag{60}$$

6.31 Reaction proMMP1cleavageByMMP3

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{proMMP1} + \text{MMP3} \xrightarrow{\text{proMMP1, MMP3}} \text{MMP1} + \text{MMP3} \tag{61}$$

Reactants

Table 96: Properties of each reactant.

Id	Name	SBO
proMMP1		
MMP3		

Modifiers

Table 97: Properties of each modifier.

Id	Name	SBO
proMMP1		
MMP3		

Products

Table 98: Properties of each product.

Id	Name	SBO
MMP1		
MMP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{31} = \text{kactMMP1mmp3} \cdot \text{proMMP1} \cdot \text{MMP3} \tag{62}$$

6.32 Reaction MMP1Degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{MMP1} \xrightarrow{\text{MMP1}} \text{Sink} \tag{63}$$

Reactant

Table 99: Properties of each reactant.

Id	Name	SBO
MMP1		

Modifier

Table 100: Properties of each modifier.

Id	Name	SBO
MMP1		

Product

Table 101: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{32} = \text{kdegMMP1} \cdot \text{MMP1} \tag{64}$$

6.33 Reaction MMP3Transcription_AP1

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{MMP3\_mRNA} \tag{65}$$

Reactant

Table 102: Properties of each reactant.

Id	Name	SBO
cFos_cJun		

Modifier

Table 103: Properties of each modifier.

Id	Name	SBO
cFos_cJun		

Products

Table 104: Properties of each product.

Id	Name	SBO
cFos_cJun		
MMP3_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{33} = \text{ksynMMP3mRNA} \cdot \text{cFos\_cJun} \cdot \text{kAP1activity} \tag{66}$$

6.34 Reaction MMP3Transcription_cJun_dimer

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_dimer} + \text{MMP3\_mRNA} \tag{67}$$

Reactant

Table 105: Properties of each reactant.

Id	Name	SBO
cJun_dimer		

Modifier

Table 106: Properties of each modifier.

Id	Name	SBO
cJun_dimer		

Products

Table 107: Properties of each product.

Id	Name	SBO
cJun_dimer		
MMP3_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{34} = \text{ksynMMP3mRNAcJun} \cdot \text{cJun\_dimer} \tag{68}$$

6.35 Reaction MMP3Translation

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{MMP3\_mRNA} \xrightarrow{\text{MMP3\_mRNA}} \text{MMP3\_mRNA} + \text{proMMP3} \tag{69}$$

Reactant

Table 108: Properties of each reactant.

Id	Name	SBO
MMP3_mRNA		

Modifier

Table 109: Properties of each modifier.

Id	Name	SBO
MMP3_mRNA		

Products

Table 110: Properties of each product.

Id	Name	SBO
MMP3_mRNA		
proMMP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{35} = \text{ksynMMP3} \cdot \text{MMP3\_mRNA} \tag{70}$$

6.36 Reaction MMP3mRNADegradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{MMP3\_mRNA} \xrightarrow{\text{MMP3\_mRNA}} \text{Sink} \tag{71}$$

Reactant

Table 111: Properties of each reactant.

Id	Name	SBO
MMP3_mRNA		

Modifier

Table 112: Properties of each modifier.

Id	Name	SBO
MMP3_mRNA		

Product

Table 113: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{36} = \text{kdegMMP3mRNA} \cdot \text{MMP3\_mRNA} \tag{72}$$

6.37 Reaction proMMP3cleavageByMatriptase

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{proMMP3} + \text{Matriptase} \xrightarrow{\text{proMMP3, Matriptase}} \text{MMP3} + \text{Matriptase} \tag{73}$$

Reactants

Table 114: Properties of each reactant.

Id	Name	SBO
proMMP3		
Matriptase		

Modifiers

Table 115: Properties of each modifier.

Id	Name	SBO
proMMP3		
Matriptase		

Products

Table 116: Properties of each product.

Id	Name	SBO
MMP3		
Matriptase		

Kinetic Law

Derived unit contains undeclared units

$$v_{37} = \text{kactMMP3mat} \cdot \text{proMMP3} \cdot \text{Matriptase} \tag{74}$$

6.38 Reaction MMP3Degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{MMP3} \xrightarrow{\text{MMP3}} \text{Sink} \tag{75}$$

Reactant

Table 117: Properties of each reactant.

Id	Name	SBO
MMP3		

Modifier

Table 118: Properties of each modifier.

Id	Name	SBO
MMP3		

Product

Table 119: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{38} = \text{kdegMMP3} \cdot \text{MMP3} \tag{76}$$

6.39 Reaction MMP13Transcription_AP1

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{MMP13\_mRNA} \tag{77}$$

Reactant

Table 120: Properties of each reactant.

Id	Name	SBO
cFos_cJun		

Modifier

Table 121: Properties of each modifier.

Id	Name	SBO
cFos_cJun		

Products

Table 122: Properties of each product.

Id	Name	SBO
cFos_cJun		
MMP13_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{39} = \text{ksynMMP13mRNA} \cdot \text{cFos\_cJun} \cdot \text{kAP1activity} \tag{78}$$

6.40 Reaction MMP13Transcription_cJun_dimer

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_dimer} + \text{MMP13\_mRNA} \tag{79}$$

Reactant

Table 123: Properties of each reactant.

Id	Name	SBO
cJun_dimer		

Modifier

Table 124: Properties of each modifier.

Id	Name	SBO
cJun_dimer		

Products

Table 125: Properties of each product.

Id	Name	SBO
cJun_dimer		
MMP13_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{40} = \text{ksynMMP13mRNAcJun} \cdot \text{cJun\_dimer} \tag{80}$$

6.41 Reaction MMP13Translation

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{MMP13\_mRNA} \xrightarrow{\text{MMP13\_mRNA}} \text{MMP13\_mRNA} + \text{proMMP13} \tag{81}$$

Reactant

Table 126: Properties of each reactant.

Id	Name	SBO
MMP13_mRNA		

Modifier

Table 127: Properties of each modifier.

Id	Name	SBO
MMP13_mRNA		

Products

Table 128: Properties of each product.

Id	Name	SBO
MMP13_mRNA		
proMMP13		

Kinetic Law

Derived unit contains undeclared units

$$v_{41} = \text{ksynMMP13} \cdot \text{MMP13\_mRNA} \tag{82}$$

6.42 Reaction MMP13mRNADegradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{MMP13\_mRNA} \xrightarrow{\text{MMP13\_mRNA}} \text{Sink} \tag{83}$$

Reactant

Table 129: Properties of each reactant.

Id	Name	SBO
MMP13_mRNA		

Modifier

Table 130: Properties of each modifier.

Id	Name	SBO
MMP13_mRNA		

Product

Table 131: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{42} = \text{kdegMMP13mRNA} \cdot \text{MMP13\_mRNA} \tag{84}$$

6.43 Reaction proMMP13cleavageByMMP3

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{proMMP13} + \text{MMP3} \xrightarrow{\text{proMMP13, MMP3}} \text{MMP13} + \text{MMP3} \tag{85}$$

Reactants

Table 132: Properties of each reactant.

Id	Name	SBO
proMMP13		
MMP3		

Modifiers

Table 133: Properties of each modifier.

Id	Name	SBO
proMMP13		
MMP3		

Products

Table 134: Properties of each product.

Id	Name	SBO
MMP13		
MMP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{43} = \text{kactMMP13mmp3} \cdot \text{proMMP13} \cdot \text{MMP3} \tag{86}$$

6.44 Reaction MMP13Degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{MMP13} \xrightarrow{\text{MMP13}} \text{Sink} \tag{87}$$

Reactant

Table 135: Properties of each reactant.

Id	Name	SBO
MMP13		

Modifier

Table 136: Properties of each modifier.

Id	Name	SBO
MMP13		

Product

Table 137: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{44} = \text{kdegMMP13} \cdot \text{MMP13} \tag{88}$$

6.45 Reaction TIMP1Translation

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{TIMP1\_mRNA} \xrightarrow{\text{TIMP1\_mRNA}} \text{TIMP1\_mRNA} + \text{TIMP1} \tag{89}$$

Reactant

Table 138: Properties of each reactant.

Id	Name	SBO
TIMP1_mRNA		

Modifier

Table 139: Properties of each modifier.

Id	Name	SBO
TIMP1_mRNA		

Products

Table 140: Properties of each product.

Id	Name	SBO
TIMP1_mRNA		
TIMP1		

Kinetic Law

Derived unit contains undeclared units

$$v_{45} = \text{ksynTIMP1} \cdot \text{TIMP1\_mRNA} \tag{90}$$

6.46 Reaction TIMP1mRNADegradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{TIMP1\_mRNA} \xrightarrow{\text{TIMP1\_mRNA}} \text{Sink} \tag{91}$$

Reactant

Table 141: Properties of each reactant.

Id	Name	SBO
TIMP1_mRNA		

Modifier

Table 142: Properties of each modifier.

Id	Name	SBO
TIMP1_mRNA		

Product

Table 143: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{46} = \text{kdegTIMP1mRNA} \cdot \text{TIMP1\_mRNA} \tag{92}$$

6.47 Reaction TIMP1Degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{TIMP1} \xrightarrow{\text{TIMP1}} \text{Sink} \tag{93}$$

Reactant

Table 144: Properties of each reactant.

Id	Name	SBO
TIMP1		

Modifier

Table 145: Properties of each modifier.

Id	Name	SBO
TIMP1		

Product

Table 146: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{47} = \text{kdegTIMP1} \cdot \text{TIMP1} \tag{94}$$

6.48 Reaction ADAMTS4Transcription_AP1

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{ADAMTS4\_mRNA} \tag{95}$$

Reactant

Table 147: Properties of each reactant.

Id	Name	SBO
cFos_cJun		

Modifier

Table 148: Properties of each modifier.

Id	Name	SBO
cFos_cJun		

Products

Table 149: Properties of each product.

Id	Name	SBO
cFos_cJun		
ADAMTS4_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{48} = \text{ksynADAMTS4mRNA} \cdot \text{cFos\_cJun} \cdot \text{kAP1activity} \tag{96}$$

6.49 Reaction ADAMTS4Transcription_cJun_dimer

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_dimer} + \text{ADAMTS4\_mRNA} \tag{97}$$

Reactant

Table 150: Properties of each reactant.

Id	Name	SBO
cJun_dimer		

Modifier

Table 151: Properties of each modifier.

Id	Name	SBO
cJun_dimer		

Products

Table 152: Properties of each product.

Id	Name	SBO
cJun_dimer		
ADAMTS4_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{49} = \text{ksynADAMTS4mRNAcJun} \cdot \text{cJun\_dimer} \tag{98}$$

6.50 Reaction ADAMTS4Translation

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{ADAMTS4\_mRNA} \xrightarrow{\text{ADAMTS4\_mRNA}} \text{ADAMTS4\_mRNA} + \text{ADAMTS4} \tag{99}$$

Reactant

Table 153: Properties of each reactant.

Id	Name	SBO
ADAMTS4_mRNA		

Modifier

Table 154: Properties of each modifier.

Id	Name	SBO
ADAMTS4_mRNA		

Products

Table 155: Properties of each product.

Id	Name	SBO
ADAMTS4_mRNA		
ADAMTS4		

Kinetic Law

Derived unit contains undeclared units

$$v_{50} = \text{ksynADAMTS4} \cdot \text{ADAMTS4\_mRNA} \tag{100}$$

6.51 Reaction ADAMTS4mRNADegradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{ADAMTS4\_mRNA} \xrightarrow{\text{ADAMTS4\_mRNA}} \text{Sink} \tag{101}$$

Reactant

Table 156: Properties of each reactant.

Id	Name	SBO
ADAMTS4_mRNA		

Modifier

Table 157: Properties of each modifier.

Id	Name	SBO
ADAMTS4_mRNA		

Product

Table 158: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{51} = \text{kdegADAMTS4mRNA} \cdot \text{ADAMTS4\_mRNA} \tag{102}$$

6.52 Reaction ADAMTS4Degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{ADAMTS4} \xrightarrow{\text{ADAMTS4}} \text{Sink} \tag{103}$$

Reactant

Table 159: Properties of each reactant.

Id	Name	SBO
ADAMTS4		

Modifier

Table 160: Properties of each modifier.

Id	Name	SBO
ADAMTS4		

Product

Table 161: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{52} = \text{kdegADAMTS4} \cdot \text{ADAMTS4} \tag{104}$$

6.53 Reaction PP4Synthesis

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{PP4} \tag{105}$$

Reactant

Table 162: Properties of each reactant.

Id	Name	SBO
cFos_cJun		

Modifier

Table 163: Properties of each modifier.

Id	Name	SBO
cFos_cJun		

Id	Name	SBO

Products

Table 164: Properties of each product.

Id	Name	SBO
cFos_cJun		
PP4		

Kinetic Law

Derived unit contains undeclared units

$$v_{53} = \text{ksynPP4} \cdot \text{cFos\_cJun} \cdot \text{kAP1activity} \tag{106}$$

6.54 Reaction PP4Synthesis_cJun_dimer

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_dimer} + \text{PP4} \tag{107}$$

Reactant

Table 165: Properties of each reactant.

Id	Name	SBO
cJun_dimer		

Modifier

Table 166: Properties of each modifier.

Id	Name	SBO
cJun_dimer		

Products

Table 167: Properties of each product.

Id	Name	SBO
cJun_dimer		
PP4		

Kinetic Law

Derived unit contains undeclared units

$$v_{54} = \text{ksynPP4cJun} \cdot \text{cJun\_dimer} \tag{108}$$

6.55 Reaction DUSP16Synthesis

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{DUSP16} \tag{109}$$

Reactant

Table 168: Properties of each reactant.

Id	Name	SBO
cFos_cJun		

Modifier

Table 169: Properties of each modifier.

Id	Name	SBO
cFos_cJun		

Products

Table 170: Properties of each product.

Id	Name	SBO
cFos_cJun		
DUSP16		

Kinetic Law

Derived unit contains undeclared units

$$v_{55} = \text{ksynDUSP16} \cdot \text{cFos\_cJun} \cdot \text{kAP1activity} \tag{110}$$

6.56 Reaction DUSP16Synthesis_cJun_dimer

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{cJun\_dimer} + \text{DUSP16} \tag{111}$$

Reactant

Table 171: Properties of each reactant.

Id	Name	SBO
cJun_dimer		

Modifier

Table 172: Properties of each modifier.

Id	Name	SBO
cJun_dimer		

Products

Table 173: Properties of each product.

Id	Name	SBO
cJun_dimer		
DUSP16		

Kinetic Law

Derived unit contains undeclared units

$$v_{56} = \text{ksynDUSP16cJun} \cdot \text{cJun\_dimer} \tag{112}$$

6.57 Reaction PP4Degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{PP4} \xrightarrow{\text{PP4}} \text{Sink} \tag{113}$$

Reactant

Table 174: Properties of each reactant.

Id	Name	SBO
PP4		

Modifier

Table 175: Properties of each modifier.

Id	Name	SBO
PP4		

Product

Table 176: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{57} = \text{kdegPP4} \cdot \text{PP4} \tag{114}$$

6.58 Reaction DUSP16Degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{DUSP16} \xrightarrow{\text{DUSP16}} \text{Sink} \tag{115}$$

Reactant

Table 177: Properties of each reactant.

Id	Name	SBO
DUSP16		

Modifier

Table 178: Properties of each modifier.

Id	Name	SBO
DUSP16		

Product

Table 179: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{58} = \text{kdegDUSP16} \cdot \text{DUSP16} \tag{116}$$

6.59 Reaction TRAF6Inhibition

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{TRAF6} + \text{PP4} \xrightarrow{\text{TRAF6, PP4}} \text{TRAF6\_PP4} \tag{117}$$

Reactants

Table 180: Properties of each reactant.

Id	Name	SBO
TRAF6		
PP4		

Modifiers

Table 181: Properties of each modifier.

Id	Name	SBO
TRAF6		
PP4		

Product

Table 182: Properties of each product.

Id	Name	SBO
TRAF6_PP4		

Kinetic Law

Derived unit contains undeclared units

$$v_{59} = \text{kinhibTRAF6} \cdot \text{TRAF6} \cdot \text{PP4} \tag{118}$$

6.60 Reaction BoundTRAF6Inhibition

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{IRAK2\_TRAF6} + \text{PP4} \xrightarrow{\text{IRAK2\_TRAF6, PP4}} \text{IRAK2\_TRAF6\_PP4} \tag{119}$$

Reactants

Table 183: Properties of each reactant.

Id	Name	SBO
IRAK2_TRAF6		
PP4		

Modifiers

Table 184: Properties of each modifier.

Id	Name	SBO
IRAK2_TRAF6 PP4		

Product

Table 185: Properties of each product.

Id	Name	SBO
IRAK2_TRAF6_PP4		

Kinetic Law

Derived unit contains undeclared units

$$v_{60} = \text{kinhibTRAF6} \cdot \text{IRAK2\_TRAF6} \cdot \text{PP4} \tag{120}$$

6.61 Reaction TRAF6PP4Disassociation

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{TRAF6\_PP4} \xrightarrow{\text{TRAF6\_PP4}} \text{TRAF6} + \text{PP4} \tag{121}$$

Reactant

Table 186: Properties of each reactant.

Id	Name	SBO
TRAF6_PP4		

Modifier

Table 187: Properties of each modifier.

Id	Name	SBO
TRAF6_PP4		

Products

Table 188: Properties of each product.

Id	Name	SBO
TRAF6		
PP4		

Kinetic Law

Derived unit contains undeclared units

$$v_{61} = \text{krelTRAF6PP4} \cdot \text{TRAF6\_PP4} \tag{122}$$

6.62 Reaction IRAK2_TRAF6PP4Disassociation

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{IRAK2\_TRAF6\_PP4} \xrightarrow{\text{IRAK2\_TRAF6\_PP4}} \text{IRAK2\_TRAF6} + \text{PP4} \tag{123}$$

Reactant

Table 189: Properties of each reactant.

Id	Name	SBO
IRAK2_TRAF6_PP4		

Modifier

Table 190: Properties of each modifier.

Id	Name	SBO
IRAK2_TRAF6_PP4		

Products

Table 191: Properties of each product.

Id	Name	SBO
IRAK2_TRAF6PP4		

Kinetic Law

Derived unit contains undeclared units

$$v_{62} = \text{krelTRAF6PP4} \cdot \text{IRAK2\_TRAF6\_PP4} \tag{124}$$

6.63 Reaction Transcription_cFos_byAP1

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{cFos\_mRNA} \tag{125}$$

Reactant

Table 192: Properties of each reactant.

Id	Name	SBO
cFos_cJun		

Modifier

Table 193: Properties of each modifier.

Id	Name	SBO
cFos_cJun		

Products

Table 194: Properties of each product.

Id	Name	SBO
cFos_cJun		
cFos_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{63} = \text{ksyncFosmRNA} \cdot \text{cFos\_cJun} \cdot \text{kAP1activity} \tag{126}$$

6.64 Reaction cFosmRNA_Degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{cFos\_mRNA} \xrightarrow{\text{cFos\_mRNA}} \text{Sink} \tag{127}$$

Reactant

Table 195: Properties of each reactant.

Id	Name	SBO
cFos_mRNA		

Modifier

Table 196: Properties of each modifier.

Id	Name	SBO
cFos_mRNA		

Product

Table 197: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{64} = \text{kdegcFosmRNA} \cdot \text{cFos\_mRNA} \tag{128}$$

6.65 Reaction cFosSynthesis

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_mRNA} \xrightarrow{\text{cFos\_mRNA}} \text{cFos\_mRNA} + \text{cFos} \tag{129}$$

Reactant

Table 198: Properties of each reactant.

Id	Name	SBO
cFos_mRNA		

Modifier

Table 199: Properties of each modifier.

Id	Name	SBO
cFos_mRNA		

Products

Table 200: Properties of each product.

Id	Name	SBO
cFos_mRNA		
cFos		

Kinetic Law

Derived unit contains undeclared units

$$v_{65} = \text{ksyncFos} \cdot \text{cFos\_mRNA} \tag{130}$$

6.66 Reaction cFosDegradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{cFos} \xrightarrow{\text{cFos}} \text{Sink} \tag{131}$$

Reactant

Table 201: Properties of each reactant.

Id	Name	SBO
cFos		

Modifier

Table 202: Properties of each modifier.

Id	Name	SBO
cFos		

Product

Table 203: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{66} = \text{kdegcFos} \cdot \text{cFos} \tag{132}$$

6.67 Reaction cFosPhosphorylation_p38

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{p38\_P} + \text{cFos} \xrightarrow{\text{p38\_P, cFos}} \text{p38\_P} + \text{cFos\_P} \tag{133}$$

Reactants

Table 204: Properties of each reactant.

Id	Name	SBO
p38_P		
cFos		

Modifiers

Table 205: Properties of each modifier.

Id	Name	SBO
p38_P		
cFos		

Products

Table 206: Properties of each product.

Id	Name	SBO
p38_P		
cFos_P		

Kinetic Law

Derived unit contains undeclared units

$$v_{67} = \text{kphoscFos} \cdot \text{p38\_P} \cdot \text{cFos} \tag{134}$$

6.68 Reaction cFosDephosphorylation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{cFos\_P} \xrightarrow{\text{cFos\_P}} \text{cFos} \tag{135}$$

Reactant

Table 207: Properties of each reactant.

Id	Name	SBO
cFos_P		

Modifier

Table 208: Properties of each modifier.

Id	Name	SBO
cFos_P		

Product

Table 209: Properties of each product.

Id	Name	SBO
cFos		

Kinetic Law

Derived unit contains undeclared units

$$v_{68} = \text{kdephoscFos} \cdot \text{cFos\_P} \tag{136}$$

6.69 Reaction MKP1Synthesis

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{MKP1} + \text{cFos\_cJun} \tag{137}$$

Reactant

Table 210: Properties of each reactant.

Id	Name	SBO
cFos_cJun		

Modifier

Table 211: Properties of each modifier.

Id	Name	SBO
cFos_cJun		

Products

Table 212: Properties of each product.

Id	Name	SBO
MKP1		
cFos_cJun		

Kinetic Law

Derived unit contains undeclared units

$$v_{69} = \text{ksynMKP1} \cdot \text{cFos\_cJun} \cdot \text{kAP1activity} \tag{138}$$

6.70 Reaction MKP1Synthesis_cJun_dimer

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cJun\_dimer} \xrightarrow{\text{cJun\_dimer}} \text{MKP1} + \text{cJun\_dimer} \tag{139}$$

Reactant

Table 213: Properties of each reactant.

Id	Name	SBO
cJun_dimer		

Modifier

Table 214: Properties of each modifier.

Id	Name	SBO
cJun_dimer		

Products

Table 215: Properties of each product.

Id	Name	SBO
MKP1		
cJun_dimer		

Kinetic Law

Derived unit contains undeclared units

$$v_{70} = \text{ksynMKP1cJun} \cdot \text{cJun\_dimer} \tag{140}$$

6.71 Reaction MKP1Degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{MKP1} \xrightarrow{\text{MKP1}} \text{Sink} \tag{141}$$

Reactant

Table 216: Properties of each reactant.

Id	Name	SBO
MKP1		

Modifier

Table 217: Properties of each modifier.

Id	Name	SBO
MKP1		

Product

Table 218: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{71} = \text{kdegMKP1} \cdot \text{MKP1} \tag{142}$$

6.72 Reaction cFosDephosphorylationByDusp16

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{cFos\_P} + \text{DUSP16} \xrightarrow{\text{cFos\_P, DUSP16}} \text{cFos} + \text{DUSP16} \tag{143}$$

Reactants

Table 219: Properties of each reactant.

Id	Name	SBO
cFos_P		
DUSP16		

Modifiers

Table 220: Properties of each modifier.

Id	Name	SBO
cFos_P		
DUSP16		

Products

Table 221: Properties of each product.

Id	Name	SBO
cFos		
DUSP16		

Kinetic Law

Derived unit contains undeclared units

$$v_{72} = \text{kdephoscFosDUSP16} \cdot \text{cFos\_P} \cdot \text{DUSP16} \tag{144}$$

6.73 Reaction cFoscJunBinding

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{cFos\_P} + \text{cJun\_P} \xrightarrow{\text{cFos\_P, cJun\_P}} \text{cFos\_cJun} \tag{145}$$

Reactants

Table 222: Properties of each reactant.

Id	Name	SBO
cFos_P		
cJun_P		

Modifiers

Table 223: Properties of each modifier.

Id	Name	SBO
cFos_P		
cJun_P		

Product

Table 224: Properties of each product.

Id	Name	SBO
cFos_cJun		

Kinetic Law

Derived unit contains undeclared units

$$v_{73} = \text{kbincFoscJun} \cdot \text{cFos\_P} \cdot \text{cJun\_P} \tag{146}$$

6.74 Reaction cFoscJunRelease

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_P} + \text{cJun\_P} \tag{147}$$

Reactant

Table 225: Properties of each reactant.

Id	Name	SBO
cFos_cJun		

Modifier

Table 226: Properties of each modifier.

Id	Name	SBO
cFos_cJun		

Products

Table 227: Properties of each product.

Id	Name	SBO
cFos_P		
cJun_P		

Kinetic Law

Derived unit contains undeclared units

$$v_{74} = \text{krelcFoscJun} \cdot \text{cFos\_cJun} \tag{148}$$

6.75 Reaction OSM_OSMR_binding

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{OSM} + \text{OSMR} \xrightarrow{\text{OSM, OSMR}} \text{OSM\_OSMR} \tag{149}$$

Reactants

Table 228: Properties of each reactant.

Id	Name	SBO
OSM		
OSMR		

Modifiers

Table 229: Properties of each modifier.

Id	Name	SBO
OSM		
OSMR		

Product

Table 230: Properties of each product.

Id	Name	SBO
OSM_OSMR		

Kinetic Law

Derived unit contains undeclared units

$$v_{75} = \text{kbinOSMOSMR} \cdot \text{OSM} \cdot \text{OSMR} \tag{150}$$

6.76 Reaction OSM_OSMR_release

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{OSM\_OSMR} \xrightarrow{\text{OSM\_OSMR}} \text{OSM} + \text{OSMR} \tag{151}$$

Reactant

Table 231: Properties of each reactant.

Id	Name	SBO
OSM_OSMR		

Modifier

Table 232: Properties of each modifier.

Id	Name	SBO
OSM_OSMR		

Products

Table 233: Properties of each product.

Id	Name	SBO
OSM		
OSMR		

Kinetic Law

Derived unit contains undeclared units

$$v_{76} = \text{krelOSMOSMR} \cdot \text{OSM\_OSMR} \tag{152}$$

6.77 Reaction OSM_OSMRa_binding

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{OSM} + \text{OSMRa} \xrightarrow{\text{OSM, OSMRa}} \text{OSM\_OSMRa} \tag{153}$$

Reactants

Table 234: Properties of each reactant.

Id	Name	SBO
OSM		
OSMRa		

Modifiers

Table 235: Properties of each modifier.

Id	Name	SBO
OSM		
OSMRa		

Product

Table 236: Properties of each product.

Id	Name	SBO
OSM_OSMRa		

Kinetic Law

Derived unit contains undeclared units

$$v_{77} = \text{kbinOSMOSMRa} \cdot \text{OSM} \cdot \text{OSMRa} \tag{154}$$

6.78 Reaction OSM_OSMRa_release

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{OSM\_OSMRa} \xrightarrow{\text{OSM\_OSMRa}} \text{OSM} + \text{OSMRa} \tag{155}$$

Reactant

Table 237: Properties of each reactant.

Id	Name	SBO
OSM_OSMRa		

Modifier

Table 238: Properties of each modifier.

Id	Name	SBO
OSM_OSMRa		

Products

Table 239: Properties of each product.

Id	Name	SBO
OSM		
OSMRa		

Kinetic Law

Derived unit contains undeclared units

$$v_{78} = \text{krelOSMOSMRa} \cdot \text{OSM\_OSMRa} \tag{156}$$

6.79 Reaction JAK1_Phosphorylation

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{JAK1} + \text{OSM\_OSMR} \xrightarrow{\text{JAK1, OSM\_OSMR}} \text{JAK1\_P} + \text{OSM\_OSMR} \tag{157}$$

Reactants

Table 240: Properties of each reactant.

Id	Name	SBO
JAK1		
OSM_OSMR		

Modifiers

Table 241: Properties of each modifier.

Id	Name	SBO
JAK1		
OSM_OSMR		

Products

Table 242: Properties of each product.

Id	Name	SBO
JAK1_P		
OSM_OSMR		

Kinetic Law

Derived unit contains undeclared units

$$v_{79} = \text{kphosJAK1} \cdot \text{JAK1} \cdot \text{OSM\_OSMR} \tag{158}$$

6.80 Reaction JAK1_Dephosphorylation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{JAK1\_P} \xrightarrow{\text{JAK1\_P}} \text{JAK1} \tag{159}$$

Reactant

Table 243: Properties of each reactant.

Id	Name	SBO
JAK1_P		

Modifier

Table 244: Properties of each modifier.

Id	Name	SBO
JAK1_P		

Product

Table 245: Properties of each product.

Id	Name	SBO
JAK1		

Kinetic Law

Derived unit contains undeclared units

$$v_{80} = \text{kdephosJAK1} \cdot \text{JAK1\_P} \tag{160}$$

6.81 Reaction JAK1_DephosphorylationByPTPRT

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{JAK1\_P} + \text{PTPRT} \xrightarrow{\text{JAK1\_P, PTPRT}} \text{JAK1} + \text{PTPRT} \tag{161}$$

Reactants

Table 246: Properties of each reactant.

Id	Name	SBO
JAK1_P		
PTPRT		

Modifiers

Table 247: Properties of each modifier.

Id	Name	SBO
JAK1_P		

Id	Name	SBO
PTPRT		

Products

Table 248: Properties of each product.

Id	Name	SBO
JAK1		
PTPRT		

Kinetic Law

Derived unit contains undeclared units

$$v_{81} = \text{kdephosJAK1PTPRT} \cdot \text{JAK1\_P} \cdot \text{PTPRT} \tag{162}$$

6.82 Reaction STAT3_Phosphorylation

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{STAT3\_cyt} + \text{JAK1\_P} \xrightarrow{\text{STAT3\_cyt, JAK1\_P}} \text{STAT3\_P\_cyt} + \text{JAK1\_P} \tag{163}$$

Reactants

Table 249: Properties of each reactant.

Id	Name	SBO
STAT3_cyt		
JAK1_P		

Modifiers

Table 250: Properties of each modifier.

Id	Name	SBO
STAT3_cyt		
JAK1_P		

Id	Name	SBO

Products

Table 251: Properties of each product.

Id	Name	SBO
STAT3_P_cyt		
JAK1_P		

Kinetic Law

Derived unit contains undeclared units

$$v_{82} = \text{kphosSTAT3} \cdot \text{STAT3\_cyt} \cdot \text{JAK1\_P} \tag{164}$$

6.83 Reaction STAT3_cyt_Dephosphorylation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{STAT3\_P\_cyt} \xrightarrow{\text{STAT3\_P\_cyt}} \text{STAT3\_cyt} \tag{165}$$

Reactant

Table 252: Properties of each reactant.

Id	Name	SBO
STAT3_P_cyt		

Modifier

Table 253: Properties of each modifier.

Id	Name	SBO
STAT3_P_cyt		

Product

Table 254: Properties of each product.

Id	Name	SBO
STAT3_cyt		

Kinetic Law

Derived unit contains undeclared units

$$v_{83} = \text{kdephosSTAT3} \cdot \text{STAT3\_P\_cyt} \tag{166}$$

6.84 Reaction STAT3_cyt_DephosphorylationByPTPRT

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{STAT3\_P\_cyt} + \text{PTPRT} \xrightarrow{\text{STAT3\_P\_cyt, PTPRT}} \text{STAT3\_cyt} + \text{PTPRT} \tag{167}$$

Reactants

Table 255: Properties of each reactant.

Id	Name	SBO
STAT3_P_cyt		
PTPRT		

Modifiers

Table 256: Properties of each modifier.

Id	Name	SBO
STAT3_P_cyt		
PTPRT		

Products

Table 257: Properties of each product.

Id	Name	SBO
STAT3_cyt		
PTPRT		

Kinetic Law

Derived unit contains undeclared units

$$v_{84} = \text{kdephosSTAT3PTPRT} \cdot \text{STAT3\_P\_cyt} \cdot \text{PTPRT} \tag{168}$$

6.85 Reaction STAT3_nuc_Dephosphorylation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{STAT3\_P\_nuc} \xrightarrow{\text{STAT3\_P\_nuc}} \text{STAT3\_nuc} \tag{169}$$

Reactant

Table 258: Properties of each reactant.

Id	Name	SBO
STAT3_P_nuc		

Modifier

Table 259: Properties of each modifier.

Id	Name	SBO
STAT3_P_nuc		

Product

Table 260: Properties of each product.

Id	Name	SBO
STAT3_nuc		

Kinetic Law

Derived unit contains undeclared units

$$v_{85} = \text{kdephosSTAT3nuc} \cdot \text{STAT3\_P\_nuc} \tag{170}$$

6.86 Reaction STAT3_nuc_DephosphorylationByPTPRT

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{STAT3\_P\_nuc} + \text{PTPRT} \xrightarrow{\text{STAT3\_P\_nuc, PTPRT}} \text{STAT3\_nuc} + \text{PTPRT} \tag{171}$$

Reactants

Table 261: Properties of each reactant.

Id	Name	SBO
STAT3_P_nuc		
PTPRT		

Modifiers

Table 262: Properties of each modifier.

Id	Name	SBO
STAT3_P_nuc		
PTPRT		

Products

Table 263: Properties of each product.

Id	Name	SBO
STAT3_nuc		
PTPRT		

Kinetic Law

Derived unit contains undeclared units

$$v_{86} = \text{kdephosSTAT3nucPTPRT} \cdot \text{STAT3\_P\_nuc} \cdot \text{PTPRT} \tag{172}$$

6.87 Reaction STAT3_transport_to_nucleus

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{STAT3\_P\_cyt} \xrightarrow{\text{STAT3\_P\_cyt}} \text{STAT3\_P\_nuc} \tag{173}$$

Reactant

Table 264: Properties of each reactant.

Id	Name	SBO
STAT3_P_cyt		

Modifier

Table 265: Properties of each modifier.

Id	Name	SBO
STAT3_P_cyt		

Product

Table 266: Properties of each product.

Id	Name	SBO
STAT3_P_nuc		

Kinetic Law

Derived unit contains undeclared units

$$v_{87} = \text{kcyt2nucSTAT3} \cdot \text{STAT3\_P\_cyt} \tag{174}$$

6.88 Reaction STAT3_transport_from_nucleus

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{STAT3\_nuc} \xrightarrow{\text{STAT3\_nuc}} \text{STAT3\_cyt} \tag{175}$$

Reactant

Table 267: Properties of each reactant.

Id	Name	SBO
STAT3_nuc		

Modifier

Table 268: Properties of each modifier.

Id	Name	SBO
STAT3_nuc		

Product

Table 269: Properties of each product.

Id	Name	SBO
STAT3_cyt		

Kinetic Law

Derived unit contains undeclared units

$$v_{88} = \text{knuc2cytSTAT3} \cdot \text{STAT3\_nuc} \tag{176}$$

6.89 Reaction cFos_induction_by_STAT3

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{STAT3\_P\_nuc} \xrightarrow{\text{STAT3\_P\_nuc}} \text{STAT3\_P\_nuc} + \text{cFos\_mRNA} \tag{177}$$

Reactant

Table 270: Properties of each reactant.

Id	Name	SBO
STAT3_P_nuc		

Modifier

Table 271: Properties of each modifier.

Id	Name	SBO
STAT3_P_nuc		

Products

Table 272: Properties of each product.

Id	Name	SBO
STAT3_P_nuc		
cFos_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{89} = \text{ksyncFosmRNAStat3} \cdot \text{STAT3\_P\_nuc} \tag{178}$$

6.90 Reaction PTPRT_induction_by_STAT3

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{STAT3\_P\_nuc} \xrightarrow{\text{STAT3\_P\_nuc}} \text{STAT3\_P\_nuc} + \text{PTPRT} \tag{179}$$

Reactant

Table 273: Properties of each reactant.

Id	Name	SBO
STAT3_P_nuc		

Modifier

Table 274: Properties of each modifier.

Id	Name	SBO
STAT3_P_nuc		

Products

Table 275: Properties of each product.

Id	Name	SBO
STAT3_P_nuc		
PTPRT		

Kinetic Law

Derived unit contains undeclared units

$$v_{90} = \text{ksynPTPRT} \cdot \text{STAT3\_P\_nuc} \tag{180}$$

6.91 Reaction PTPRT_degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{PTPRT} \xrightarrow{\text{PTPRT}} \text{Sink} \tag{181}$$

Reactant

Table 276: Properties of each reactant.

Id	Name	SBO
PTPRT		

Modifier

Table 277: Properties of each modifier.

Id	Name	SBO
PTPRT		

Product

Table 278: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{91} = \text{kdegPTPRT} \cdot \text{PTPRT} \tag{182}$$

6.92 Reaction STAT3_induction_of_SOCS3

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{STAT3\_P\_nuc} \xrightarrow{\text{STAT3\_P\_nuc}} \text{STAT3\_P\_nuc} + \text{SOCS3\_mRNA} \tag{183}$$

Reactant

Table 279: Properties of each reactant.

Id	Name	SBO
STAT3_P_nuc		

Modifier

Table 280: Properties of each modifier.

Id	Name	SBO
STAT3_P_nuc		

Products

Table 281: Properties of each product.

Id	Name	SBO
STAT3_P_nuc		
SOCS3_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{92} = \text{ksynSOCS3mRNA} \cdot \text{STAT3\_P\_nuc} \tag{184}$$

6.93 Reaction SOCS3mRNAdegradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{SOCS3\_mRNA} \xrightarrow{\text{SOCS3\_mRNA}} \text{Sink} \tag{185}$$

Reactant

Table 282: Properties of each reactant.

Id	Name	SBO
SOCS3_mRNA		

Modifier

Table 283: Properties of each modifier.

Id	Name	SBO
SOCS3_mRNA		

Product

Table 284: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{93} = \text{kdegSOCS3mRNA} \cdot \text{SOCS3\_mRNA} \tag{186}$$

6.94 Reaction SOCS3_translation

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{SOCS3\_mRNA} \xrightarrow{\text{SOCS3\_mRNA}} \text{SOCS3\_mRNA} + \text{SOCS3} \tag{187}$$

Reactant

Table 285: Properties of each reactant.

Id	Name	SBO
SOCS3_mRNA		

Modifier

Table 286: Properties of each modifier.

Id	Name	SBO
SOCS3_mRNA		

Products

Table 287: Properties of each product.

Id	Name	SBO
SOCS3_mRNA		
SOCS3		

Kinetic Law

Derived unit contains undeclared units

$$v_{94} = \text{ksynSOCS3} \cdot \text{SOCS3\_mRNA} \tag{188}$$

6.95 Reaction SOCS3_degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{SOCS3} \xrightarrow{\text{SOCS3}} \text{Sink} \tag{189}$$

Reactant

Table 288: Properties of each reactant.

Id	Name	SBO
SOCS3		

Modifier

Table 289: Properties of each modifier.

Id	Name	SBO
SOCS3		

Product

Table 290: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{95} = \text{kdegSOCS3} \cdot \text{SOCS3} \tag{190}$$

6.96 Reaction SOCS3_OSMR_binding

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\mathrm{SOCS3} + \mathrm{OSMR} \xrightarrow{\mathrm{SOCS3,\ OSMR}} \mathrm{OSMR\_SOCS3} \tag{191}$$

Reactants

Table 291: Properties of each reactant.

Id	Name	SBO
SOCS3		
OSMR		

Modifiers

Table 292: Properties of each modifier.

Id	Name	SBO
SOCS3		
OSMR		

Product

Table 293: Properties of each product.

Id	Name	SBO
OSMR_SOCS3		

Kinetic Law

Derived unit contains undeclared units

$$v_{96} = \mathrm{kbinSOCS3OSMR} \cdot \mathrm{SOCS3} \cdot \mathrm{OSMR} \tag{192}$$

6.97 Reaction SOCS3_OSMR_release

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{OSMR\_SOCS3} \xrightarrow{\text{OSMR\_SOCS3}} \text{SOCS3} + \text{OSMR} \tag{193}$$

Reactant

Table 294: Properties of each reactant.

Id	Name	SBO
OSMR_SOCS3		

Modifier

Table 295: Properties of each modifier.

Id	Name	SBO
OSMR_SOCS3		

Products

Table 296: Properties of each product.

Id	Name	SBO
SOCS3		
OSMR		

Kinetic Law

Derived unit contains undeclared units

$$v_{97} = \text{krelSOCS3OSMR} \cdot \text{OSMR\_SOCS3} \tag{194}$$

6.98 Reaction OSM_degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{OSM} \xrightarrow{\text{OSM}} \text{Sink} \tag{195}$$

Reactant

Table 297: Properties of each reactant.

Id	Name	SBO
OSM		

Modifier

Table 298: Properties of each modifier.

Id	Name	SBO
OSM		

Product

Table 299: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{98} = \text{kdegOSM} \cdot \text{OSM} \tag{196}$$

6.99 Reaction MMP1InhibtionByTIMP1

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{MMP1} + \text{TIMP1} \xrightarrow{\text{MMP1, TIMP1}} \text{MMP1\_TIMP1} \tag{197}$$

Reactants

Table 300: Properties of each reactant.

Id	Name	SBO
MMP1		
TIMP1		

Modifiers

Table 301: Properties of each modifier.

Id	Name	SBO
MMP1		
TIMP1		

Product

Table 302: Properties of each product.

Id	Name	SBO
MMP1_TIMP1		

Kinetic Law

Derived unit contains undeclared units

$$v_{99} = \text{kinhibMMP1TIMP1} \cdot \text{MMP1} \cdot \text{TIMP1} \tag{198}$$

6.100 Reaction MMP1_TIMP1release

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{MMP1\_TIMP1} \xrightarrow{\text{MMP1\_TIMP1}} \text{MMP1} + \text{TIMP1} \tag{199}$$

Reactant

Table 303: Properties of each reactant.

Id	Name	SBO
MMP1_TIMP1		

Modifier

Table 304: Properties of each modifier.

Id	Name	SBO
MMP1_TIMP1		

Products

Table 305: Properties of each product.

Id	Name	SBO
MMP1		
TIMP1		

Kinetic Law

Derived unit contains undeclared units

$$v_{100} = \text{krelMMP1} \cdot \text{MMP1\_TIMP1} \tag{200}$$

6.101 Reaction MMP3InhibtionByTIMP1

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{MMP3} + \text{TIMP1} \xrightarrow{\text{MMP3, TIMP1}} \text{MMP3\_TIMP1} \tag{201}$$

Reactants

Table 306: Properties of each reactant.

Id	Name	SBO
MMP3		
TIMP1		

Modifiers

Table 307: Properties of each modifier.

Id	Name	SBO
MMP3		

Id	Name	SBO
TIMP1		

Product

Table 308: Properties of each product.

Id	Name	SBO
MMP3_TIMP1		

Kinetic Law

Derived unit contains undeclared units

$$v_{101} = \text{kinhibMMP3TIMP1} \cdot \text{MMP3} \cdot \text{TIMP1} \tag{202}$$

6.102 Reaction MMP3_TIMP1release

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{MMP3\_TIMP1} \xrightarrow{\text{MMP3\_TIMP1}} \text{MMP3} + \text{TIMP1} \tag{203}$$

Reactant

Table 309: Properties of each reactant.

Id	Name	SBO
MMP3_TIMP1		

Modifier

Table 310: Properties of each modifier.

Id	Name	SBO
MMP3_TIMP1		

Products

Table 311: Properties of each product.

Id	Name	SBO
MMP3		
TIMP1		

Kinetic Law

Derived unit contains undeclared units

$$v_{102} = \text{krelMMP3} \cdot \text{MMP3\_TIMP1} \tag{204}$$

6.103 Reaction MMP13InhibtionByTIMP1

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{MMP13} + \text{TIMP1} \xrightarrow{\text{MMP13, TIMP1}} \text{MMP13\_TIMP1} \tag{205}$$

Reactants

Table 312: Properties of each reactant.

Id	Name	SBO
MMP13		
TIMP1		

Modifiers

Table 313: Properties of each modifier.

Id	Name	SBO
MMP13		
TIMP1		

Product

Table 314: Properties of each product.

Id	Name	SBO
MMP13_TIMP1		

Kinetic Law

Derived unit contains undeclared units

$$v_{103} = \text{kinhibMMP13TIMP1} \cdot \text{MMP13} \cdot \text{TIMP1} \tag{206}$$

6.104 Reaction MMP13_TIMP1release

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{MMP13\_TIMP1} \xrightarrow{\text{MMP13\_TIMP1}} \text{MMP13} + \text{TIMP1} \tag{207}$$

Reactant

Table 315: Properties of each reactant.

Id	Name	SBO
MMP13_TIMP1		

Modifier

Table 316: Properties of each modifier.

Id	Name	SBO
MMP13_TIMP1		

Products

Table 317: Properties of each product.

Id	Name	SBO
MMP13		
TIMP1		

Kinetic Law

Derived unit contains undeclared units

$$v_{104} = \text{krelMMP13} \cdot \text{MMP13\_TIMP1} \tag{208}$$

6.105 Reaction ADAMTS4InhibtionByTIMP1

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{ADAMTS4} + \text{TIMP1} \xrightarrow{\text{ADAMTS4, TIMP1}} \text{ADAMTS4\_TIMP1} \tag{209}$$

Reactants

Table 318: Properties of each reactant.

Id	Name	SBO
ADAMTS4		
TIMP1		

Modifiers

Table 319: Properties of each modifier.

Id	Name	SBO
ADAMTS4		
TIMP1		

Product

Table 320: Properties of each product.

Id	Name	SBO
ADAMTS4_TIMP1		

Kinetic Law

Derived unit contains undeclared units

$$v_{105} = \text{kinhibADAMTS4TIMP1} \cdot \text{ADAMTS4} \cdot \text{TIMP1} \tag{210}$$

6.106 Reaction ADAMTS4_TIMP1release

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{ADAMTS4\_TIMP1} \xrightarrow{\text{ADAMTS4\_TIMP1}} \text{ADAMTS4} + \text{TIMP1} \tag{211}$$

Reactant

Table 321: Properties of each reactant.

Id	Name	SBO
ADAMTS4_TIMP1		

Modifier

Table 322: Properties of each modifier.

Id	Name	SBO
ADAMTS4_TIMP1		

Products

Table 323: Properties of each product.

Id	Name	SBO
ADAMTS4		
TIMP1		

Kinetic Law

Derived unit contains undeclared units

$$v_{106} = \text{krelADAMTS4TIMP1} \cdot \text{ADAMTS4\_TIMP1} \tag{212}$$

6.107 Reaction Collagen2DegradationByMMP1

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{Collagen2} + \text{MMP1} \xrightarrow{\text{Collagen2, MMP1}} \text{MMP1} + \text{ColFrag} \tag{213}$$

Reactants

Table 324: Properties of each reactant.

Id	Name	SBO
Collagen2		
MMP1		

Modifiers

Table 325: Properties of each modifier.

Id	Name	SBO
Collagen2		
MMP1		

Products

Table 326: Properties of each product.

Id	Name	SBO
MMP1		
ColFrag		

Kinetic Law

Derived unit contains undeclared units

$$v_{107} = \text{kdegCollagen2mmp1} \cdot \text{Collagen2} \cdot \text{MMP1} \tag{214}$$

6.108 Reaction Collagen2DegradationByMMP13

This is an irreversible reaction of two reactants forming two products influenced by two modifiers.

Reaction equation

$$\text{Collagen2} + \text{MMP13} \xrightarrow{\text{Collagen2, MMP13}} \text{MMP13} + \text{ColFrag} \tag{215}$$

Reactants

Table 327: Properties of each reactant.

Id	Name	SBO
Collagen2		
MMP13		

Modifiers

Table 328: Properties of each modifier.

Id	Name	SBO
Collagen2		
MMP13		

Products

Table 329: Properties of each product.

Id	Name	SBO
MMP13		
ColFrag		

Kinetic Law

Derived unit contains undeclared units

$$v_{108} = \text{kdegCollagen2mmp13} \cdot \text{Collagen2} \cdot \text{MMP13} \tag{216}$$

6.109 Reaction AggrecanDegradationByADAMTS4

This is an irreversible reaction of two reactants forming three products influenced by two modifiers.

Reaction equation

$$\text{Aggrecan\_Collagen2} + \text{ADAMTS4} \xrightarrow{\text{Aggrecan\_Collagen2, ADAMTS4}} \text{ADAMTS4} + \text{Collagen2} + \text{AggFrag} \tag{217}$$

Reactants

Table 330: Properties of each reactant.

Id	Name	SBO
Aggrecan_Collagen2		
ADAMTS4		

Modifiers

Table 331: Properties of each modifier.

Id	Name	SBO
Aggrecan_Collagen2		
ADAMTS4		

Products

Table 332: Properties of each product.

Id	Name	SBO
ADAMTS4		
Collagen2		
AggFrag		

Kinetic Law

Derived unit contains undeclared units

$$v_{109} = \text{kdegAggrecan} \cdot \text{Aggrecan\_Collagen2} \cdot \text{ADAMTS4} \tag{218}$$

6.110 Reaction MatriptaseSynthesis

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{Matriptase} + \text{cFos\_cJun} \tag{219}$$

Reactant

Table 333: Properties of each reactant.

Id	Name	SBO
cFos_cJun		

Modifier

Table 334: Properties of each modifier.

Id	Name	SBO
cFos_cJun		

Products

Table 335: Properties of each product.

Id	Name	SBO
Matriptase		
cFos_cJun		

Kinetic Law

Derived unit contains undeclared units

$$v_{110} = \text{ksynMatriptase} \cdot \text{cFos\_cJun} \cdot \text{kAP1activity} \tag{220}$$

6.111 Reaction MatriptaseDegradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{Matriptase} \xrightarrow{\text{Matriptase}} \text{Sink} \tag{221}$$

Reactant

Table 336: Properties of each reactant.

Id	Name	SBO
Matriptase		

Modifier

Table 337: Properties of each modifier.

Id	Name	SBO
Matriptase		

Product

Table 338: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{111} = \text{kdegMatriptase} \cdot \text{Matriptase} \tag{222}$$

6.112 Reaction SP1Synthesis

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{SP1} + \text{cFos\_cJun} \tag{223}$$

Reactant

Table 339: Properties of each reactant.

Id	Name	SBO
cFos_cJun		

Modifier

Table 340: Properties of each modifier.

Id	Name	SBO
cFos_cJun		

Id	Name	SBO

Products

Table 341: Properties of each product.

Id	Name	SBO
SP1		
cFos_cJun		

Kinetic Law

Derived unit contains undeclared units

$$v_{112} = \text{ksynSP1} \cdot \text{cFos\_cJun} \cdot \text{kAP1activity} \tag{224}$$

6.113 Reaction SP1Degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{SP1} \xrightarrow{\text{SP1}} \text{Sink} \tag{225}$$

Reactant

Table 342: Properties of each reactant.

Id	Name	SBO
SP1		

Modifier

Table 343: Properties of each modifier.

Id	Name	SBO
SP1		

Product

Table 344: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{113} = \text{kdegSP1} \cdot \text{SP1} \tag{226}$$

6.114 Reaction SP1_TIMP1_DNAbinding

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{SP1} + \text{TIMP1\_DNA} \xrightarrow{\text{SP1, TIMP1\_DNA}} \text{SP1\_TIMP1\_DNA} \tag{227}$$

Reactants

Table 345: Properties of each reactant.

Id	Name	SBO
SP1		
TIMP1_DNA		

Modifiers

Table 346: Properties of each modifier.

Id	Name	SBO
SP1		
TIMP1_DNA		

Product

Table 347: Properties of each product.

Id	Name	SBO
SP1_TIMP1_DNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{114} = \text{kbinSP1TIMP1DNA} \cdot \text{SP1} \cdot \text{TIMP1\_DNA} \tag{228}$$

6.115 Reaction SP1_TIMP1_DNArelease

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{SP1\_TIMP1\_DNA} \xrightarrow{\text{SP1\_TIMP1\_DNA}} \text{SP1} + \text{TIMP1\_DNA} \tag{229}$$

Reactant

Table 348: Properties of each reactant.

Id	Name	SBO
SP1_TIMP1_DNA		

Modifier

Table 349: Properties of each modifier.

Id	Name	SBO
SP1_TIMP1_DNA		

Products

Table 350: Properties of each product.

Id	Name	SBO
SP1		
TIMP1_DNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{115} = \text{krelSP1TIMP1DNA} \cdot \text{SP1\_TIMP1\_DNA} \tag{230}$$

6.116 Reaction TIMP1_transcription_STAT3

This is an irreversible reaction of two reactants forming three products influenced by two modifiers.

Reaction equation

$$\text{STAT3\_P\_nuc} + \text{TIMP1\_DNA} \xrightarrow{\text{STAT3\_P\_nuc, TIMP1\_DNA}} \text{STAT3\_P\_nuc} + \text{TIMP1\_DNA} + \text{TIMP1\_mRNA} \tag{231}$$

Reactants

Table 351: Properties of each reactant.

Id	Name	SBO
STAT3_P_nuc		
TIMP1_DNA		

Modifiers

Table 352: Properties of each modifier.

Id	Name	SBO
STAT3_P_nuc		
TIMP1_DNA		

Products

Table 353: Properties of each product.

Id	Name	SBO
STAT3_P_nuc		
TIMP1_DNA		
TIMP1_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{116} = \text{ksynTIMP1mRNAStat3} \cdot \text{STAT3\_P\_nuc} \cdot \text{TIMP1\_DNA} \tag{232}$$

6.117 Reaction TIMP1BasalTranscription

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{TIMP1\_DNA} \xrightarrow{\text{TIMP1\_DNA}} \text{TIMP1\_mRNA} + \text{TIMP1\_DNA} \tag{233}$$

Reactant

Table 354: Properties of each reactant.

Id	Name	SBO
TIMP1_DNA		

Modifier

Table 355: Properties of each modifier.

Id	Name	SBO
TIMP1_DNA		

Products

Table 356: Properties of each product.

Id	Name	SBO
TIMP1_mRNA		
TIMP1_DNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{117} = \text{ksynbasalTIMP1mRNA} \cdot \text{TIMP1\_DNA} \tag{234}$$

6.118 Reaction TIMP1Transcription_AP1

This is an irreversible reaction of two reactants forming three products influenced by two modifiers.

Reaction equation

$$\text{cFos\_cJun} + \text{TIMP1\_DNA} \xrightarrow{\text{cFos\_cJun, TIMP1\_DNA}} \text{cFos\_cJun} + \text{TIMP1\_mRNA} + \text{TIMP1\_DNA} \tag{235}$$

Reactants

Table 357: Properties of each reactant.

Id	Name	SBO
cFos_cJun		
TIMP1_DNA		

Modifiers

Table 358: Properties of each modifier.

Id	Name	SBO
cFos_cJun		
TIMP1_DNA		

Products

Table 359: Properties of each product.

Id	Name	SBO
cFos_cJun		
TIMP1_mRNA		
TIMP1_DNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{118} = \text{ksynTIMP1mRNA} \cdot \text{cFos\_cJun} \cdot \text{TIMP1\_DNA} \cdot \text{kAP1activity} \tag{236}$$

6.119 Reaction TIMP3BasalTranscriptionn

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{Source} \xrightarrow{\text{Source}} \text{TIMP3\_mRNA} \tag{237}$$

Reactant

Table 360: Properties of each reactant.

Id	Name	SBO
Source		

Modifier

Table 361: Properties of each modifier.

Id	Name	SBO
Source		

Product

Table 362: Properties of each product.

Id	Name	SBO
TIMP3_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{119} = \text{ksynbasalTIMP3mRNA} \cdot \text{Source} \tag{238}$$

6.120 Reaction TIMP3Transcription_AP1

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{cFos\_cJun} \xrightarrow{\text{cFos\_cJun}} \text{cFos\_cJun} + \text{TIMP3\_mRNA} \tag{239}$$

Reactant

Table 363: Properties of each reactant.

Id	Name	SBO
cFos_cJun		

Modifier

Table 364: Properties of each modifier.

Id	Name	SBO
cFos_cJun		

Products

Table 365: Properties of each product.

Id	Name	SBO
cFos_cJun		
TIMP3_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{120} = \text{ksynTIMP3mRNA} \cdot \text{cFos\_cJun} \cdot \text{kAP1activity} \tag{240}$$

6.121 Reaction TIMP3Transcription_STAT3

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{STAT3\_P\_nuc} \xrightarrow{\text{STAT3\_P\_nuc}} \text{STAT3\_P\_nuc} + \text{TIMP3\_mRNA} \tag{241}$$

Reactant

Table 366: Properties of each reactant.

Id	Name	SBO
STAT3_P_nuc		

Modifier

Table 367: Properties of each modifier.

Id	Name	SBO
STAT3_P_nuc		

Products

Table 368: Properties of each product.

Id	Name	SBO
STAT3_P_nuc		
TIMP3_mRNA		

Kinetic Law

Derived unit contains undeclared units

$$v_{121} = \text{ksynTIMP3mRNAStat3} \cdot \text{STAT3\_P\_nuc} \cdot \text{kAP1activity} \tag{242}$$

6.122 Reaction TIMP3Translation

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{TIMP3\_mRNA} \xrightarrow{\text{TIMP3\_mRNA}} \text{TIMP3\_mRNA} + \text{TIMP3} \tag{243}$$

Reactant

Table 369: Properties of each reactant.

Id	Name	SBO
TIMP3_mRNA		

Modifier

Table 370: Properties of each modifier.

Id	Name	SBO
TIMP3_mRNA		

Products

Table 371: Properties of each product.

Id	Name	SBO
TIMP3_mRNA		
TIMP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{122} = \text{ksynTIMP3} \cdot \text{TIMP3\_mRNA} \tag{244}$$

6.123 Reaction TIMP3mRNADegradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{TIMP3\_mRNA} \xrightarrow{\text{TIMP3\_mRNA}} \text{Sink} \tag{245}$$

Reactant

Table 372: Properties of each reactant.

Id	Name	SBO
TIMP3_mRNA		

Modifier

Table 373: Properties of each modifier.

Id	Name	SBO
TIMP3_mRNA		

Product

Table 374: Properties of each product.

Id	Name	SBO
Sink		

Kinetic Law

Derived unit contains undeclared units

$$v_{123} = \text{kdegTIMP3mRNA} \cdot \text{TIMP3\_mRNA} \tag{246}$$

6.124 Reaction TIMP3Degradation

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Reaction equation

$$\text{TIMP3} \xrightarrow{\text{TIMP3}} \text{Sink} \tag{247}$$

Reactant

Table 375: Properties of each reactant.

Id	Name	SBO
TIMP3		

Modifier

Table 376: Properties of each modifier.

Id	Name	SBO
TIMP3		

Product

Table 377: Properties of each product.

Id	Name	SBO
Sink		

Id	Name	SBO

Kinetic Law

Derived unit contains undeclared units

$$v_{124} = \text{kdegTIMP3} \cdot \text{TIMP3} \tag{248}$$

6.125 Reaction ADAMTS4InhibitionByTimp3

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{TIMP3} + \text{ADAMTS4} \xrightarrow{\text{TIMP3, ADAMTS4}} \text{ADAMTS4\_TIMP3} \tag{249}$$

Reactants

Table 378: Properties of each reactant.

Id	Name	SBO
TIMP3		
ADAMTS4		

Modifiers

Table 379: Properties of each modifier.

Id	Name	SBO
TIMP3		
ADAMTS4		

Product

Table 380: Properties of each product.

Id	Name	SBO
ADAMTS4_TIMP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{125} = \text{kinhibADAMTS4TIMP3} \cdot \text{TIMP3} \cdot \text{ADAMTS4} \tag{250}$$

6.126 Reaction ADAMTS4_TIMP3release

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{ADAMTS4\_TIMP3} \xrightarrow{\text{ADAMTS4\_TIMP3}} \text{ADAMTS4} + \text{TIMP3} \tag{251}$$

Reactant

Table 381: Properties of each reactant.

Id	Name	SBO
ADAMTS4_TIMP3		

Modifier

Table 382: Properties of each modifier.

Id	Name	SBO
ADAMTS4_TIMP3		

Products

Table 383: Properties of each product.

Id	Name	SBO
ADAMTS4		
TIMP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{126} = \text{krelADAMTS4TIMP3} \cdot \text{ADAMTS4\_TIMP3} \tag{252}$$

6.127 Reaction MMP1InhibtionByTIMP3

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{MMP1} + \text{TIMP3} \xrightarrow{\text{MMP1, TIMP3}} \text{MMP1\_TIMP3} \tag{253}$$

Reactants

Table 384: Properties of each reactant.

Id	Name	SBO
MMP1		
TIMP3		

Modifiers

Table 385: Properties of each modifier.

Id	Name	SBO
MMP1		
TIMP3		

Product

Table 386: Properties of each product.

Id	Name	SBO
MMP1_TIMP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{127} = \text{kinhibMMP1TIMP3} \cdot \text{MMP1} \cdot \text{TIMP3} \tag{254}$$

6.128 Reaction MMP1_TIMP3release

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\mathrm{MMP1\_TIMP3} \xrightarrow{\mathrm{MMP1\_TIMP3}} \mathrm{MMP1} + \mathrm{TIMP3} \tag{255}$$

Reactant

Table 387: Properties of each reactant.

Id	Name	SBO
MMP1_TIMP3		

Modifier

Table 388: Properties of each modifier.

Id	Name	SBO
MMP1_TIMP3		

Products

Table 389: Properties of each product.

Id	Name	SBO
MMP1		
TIMP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{128} = \mathrm{krelMMP1TIMP3} \cdot \mathrm{MMP1\_TIMP3} \tag{256}$$

6.129 Reaction MMP3InhibtionByTIMP3

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\mathrm{MMP3} + \mathrm{TIMP3} \xrightarrow{\mathrm{MMP3,\ TIMP3}} \mathrm{MMP3\_TIMP3} \tag{257}$$

Reactants

Table 390: Properties of each reactant.

Id	Name	SBO
MMP3		
TIMP3		

Modifiers

Table 391: Properties of each modifier.

Id	Name	SBO
MMP3		
TIMP3		

Product

Table 392: Properties of each product.

Id	Name	SBO
MMP3_TIMP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{129} = \text{kinhibMMP3TIMP3} \cdot \text{MMP3} \cdot \text{TIMP3} \tag{258}$$

6.130 Reaction MMP3_TIMP3release

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{MMP3\_TIMP3} \xrightarrow{\text{MMP3\_TIMP3}} \text{MMP3} + \text{TIMP3} \tag{259}$$

Reactant

Table 393: Properties of each reactant.

Id	Name	SBO
MMP3_TIMP3		

Modifier

Table 394: Properties of each modifier.

Id	Name	SBO
MMP3_TIMP3		

Products

Table 395: Properties of each product.

Id	Name	SBO
MMP3		
TIMP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{130} = \text{krelMMP3TIMP3} \cdot \text{MMP3\_TIMP3} \tag{260}$$

6.131 Reaction MMP13InhibtionByTIMP3

This is an irreversible reaction of two reactants forming one product influenced by two modifiers.

Reaction equation

$$\text{MMP13} + \text{TIMP3} \xrightarrow{\text{MMP13, TIMP3}} \text{MMP13\_TIMP3} \tag{261}$$

Reactants

Table 396: Properties of each reactant.

Id	Name	SBO
MMP13		
TIMP3		

Modifiers

Table 397: Properties of each modifier.

Id	Name	SBO
MMP13		
TIMP3		

Product

Table 398: Properties of each product.

Id	Name	SBO
MMP13_TIMP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{131} = \text{kinhibMMP13TIMP3} \cdot \text{MMP13} \cdot \text{TIMP3} \tag{262}$$

6.132 Reaction MMP13_TIMP3release

This is an irreversible reaction of one reactant forming two products influenced by one modifier.

Reaction equation

$$\text{MMP13\_TIMP3} \xrightarrow{\text{MMP13\_TIMP3}} \text{MMP13} + \text{TIMP3} \tag{263}$$

Reactant

Table 399: Properties of each reactant.

Id	Name	SBO
MMP13_TIMP3		

Modifier

Table 400: Properties of each modifier.

Id	Name	SBO
MMP13_TIMP3		

Products

Table 401: Properties of each product.

Id	Name	SBO
MMP13		
TIMP3		

Kinetic Law

Derived unit contains undeclared units

$$v_{132} = \text{krelMMP13TIMP3} \cdot \text{MMP13\_TIMP3} \tag{264}$$

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 ADAMTS4_mRNA

SBO:0000278 messenger RNA

Initial amount 0 item

This species takes part in seven reactions (as a reactant in ADAMTS4Translation, ADAMTS4mRNADegradation and as a product in ADAMTS4Transcription_AP1, ADAMTS4Transcription_cJun_dimer, ADAMTS4Translation and as a modifier in ADAMTS4Translation, ADAMTS4mRNADegradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\text{ADAMTS4\_mRNA} = v_{48} + v_{49} + v_{50} - v_{50} - v_{51} \tag{265}$$

7.2 Species cFos

Initial amount 0 item

This species takes part in seven reactions (as a reactant in cFosDegradation, cFosPhosphorylation_p38 and as a product in cFosSynthesis, cFosDephosphorylation, cFosDephosphorylationByDusp16 and as a modifier in cFosDegradation, cFosPhosphorylation_p38).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cFos} = v_{65} + v_{68} + v_{72} - v_{66} - v_{67} \tag{266}$$

7.3 Species cFos_mRNA

SBO:0000278 messenger RNA

Initial amount 0 item

This species takes part in seven reactions (as a reactant in cFosmRNA_Degradation, cFosSynthesis and as a product in Transcription_cFos_byAP1, cFosSynthesis, cFos_induction_by_STAT3 and as a modifier in cFosmRNA_Degradation, cFosSynthesis).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cFos\_mRNA} = v_{63} + v_{65} + v_{89} - v_{64} - v_{65} \tag{267}$$

7.4 Species cJun

Initial amount 100 item

This species takes part in six reactions (as a reactant in cJunPhosphorylation, cJunDegradation and as a product in cJunDephosphorylation, cJunTranslation and as a modifier in cJunPhosphorylation, cJunDegradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cJun} = v_{14} + v_{21} - v_{13} - v_{22} \tag{268}$$

7.5 Species cJun_mRNA

Initial amount 5 item

This species takes part in eight reactions (as a reactant in cJunmRNADegradation, cJunTranslation and as a product in cJunTranscriptionAP1, cJunTranscriptioncJun, cJunBasalTranscription, cJunTranslation and as a modifier in cJunmRNADegradation, cJunTranslation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cJun\_mRNA} = v_{17} + v_{18} + v_{19} + v_{21} - v_{20} - v_{21} \tag{269}$$

7.6 Species DUSP16

Initial amount 0 item

This species takes part in ten reactions (as a reactant in JNKdephosphorylationByDUSP16, DUSP16Degradation, cFosDephosphorylationByDusp16 and as a product in JNKdephosphorylationByDUSP1 DUSP16Synthesis, DUSP16Synthesis_cJun_dimer, cFosDephosphorylationByDusp16 and as a modifier in JNKdephosphorylationByDUSP16, DUSP16Degradation, cFosDephosphorylationByDusp16).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{DUSP16} = v_{12} + v_{55} + v_{56} + v_{72} - v_{12} - v_{58} - v_{72} \tag{270}$$

7.7 Species IRAK2

Initial amount 100 item

This species takes part in four reactions (as a reactant in IRAK2binding and as a product in IRAK2release, TRAF6release and as a modifier in IRAK2binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{IRAK2} = v_7 + v_9 - v_6 \tag{271}$$

7.8 Species IRAK2_TRAF6

Initial amount 0 item

This species takes part in twelve reactions (as a reactant in TRAF6release, JNKphosphorylation, p38phosphorylation, BoundTRAF6Inhibition and as a product in TRAF6binding, JNKphosphorylation, p38phosphorylation, IRAK2_TRAF6PP4Disassociation and as a modifier in TRAF6release, JNKphosphorylation, p38phosphorylation, BoundTRAF6Inhibition).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{IRAK2\_TRAF6} = v_8 + v_{10} + v_{23} + v_{62} - v_9 - v_{10} - v_{23} - v_{60} \tag{272}$$

7.9 Species IRAK2_TRAF6_PP4

Initial amount 0 item

This species takes part in three reactions (as a reactant in IRAK2_TRAF6PP4Disassociation and as a product in BoundTRAF6Inhibition and as a modifier in IRAK2_TRAF6PP4Disassociation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{IRAK2\_TRAF6\_PP4} = v_{60} - v_{62} \tag{273}$$

7.10 Species JAK1

Initial amount 100 item

This species takes part in four reactions (as a reactant in JAK1_Phosphorylation and as a product in JAK1_Dephosphorylation, JAK1_DephosphorylationByPTPRT and as a modifier in JAK1_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{JAK1} = v_{80} + v_{81} - v_{79} \tag{274}$$

7.11 Species JAK1_P

Initial amount 0 item

This species takes part in eight reactions (as a reactant in JAK1_Dephosphorylation, JAK1-_DephosphorylationByPTPRT, STAT3_Phosphorylation and as a product in JAK1_Phosphorylation, STAT3_Phosphorylation and as a modifier in JAK1_Dephosphorylation, JAK1_DephosphorylationByPTPRT, STAT3_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{JAK1\_P} = v_{79} + v_{82} - v_{80} - v_{81} - v_{82} \tag{275}$$

7.12 Species JNK

Initial amount 100 item

This species takes part in four reactions (as a reactant in JNKphosphorylation and as a product in JNKdephosphorylation, JNKdephosphorylationByDUSP16 and as a modifier in JNKphosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{JNK} = v_{11} + v_{12} - v_{10} \tag{276}$$

7.13 Species JNK_P

Initial amount 0 item

This species takes part in eight reactions (as a reactant in JNKdephosphorylation, JNKdephosphorylationByDUS cJunPhosphorylation and as a product in JNKphosphorylation, cJunPhosphorylation and as a modifier in JNKdephosphorylation, JNKdephosphorylationByDUSP16, cJunPhosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{JNK\_P} = v_{10} + v_{13} - v_{11} - v_{12} - v_{13} \tag{277}$$

7.14 Species Matriptase

Notes Matriptase is referred to as MMPActivator in the paper.

Initial amount 100 item

This species takes part in nine reactions (as a reactant in proMMP1cleavageByMatriptase, proMMP3cleavageByMatriptase, MatriptaseDegradation and as a product in proMMP1cleavageByMatripta proMMP3cleavageByMatriptase, MatriptaseSynthesis and as a modifier in proMMP1cleavageByMatriptas proMMP3cleavageByMatriptase, MatriptaseDegradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Matriptase} = v_{30} + v_{37} + v_{110} - v_{30} - v_{37} - v_{111} \tag{278}$$

7.15 Species MKP1

Initial amount 0 item

This species takes part in seven reactions (as a reactant in p38dephosphorylationMKP1, MKP1Degradation and as a product in p38dephosphorylationMKP1, MKP1Synthesis, MKP1Synthesis_cJun-_dimer and as a modifier in p38dephosphorylationMKP1, MKP1Degradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MKP1} = v_{25} + v_{69} + v_{70} - v_{25} - v_{71} \tag{279}$$

7.16 Species MMP1_mRNA

Initial amount 0 item

This species takes part in seven reactions (as a reactant in MMP1Translation, MMP1mRNADegradation and as a product in MMP1Transcription_AP1, MMP1Transcription_cJun_dimer, MMP1Translation and as a modifier in MMP1Translation, MMP1mRNADegradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MMP1\_mRNA} = v_{26} + v_{27} + v_{28} - v_{28} - v_{29} \tag{280}$$

7.17 Species MMP3_mRNA

Initial amount 0 item

This species takes part in seven reactions (as a reactant in MMP3Translation, MMP3mRNADegradation and as a product in MMP3Transcription_AP1, MMP3Transcription_cJun_dimer, MMP3Translation and as a modifier in MMP3Translation, MMP3mRNADegradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MMP3\_mRNA} = v_{33} + v_{34} + v_{35} - v_{35} - v_{36} \tag{281}$$

7.18 Species MMP13_mRNA

Initial amount 0 item

This species takes part in seven reactions (as a reactant in MMP13Translation, MMP13mRNADegradation and as a product in MMP13Transcription_AP1, MMP13Transcription_cJun_dimer, MMP13Translation and as a modifier in MMP13Translation, MMP13mRNADegradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MMP13\_mRNA} = v_{39} + v_{40} + v_{41} - v_{41} - v_{42} \tag{282}$$

7.19 Species p38

Initial amount 100 item

This species takes part in four reactions (as a reactant in p38phosphorylation and as a product in p38dephosphorylation, p38dephosphorylationMKP1 and as a modifier in p38phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{p38} = v_{24} + v_{25} - v_{23} \tag{283}$$

7.20 Species p38_P

Initial amount 0 item

This species takes part in eight reactions (as a reactant in p38dephosphorylation, p38dephosphorylationMKP1, cFosPhosphorylation_p38 and as a product in p38phosphorylation, cFosPhosphorylation_p38 and as a modifier in p38dephosphorylation, p38dephosphorylationMKP1, cFosPhosphorylation_p38).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{p38\_P} = v_{23} + v_{67} - v_{24} - v_{25} - v_{67} \tag{284}$$

7.21 Species PP4

Initial amount 0 item

This species takes part in ten reactions (as a reactant in PP4Degradation, TRAF6Inhibition, BoundTRAF6Inhibition and as a product in PP4Synthesis, PP4Synthesis_cJun_dimer, TRAF6PP4Disassociation, IRAK2_TRAF6PP4Disassociation and as a modifier in PP4Degradation, TRAF6Inhibition, BoundTRAF6Inhibition).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PP4} = v_{53} + v_{54} + v_{61} + v_{62} - v_{57} - v_{59} - v_{60} \tag{285}$$

7.22 Species proMMP1

Initial amount 0 item

This species takes part in five reactions (as a reactant in proMMP1cleavageByMatriptase, proMMP1cleavageByMMP3 and as a product in MMP1Translation and as a modifier in proMMP1cleavageByMatrip proMMP1cleavageByMMP3).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{proMMP1} = v_{28} - v_{30} - v_{31} \tag{286}$$

7.23 Species proMMP3

Initial amount 0 item

This species takes part in three reactions (as a reactant in proMMP3cleavageByMatriptase and as a product in MMP3Translation and as a modifier in proMMP3cleavageByMatriptase).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{proMMP3} = v_{35} - v_{37} \tag{287}$$

7.24 Species proMMP13

Initial amount 0 item

This species takes part in three reactions (as a reactant in proMMP13cleavageByMMP3 and as a product in MMP13Translation and as a modifier in proMMP13cleavageByMMP3).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{proMMP13} = v_{41} - v_{43} \tag{288}$$

7.25 Species PTPRT

Initial amount 0 item

This species takes part in twelve reactions (as a reactant in JAK1_DephosphorylationByPTPRT, STAT3_cyt_DephosphorylationByPTPRT, STAT3_nuc_DephosphorylationByPTPRT, PTPRT-_degradation and as a product in JAK1_DephosphorylationByPTPRT, STAT3_cyt_DephosphorylationByPTPR STAT3_nuc_DephosphorylationByPTPRT, PTPRT_induction_by_STAT3 and as a modifier in JAK1_DephosphorylationByPTPRT, STAT3_cyt_DephosphorylationByPTPRT, STAT3-_nuc_DephosphorylationByPTPRT, PTPRT_degradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PTPRT} = v_{81} + v_{84} + v_{86} + v_{90} - v_{81} - v_{84} - v_{86} - v_{91} \tag{289}$$

7.26 Species SOCS3

Initial amount 0 item

This species takes part in six reactions (as a reactant in SOCS3_degradation, SOCS3_OSMR_binding and as a product in SOCS3_translation, SOCS3_OSMR_release and as a modifier in SOCS3_degradation, SOCS3_OSMR_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SOCS3} = v_{94} + v_{97} - v_{95} - v_{96} \tag{290}$$

7.27 Species SOCS3_mRNA

SBO:0000278 messenger RNA

Initial amount 0 item

This species takes part in six reactions (as a reactant in SOCS3mRNAdegradation, SOCS3_translation and as a product in STAT3_induction_of_SOCS3, SOCS3_translation and as a modifier in SOCS3mRNAdegradation, SOCS3_translation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SOCS3\_mRNA} = v_{92} + v_{94} - v_{93} - v_{94} \tag{291}$$

7.28 Species STAT3_cyt

Initial amount 100 item

This species takes part in five reactions (as a reactant in STAT3_Phosphorylation and as a product in STAT3_cyt_Dephosphorylation, STAT3_cyt_DephosphorylationByPTPRT, STAT3_transport_from_nucleus and as a modifier in STAT3_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{STAT3\_cyt} = v_{83} + v_{84} + v_{88} - v_{82} \tag{292}$$

7.29 Species STAT3_P_cyt

Initial amount 0 item

This species takes part in seven reactions (as a reactant in STAT3_cyt_Dephosphorylation, STAT3_cyt_DephosphorylationByPTPRT, STAT3_transport_to_nucleus and as a product in STAT3_Phosphorylation and as a modifier in STAT3_cyt_Dephosphorylation, STAT3_cyt_DephosphorylationByPTPRT, STAT3_transport_to_nucleus).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{STAT3\_P\_cyt} = v_{82} - v_{83} - v_{84} - v_{87} \tag{293}$$

7.30 Species TIMP1_mRNA

Initial amount 20 item

This species takes part in eight reactions (as a reactant in TIMP1Translation, TIMP1mRNADegradation and as a product in TIMP1Translation, TIMP1_transcription_STAT3, TIMP1BasalTranscription, TIMP1Transcription_AP1 and as a modifier in TIMP1Translation, TIMP1mRNADegradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{TIMP1\_mRNA} = v_{45} + v_{116} + v_{117} + v_{118} - v_{45} - v_{46} \tag{294}$$

7.31 Species TIMP3_mRNA

Initial amount 20 item

This species takes part in eight reactions (as a reactant in TIMP3Translation, TIMP3mRNADegradation and as a product in TIMP3BasalTranscriptionn, TIMP3Transcription_AP1, TIMP3Transcription-_STAT3, TIMP3Translation and as a modifier in TIMP3Translation, TIMP3mRNADegradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{TIMP3\_mRNA} = v_{119} + v_{120} + v_{121} + v_{122} - v_{122} - v_{123} \tag{295}$$

7.32 Species TRAF6

Initial amount 100 item

This species takes part in six reactions (as a reactant in TRAF6binding, TRAF6Inhibition and as a product in TRAF6release, TRAF6PP4Disassociation and as a modifier in TRAF6binding, TRAF6Inhibition).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{TRAF6} = v_{9} + v_{61} - v_{8} - v_{59} \tag{296}$$

7.33 Species TRAF6_PP4

Initial amount 0 item

This species takes part in three reactions (as a reactant in TRAF6PP4Disassociation and as a product in TRAF6Inhibition and as a modifier in TRAF6PP4Disassociation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{TRAF6\_PP4} = v_{59} - v_{61} \tag{297}$$

7.34 Species ADAMTS4

Initial amount 0 item

This species takes part in twelve reactions (as a reactant in ADAMTS4Degradation, ADAMTS4InhibtionByTIMP1, AggrecanDegradationByADAMTS4, ADAMTS4InhibitionByTimp3 and as a product in ADAMTS4Translation, ADAMTS4_TIMP1release, AggrecanDegradationByADAMTS4, ADAMTS4_TIMP3release and as a modifier in ADAMTS4Degradation, ADAMTS4InhibtionByTIMP1, AggrecanDegradationByADAMTS4, ADAMTS4InhibitionByTimp3).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{ADAMTS4} = v_{50} + v_{106} + v_{109} + v_{126} - v_{52} - v_{105} - v_{109} - v_{125} \tag{298}$$

7.35 Species ADAMTS4_TIMP1

Initial amount 0 item

This species takes part in three reactions (as a reactant in ADAMTS4_TIMP1release and as a product in ADAMTS4InhibtionByTIMP1 and as a modifier in ADAMTS4_TIMP1release).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{ADAMTS4\_TIMP1} = v_{105} - v_{106} \tag{299}$$

7.36 Species ADAMTS4_TIMP3

Initial amount 0 item

This species takes part in three reactions (as a reactant in ADAMTS4_TIMP3release and as a product in ADAMTS4InhibitionByTimp3 and as a modifier in ADAMTS4_TIMP3release).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{ADAMTS4\_TIMP3} = v_{125} - v_{126} \tag{300}$$

7.37 Species Aggrecan

Initial amount 0 item

This species does not take part in any reactions. Its quantity does hence not change over time:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Aggrecan} = 0 \tag{301}$$

7.38 Species Aggrecan_Collagen2

Initial amount 100000 item

This species takes part in two reactions (as a reactant in AggrecanDegradationByADAMTS4 and as a modifier in AggrecanDegradationByADAMTS4).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Aggrecan\_Collagen2} = -v_{109} \tag{302}$$

7.39 Species AggFrag

Initial amount 0 item

This species takes part in one reaction (as a product in AggrecanDegradationByADAMTS4).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{AggFrag} = v_{109} \tag{303}$$

7.40 Species ColFrag

Initial amount 0 item

This species takes part in two reactions (as a product in Collagen2DegradationByMMP1, Collagen2DegradationByMMP13).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{ColFrag} = v_{107} + v_{108} \tag{304}$$

7.41 Species Collagen2

Initial amount 0 item

This species takes part in five reactions (as a reactant in Collagen2DegradationByMMP1, Collagen2DegradationByMMP13 and as a product in AggrecanDegradationByADAMTS4 and as a modifier in Collagen2DegradationByMMP1, Collagen2DegradationByMMP13).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Collagen2} = v_{109} - v_{107} - v_{108} \tag{305}$$

7.42 Species IL1

Initial amount 100 item

This species takes part in eight reactions (as a reactant in IL1binding, IL1antagonistbinding, IL1degradation and as a product in IL1release, IL1antagonistrelease and as a modifier in IL1binding, IL1antagonistbinding, IL1degradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{IL1} = v_2 + v_4 - v_1 - v_3 - v_5 \tag{306}$$

7.43 Species MMP1

Initial amount 0 item

This species takes part in 13 reactions (as a reactant in MMP1Degradation, MMP1InhibtionByTIMP1, Collagen2DegradationByMMP1, MMP1InhibtionByTIMP3 and as a product in proMMP1cleavageByMatriptase proMMP1cleavageByMMP3, MMP1_TIMP1release, Collagen2DegradationByMMP1, MMP1-_TIMP3release and as a modifier in MMP1Degradation, MMP1InhibtionByTIMP1, Collagen2DegradationByMM MMP1InhibtionByTIMP3).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MMP1} = v_{30} + v_{31} + v_{100} + v_{107} + v_{128} - v_{32} - v_{99} - v_{107} - v_{127} \tag{307}$$

7.44 Species MMP1_TIMP1

Initial amount 0 item

This species takes part in three reactions (as a reactant in MMP1_TIMP1release and as a product in MMP1InhibtionByTIMP1 and as a modifier in MMP1_TIMP1release).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MMP1\_TIMP1} = v_{99} - v_{100} \tag{308}$$

7.45 Species MMP1_TIMP3

Initial amount 0 item

This species takes part in three reactions (as a reactant in MMP1_TIMP3release and as a product in MMP1InhibtionByTIMP3 and as a modifier in MMP1_TIMP3release).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MMP1\_TIMP3} = v_{127} - v_{128} \tag{309}$$

7.46 Species MMP3

Initial amount 0 item

This species takes part in 15 reactions (as a reactant in proMMP1cleavageByMMP3, MMP3Degradation, proMMP13cleavageByMMP3, MMP3InhibtionByTIMP1, MMP3InhibtionByTIMP3 and as a product in proMMP1cleavageByMMP3, proMMP3cleavageByMatriptase, proMMP13cleavageByMMP3, MMP3_TIMP1release, MMP3_TIMP3release and as a modifier in proMMP1cleavageByMMP3, MMP3Degradation, proMMP13cleavageByMMP3, MMP3InhibtionByTIMP1, MMP3InhibtionByTIMP3).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MMP3} = v_{31} + v_{37} + v_{43} + v_{102} + v_{130} - v_{31} - v_{38} - v_{43} - v_{101} - v_{129} \tag{310}$$

7.47 Species MMP3_TIMP1

Initial amount 0 item

This species takes part in three reactions (as a reactant in MMP3_TIMP1release and as a product in MMP3InhibtionByTIMP1 and as a modifier in MMP3_TIMP1release).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MMP3\_TIMP1} = v_{101} - v_{102} \tag{311}$$

7.48 Species MMP3_TIMP3

Initial amount 0 item

This species takes part in three reactions (as a reactant in MMP3_TIMP3release and as a product in MMP3InhibtionByTIMP3 and as a modifier in MMP3_TIMP3release).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MMP3\_TIMP3} = v_{129} - v_{130} \tag{312}$$

7.49 Species MMP13

Initial amount 0 item

This species takes part in twelve reactions (as a reactant in MMP13Degradation, MMP13InhibtionByTIMP1, Collagen2DegradationByMMP13, MMP13InhibtionByTIMP3 and as a product in proMMP13cleavageByMMP3, MMP13_TIMP1release, Collagen2DegradationByMMP13, MMP13_TIMP3release and as a modifier in MMP13Degradation, MMP13InhibtionByTIMP1, Collagen2DegradationByMMP13, MMP13InhibtionByTIMP3).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MMP13} = v_{43} + v_{104} + v_{108} + v_{132} - v_{44} - v_{103} - v_{108} - v_{131} \tag{313}$$

7.50 Species MMP13_TIMP1

Initial amount 0 item

This species takes part in three reactions (as a reactant in MMP13_TIMP1release and as a product in MMP13InhibtionByTIMP1 and as a modifier in MMP13_TIMP1release).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MMP13\_TIMP1} = v_{103} - v_{104} \tag{314}$$

7.51 Species MMP13_TIMP3

Initial amount 0 item

This species takes part in three reactions (as a reactant in MMP13_TIMP3release and as a product in MMP13InhibtionByTIMP3 and as a modifier in MMP13_TIMP3release).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MMP13\_TIMP3} = v_{131} - v_{132} \tag{315}$$

7.52 Species OSM

Initial amount 1000 item

This species takes part in eight reactions (as a reactant in OSM_OSMR_binding, OSM_OSMRa_binding, OSM_degradation and as a product in OSM_OSMR_release, OSM_OSMRa_release and as a modifier in OSM_OSMR_binding, OSM_OSMRa_binding, OSM_degradation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{OSM} = v_{76} + v_{78} - v_{75} - v_{77} - v_{98} \tag{316}$$

7.53 Species TIMP1

Initial amount 200 item

This species takes part in 15 reactions (as a reactant in TIMP1Degradation, MMP1InhibtionByTIMP1, MMP3InhibtionByTIMP1, MMP13InhibtionByTIMP1, ADAMTS4InhibtionByTIMP1 and as a product in TIMP1Translation, MMP1_TIMP1release, MMP3_TIMP1release, MMP13_TIMP1release, ADAMTS4_TIMP1release and as a modifier in TIMP1Degradation, MMP1InhibtionByTIMP1, MMP3InhibtionByTIMP1, MMP13InhibtionByTIMP1, ADAMTS4InhibtionByTIMP1).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{TIMP1} = v_{45} + v_{100} + v_{102} + v_{104} + v_{106} - v_{47} - v_{99} - v_{101} - v_{103} - v_{105} \quad (317)$$

7.54 Species TIMP3

Initial amount 200 item

This species takes part in 15 reactions (as a reactant in TIMP3Degradation, ADAMTS4InhibitionByTimp3, MMP1InhibtionByTIMP3, MMP3InhibtionByTIMP3, MMP13InhibtionByTIMP3 and as a product in TIMP3Translation, ADAMTS4_TIMP3release, MMP1_TIMP3release, MMP3_TIMP3release, MMP13_TIMP3release and as a modifier in TIMP3Degradation, ADAMTS4InhibitionByTimp3, MMP1InhibtionByTIMP3, MMP3InhibtionByTIMP3, MMP13InhibtionByTIMP3).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{TIMP3} = v_{122} + v_{126} + v_{128} + v_{130} + v_{132} - v_{124} - v_{125} - v_{127} - v_{129} - v_{131} \quad (318)$$

7.55 Species IL1_IL1R

Initial amount 0 item

This species takes part in seven reactions (as a reactant in IL1release, IRAK2binding and as a product in IL1binding, IRAK2release, TRAF6binding and as a modifier in IL1release, IRAK2binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{IL1\_IL1R} = v_1 + v_7 + v_8 - v_2 - v_6 \quad (319)$$

7.56 Species IL1_IL1Ra

Initial amount 0 item

This species takes part in three reactions (as a reactant in IL1antagonistrelease and as a product in IL1antagonistbinding and as a modifier in IL1antagonistrelease).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{IL1\_IL1Ra} = v_3 - v_4 \quad (320)$$

7.57 Species IL1_IL1R_IRAK2

Initial amount 0 item

This species takes part in five reactions (as a reactant in IRAK2release, TRAF6binding and as a product in IRAK2binding and as a modifier in IRAK2release, TRAF6binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{IL1\_IL1R\_IRAK2} = v_6 - v_7 - v_8 \tag{321}$$

7.58 Species IL1R

Initial amount 100 item

This species takes part in three reactions (as a reactant in IL1binding and as a product in IL1release and as a modifier in IL1binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{IL1R} = v_2 - v_1 \tag{322}$$

7.59 Species IL1Ra

Initial amount 0 item

This species takes part in three reactions (as a reactant in IL1antagonistbinding and as a product in IL1antagonistrelease and as a modifier in IL1antagonistbinding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{IL1Ra} = v_4 - v_3 \tag{323}$$

7.60 Species OSM_OSMR

Initial amount 0 item

This species takes part in six reactions (as a reactant in OSM_OSMR_release, JAK1_Phosphorylation and as a product in OSM_OSMR_binding, JAK1_Phosphorylation and as a modifier in OSM_OSMR_release, JAK1_Phosphorylation).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{OSM\_OSMR} = v_{75} + v_{79} - v_{76} - v_{79} \tag{324}$$

7.61 Species OSM_OSMRa

Initial amount 0 item

This species takes part in three reactions (as a reactant in OSM_OSMRa_release and as a product in OSM_OSMRa_binding and as a modifier in OSM_OSMRa_release).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{OSM\_OSMRa} = v_{77} - v_{78} \tag{325}$$

7.62 Species OSMR_SOCS3

Initial amount 0 item

This species takes part in three reactions (as a reactant in SOCS3_OSMR_release and as a product in SOCS3_OSMR_binding and as a modifier in SOCS3_OSMR_release).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{OSMR\_SOCS3} = v_{96} - v_{97} \tag{326}$$

7.63 Species OSMR

Initial amount 100 item

This species takes part in six reactions (as a reactant in OSM_OSMR_binding, SOCS3_OSMR_binding and as a product in OSM_OSMR_release, SOCS3_OSMR_release and as a modifier in OSM_OSMR_binding, SOCS3_OSMR_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{OSMR} = v_{76} + v_{97} - v_{75} - v_{96} \tag{327}$$

7.64 Species OSMRa

Initial amount 0 item

This species takes part in three reactions (as a reactant in OSM_OSMRa_binding and as a product in OSM_OSMRa_release and as a modifier in OSM_OSMRa_binding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{OSMRa} = v_{78} - v_{77} \tag{328}$$

7.65 Species cFos_cJun

Initial amount 0 item

This species takes part in 42 reactions (as a reactant in cJunTranscriptionAP1, MMP1Transcription_AP1, MMP3Transcription_AP1, MMP13Transcription_AP1, ADAMTS4Transcription_AP1, PP4Synthesis, DUSP16Synthesis, Transcription_cFos_byAP1, MKP1Synthesis, cFoscJunRelease, MatriptaseSynthesis, SP1Synthesis, TIMP1Transcription_AP1, TIMP3Transcription_AP1 and as a product in cJunTranscriptionAP1, MMP1Transcription_AP1, MMP3Transcription_AP1, MMP13Transcription_AP1, ADAMTS4Transcription_AP1, PP4Synthesis, DUSP16Synthesis, Transcription_cFos_byAP1, MKP1Synthesis, cFoscJunBinding, MatriptaseSynthesis, SP1Synthesis, TIMP1Transcription_AP1, TIMP3Transcription_AP1 and as a modifier in cJunTranscriptionAP1, MMP1Transcription_AP1, MMP3Transcription_AP1, MMP13Transcription_AP1, ADAMTS4Transcription_AP1, PP4Synthesis, DUSP16Synthesis, Transcription_cFos_byAP1, MKP1Synthesis, cFoscJunRelease, MatriptaseSynthesis, SP1Synthesis, TIMP1Transcription_AP1, TIMP3Transcription_AP1).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cFos\_cJun} = v_{17} + v_{26} + v_{33} + v_{39} + v_{48} + v_{53} + v_{55} + v_{63} + v_{69} + v_{73} + v_{110} + v_{112} + v_{118} + v_{120} - v_{17} - v_{26} - v_{33} - v_{39} - v_{48} - v_{53} - v_{55} - v_{63} - v_{69} - v_{74} - v_{110} - v_{112} - v_{118} - v_{120} \tag{329}$$

7.66 Species cFos_P

Initial amount 0 item

This species takes part in eight reactions (as a reactant in cFosDephosphorylation, cFosDephosphorylationByD cFoscJunBinding and as a product in cFosPhosphorylation_p38, cFoscJunRelease and as a modifier in cFosDephosphorylation, cFosDephosphorylationByDusp16, cFoscJunBinding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cFos\_P} = v_{67} + v_{74} - v_{68} - v_{72} - v_{73} \tag{330}$$

7.67 Species cJun_P

Initial amount 0 item

This species takes part in nine reactions (as a reactant in cJunDephosphorylation, cJunDimerisation, cFoscJunBinding and as a product in cJunPhosphorylation, cJunDedimerisation, cFoscJunRelease and as a modifier in cJunDephosphorylation, cJunDimerisation, cFoscJunBinding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cJun\_P} = v_{13} + 2\,v_{16} + v_{74} - v_{14} - 2\,v_{15} - v_{73} \tag{331}$$

7.68 Species cJun_dimer

SBO:0000607 dimer

Initial amount 0 item

This species takes part in 27 reactions (as a reactant in cJunDedimerisation, cJunTranscriptioncJun, MMP1Transcription_cJun_dimer, MMP3Transcription_cJun_dimer, MMP13Transcription- _cJun_dimer, ADAMTS4Transcription_cJun_dimer, PP4Synthesis_cJun_dimer, DUSP16Synthesis- _cJun_dimer, MKP1Synthesis_cJun_dimer and as a product in cJunDimerisation, cJunTranscriptioncJun, MMP1Transcription_cJun_dimer, MMP3Transcription_cJun_dimer, MMP13Transcription- _cJun_dimer, ADAMTS4Transcription_cJun_dimer, PP4Synthesis_cJun_dimer, DUSP16Synthesis- _cJun_dimer, MKP1Synthesis_cJun_dimer and as a modifier in cJunDedimerisation, cJunTranscriptioncJu MMP1Transcription_cJun_dimer, MMP3Transcription_cJun_dimer, MMP13Transcription- _cJun_dimer, ADAMTS4Transcription_cJun_dimer, PP4Synthesis_cJun_dimer, DUSP16Synthesis- _cJun_dimer, MKP1Synthesis_cJun_dimer).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cJun\_dimer} = v_{15} + v_{18} + v_{27} + v_{34} + v_{40} + v_{49} + v_{54} + v_{56} + v_{70} - v_{16} - v_{18} - v_{27} - v_{34} - v_{40} - v_{49} - v_{54} - v_{56} - v_{70} \tag{332}$$

7.69 Species SP1

Initial amount 0 item

This species takes part in six reactions (as a reactant in SP1Degradation, SP1_TIMP1_DNAbinding and as a product in SP1Synthesis, SP1_TIMP1_DNArelease and as a modifier in SP1Degradation, SP1_TIMP1_DNAbinding).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SP1} = v_{112} + v_{115} - v_{113} - v_{114} \tag{333}$$

7.70 Species SP1_TIMP1_DNA

Initial amount 0 item

This species takes part in three reactions (as a reactant in SP1_TIMP1_DNArelease and as a product in SP1_TIMP1_DNAbinding and as a modifier in SP1_TIMP1_DNArelease).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{SP1\_TIMP1\_DNA} = v_{114} - v_{115} \tag{334}$$

7.71 Species STAT3_nuc

Initial amount 0 item

This species takes part in four reactions (as a reactant in STAT3_transport_from_nucleus and as a product in STAT3_nuc_Dephosphorylation, STAT3_nuc_DephosphorylationByPTPRT and as a modifier in STAT3_transport_from_nucleus).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{STAT3\_nuc} = v_{85} + v_{86} - v_{88} \tag{335}$$

7.72 Species STAT3_P_nuc

Initial amount 0 item

This species takes part in 20 reactions (as a reactant in STAT3_nuc_Dephosphorylation, STAT3_nuc_DephosphorylationByPTPRT, cFos_induction_by_STAT3, PTPRT_induction_by_STAT3, STAT3_induction_of_SOCS3, TIMP1_transcription_STAT3, TIMP3Transcription_STAT3 and as a product in STAT3_transport_to_nucleus, cFos_induction_by_STAT3, PTPRT_induction_by_STAT3, STAT3_induction_of_SOCS3, TIMP1_transcription_STAT3, TIMP3Transcription_STAT3 and as a modifier in STAT3_nuc_Dephosphorylation, STAT3_nuc_DephosphorylationByPTPRT, cFos_induction_by_STAT3, PTPRT_induction_by_STAT3, STAT3_induction_of_SOCS3, TIMP1_transcription_STAT3, TIMP3Transcription_STAT3).

$$\begin{aligned}\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{STAT3\_P\_nuc} = {} & v_{87} + v_{89} + v_{90} + v_{92} + v_{116} + v_{121} - v_{85} \\ & - v_{86} - v_{89} - v_{90} - v_{92} - v_{116} - v_{121}\end{aligned} \tag{336}$$

7.73 Species TIMP1_DNA

Initial amount 2 item

This species takes part in twelve reactions (as a reactant in SP1_TIMP1_DNAbinding, TIMP1_transcription_STAT3, TIMP1BasalTranscription, TIMP1Transcription_AP1 and as a product in SP1_TIMP1_DNArelease, TIMP1_transcription_STAT3, TIMP1BasalTranscription, TIMP1Transcription_AP1 and as a modifier in SP1_TIMP1_DNAbinding, TIMP1_transcription_STAT3, TIMP1BasalTranscription, TIMP1Transcription_AP1).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{TIMP1\_DNA} = v_{115} + v_{116} + v_{117} + v_{118} - v_{114} - v_{116} - v_{117} - v_{118} \quad (337)$$

7.74 Species Source

SBO:0000291 empty set

Initial amount 1 item

This species takes part in four reactions (as a reactant in cJunBasalTranscription, TIMP3BasalTranscriptionn and as a modifier in cJunBasalTranscription, TIMP3BasalTranscriptionn), which do not influence its rate of change because this constant species is on the boundary of the reaction system:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Source} = 0 \quad (338)$$

7.75 Species Sink

SBO:0000291 empty set

Initial amount 1 item

This species takes part in 26 reactions (as a product in IL1degradation, cJunmRNADegradation, cJunDegradation, MMP1mRNADegradation, MMP1Degradation, MMP3mRNADegradation, MMP3Degradation, MMP13mRNADegradation, MMP13Degradation, TIMP1mRNADegradation, TIMP1Degradation, ADAMTS4mRNADegradation, ADAMTS4Degradation, PP4Degradation, DUSP16Degradation, cFosmRNA_Degradation, cFosDegradation, MKP1Degradation, PTPRT_degradation, SOCS3mRNAdegradatio SOCS3_degradation, OSM_degradation, MatriptaseDegradation, SP1Degradation, TIMP3mRNADegradatio TIMP3Degradation), which do not influence its rate of change because this constant species is on the boundary of the reaction system:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{Sink} = 0 \quad (339)$$

A Glossary of Systems Biology Ontology Terms

SBO:0000278 messenger RNA: A messenger RNA is a ribonucleic acid synthesized during the transcription of a gene, and that carries the information to encode one or several proteins

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.

SBO:0000607 dimer: A macromolecular complex composed of two monomeric units, which may or may not be identical. Monomers are usually non-covalently bound

SBML2LaTeX was developed by Andreas Dräger[a], Hannes Planatscher[a], Dieudonné M Wouamba[a], Adrian Schröder[a], Michael Hucka[b], Lukas Endler[c], Martin Golebiewski[d] and Andreas Zell[a]. Please see http://www.ra.cs.uni-tuebingen.de/software/SBML2LaTeX for more information.

[a]Center for Bioinformatics Tübingen (ZBIT), Germany
[b]California Institute of Technology, Beckman Institute BNMC, Pasadena, United States
[c]European Bioinformatics Institute, Wellcome Trust Genome Campus, Hinxton, United Kingdom
[d]EML Research gGmbH, Heidelberg, Germany