SBML Model Report

Model name: "Liu2011_Complement_System"

May 6, 2016

1 General Overview

This is a document in SBML Level 2 Version 4 format. This model was created by the following two authors: Lukas Endler[1] and Bing Liu[2] at January 26th 2011 at 4:04 p. m. and last time modified at October tenth 2014 at 10:56 a. m. Table 1 provides an overview of the quantities of all components of this model.

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

Element	Quantity	Element	Quantity
compartment types	0	compartments	1
species types	0	species	42
events	0	constraints	0
reactions	45	function definitions	1
global parameters	85	unit definitions	3
rules	1	initial assignments	0

Model Notes

This is the continuous deterministic (ODE) model of the complement system described in the article:
Computational and Experimental Study of the Regulatory Mechanisms of the Complement System.

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Liu B, Zhang J, Tan PY, Hsu D, Blom AM, Leong B, Sethi S, Ho B, Ding JL and Thiagarajan PS. PLoS Comp. Bio. 2011 Jan. 7:1; doi:10.1371/journal.pcbi.1001059

Abstract:
The complement system is key to innate immunity and its activation is necessary for the clearance of bacteria and apoptotic cells. However, insufficient or excessive complement activation will lead to immune-related diseases. It is so far unknown how the complement activity is up- or down- regulated and what the associated pathophysiological mechanisms are. To quantitatively understand the modulatory mechanisms of the complement system, we built a computational model involving the enhancement and suppression mechanisms that regulate complement activity. Our model consists of a large system of Ordinary Differential Equations (ODEs) accompanied by a dynamic Bayesian network as a probabilistic approximation of the ODE dynamics. Applying Bayesian inference techniques, this approximation was used to perform parameter estimation and sensitivity analysis. Our combined computational and experimental study showed that the antimicrobial response is sensitive to changes in pH and calcium levels, which determines the strength of the crosstalk between CRP and L-ficolin. Our study also revealed differential regulatory effects of C4BP. While C4BP delays but does not decrease the classical complement activation, it attenuates but does not significantly delay the lectin pathway activation. We also found that the major inhibitory role of C4BP is to facilitate the decay of C3 convertase. In summary, the present work elucidates the regulatory mechanisms of the complement system and demonstrates how the bio-pathway machinery maintains the balance between activation and inhibition. The insights we have gained could contribute to the development of therapies targeting the complement system.

Comment:
Reproduction of figures in the article:
Figure 5: the effects of C4BP
Fig 5A: set initial concentrations PC=0.0327796, GlcNac=0, vary the initial concentration of C4BP from 2.6 to 2600 using parameter scan
Fig 5B: set initial concentrations PC=0, GlcNac=0.0327796, vary the initial concentration of C4BP from 2.6 to 2600 using parameter scan
Figure 6: knockout simulations
Set PC=0.0327796, GlcNac=0
Fig 6A: kf01=0, kf02=0
Fig 6B: kf04=0, kf06=0, kf07=0
Fig 6C: kf05=0
Fig 6D: kf03=0

2 Unit Definitions

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

2.1 Unit `volume`

Definition ml

2.2 Unit `substance`

Name nano mole

Definition nmol

2.3 Unit `nM`

Name nM

Definition $\mathrm{nmol} \cdot \mathrm{dl}$

2.4 Unit `area`

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

Definition m^2

2.5 Unit `length`

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

Definition m

2.6 Unit `time`

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

Definition s

3 Compartment

This model contains one compartment.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial Dimensions	Size	Unit	Constant	Outside
`compartment`	compartment	0000290	3	1	litre	☑	

3.1 Compartment `compartment`

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

Name compartment

SBO:0000290 physical compartment

4 Species

This model contains 42 species. Section 9 provides further details and the derived rates of change of each species.

Table 3: Properties of each species.

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
CRP	CRP	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
PC	PC	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
PC_CRP	PC/CRP	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
C4	C4	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
C4a	C4a	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
C4b	C4b	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
C2	C2	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
C1	C1	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
PC_CRP_C1	PC/CRP/C1	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
C2a	C2a	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
C2b	C2b	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
C4b_C2a	C4b/C2a	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
C3	C3	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
C3a	C3a	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
C3b	C3b	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
dC3b	dC3b	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
MASP	MASP	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
dC4b_C2a	dC4b/C2a	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
GlcNac	GlcNac	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
GlcNac_LF	GlcNac/LF	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
LF	LF	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟
GlcNac_LF_MASP	GlcNac/LF/MASP	compartment	$\mathrm{nmol \cdot ml^{-1}}$	⊟	⊟

Id	Name	Compartment	Derived Unit	Constant	Boundary Condition
PC_CRP_LF	PC/CRP/LF	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
PC_CRP_LF_MASP	PC/CRP/LF/MASP	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
GlcNac_LF_CRP	GlcNac/LF/CRP	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
GlcNac_LF_CRP_C1	GlcNac/LF/CRP/C1	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
C4BP	C4BP	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
C4BP_PC_CRP	C4BP/PC/CRP	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
C4BP_GlcNac_LF_CRP	C4BP/GlcNac/LF/CRP	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
iC4b_C2a	iC4b/C2a	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
C4BP_C4b	C4BP/C4b	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
C4b_C2a_C4BP	C4b/C2a/C4BP	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
dC4b_C2a_C4BP	dC4b/C2a/C4BP	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
PC_CRP_LF_C1	PC/CRP/LF/C1	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
C4BP_PC_CRP_LF	C4BP/PC/CRP/LF	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
GlcNac_LF_CRP_MASP	GlcNac/LF/CRP/MASP	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
PC_CRP_LF_C1_MASP	PC/CRP/LF/C1/MASP	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
GlcNac_LF_C1_MASP	GlcNac/LF/C1/MASP	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
GlcNac_HF	GlcNac/HF	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
HF	HF	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
GlcNac_HF_MASP	GlcNac/HF/MASP	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟
X	X	compartment	$\mathrm{nmol} \cdot \mathrm{ml}^{-1}$	⊟	⊟

5 Parameters

This model contains 85 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
ka01_1	ka01_1	0000339	0.028		☑
ka01_2	ka01_2	0000338	0.011		☑
ka02_1	ka02_1	0000339	$7.4 \cdot 10^{-4}$		☑
ka02_2	ka02_2	0000338	0.001		☑
ka03_1	ka03_1	0000025	2.000		☑
ka04_1	ka04_1	0000025	10.500		☑
kc01_1	kc01_1	0000339	0.646		☑
kc01_2	kc01_2	0000338	0.195		☑
kc02	kc02	0000035	$5.91152775857994 \cdot 10^{-4}$		☑
kc03_1	kc03_1	0000035	0.414		☑
kc03_2	kc03_2	0000038	0.996		☑
kc04_1	kc04_1	0000035	0.978		☑
ka03_2	ka03_2	0000027	500.000		☑
ka04_2	ka04_2	0000027	2500.000		☑
kd02_2	kd02_2	0000338	0.100		☑
kd02_1	kd02_1	0000339	0.037		☑
kd03_1	kd03_1	0000025	66.378		☑
kd03_2	kd03_2	0000027	829.116		☑
kb01_1	kb01_1	0000339	0.091		☑
kb01_2	kb01_2	0000338	0.051		☑
kb02_1	kb02_1	0000033	0.037		☑
kb02_2	kb02_2	0000338	0.100		☑
kb03_1	kb03_1	0000025	66.378		☑
kb03_2	kb03_2	0000027	829.116		☑
kb04_1	kb04_1	0000025	1.100		☑
kb04_2	kb04_2	0000027	2000.000		☑
kc04_2	kc04_2	0000038	0.199		☑
kd01_1	kd01_1	0000339	$7.07 \cdot 10^{-5}$		☑
kd01_2	kd01_2	0000338	$7.23 \cdot 10^{-5}$		☑
kd04_1	kd04_1	0000025	1.100		☑
kd04_2	kd04_2	0000027	2000.000		☑
ke01_1	ke01_1	0000339	$7.07 \cdot 10^{-5}$		☑
ke01_2	ke01_2	0000338	10^{-4}		☑
ke02_1	ke02_1	0000339	$7.4 \cdot 10^{-4}$		☑
ke02_2	ke02_2	0000338	0.001		☑
ke03_1	ke03_1	0000025	2.000		☑
ke03_2	ke03_2	0000027	500.000		☑

Id	Name	SBO	Value	Unit	Constant
ke04_1	ke04_1	0000025	10.500		☑
ke04_2	ke04_2	0000027	2500.000		☑
kf01_1	kf01_1	0000339	0.970		☑
kf01_2	kf01_2	0000338	0.069		☑
kf02_1	kf02_1	0000339	0.970		☑
kf02_2	kf02_2	0000338	0.069		☑
kf03	kf03	0000036	0.061		☑
kf04_2	kf04_2	0000338	0.984		☑
kf04_1	kf04_1	0000339	0.613		☑
kf05	kf05	0000036	0.981		☑
mC3	mC3	0000472	0.000		⊟
kf06_1	kf06_1	0000339	0.613		☑
kf06_2	kf06_2	0000338	0.984		☑
kf07_1	kf07_1	0000339	0.613		☑
kf07_2	kf07_2	0000338	0.984		☑
kd05_1	kd05_1	0000339	$7.4 \cdot 10^{-4}$		☑
kd05_2	kd05_2	0000338	0.001		☑
kd06_1	kd06_1	0000025	2.000		☑
kd06_2	kd06_2	0000027	500.000		☑
kd07_1	kd07_1	0000025	10.500		☑
kd07_2	kd07_2	0000027	2500.000		☑
ke05_1	ke05_1	0000339	0.037		☑
ke05_2	ke05_2	0000338	0.100		☑
ke06_1	ke06_1	0000025	66.378		☑
ke06_2	ke06_2	0000027	829.116		☑
ke07_1	ke07_1	0000025	1.100		☑
ke07_2	ke07_2	0000027	2000.000		☑
kd08_1	kd08_1	0000339	0.037		☑
kd08_2	kd08_2	0000338	0.100		☑
kd09_1	kd09_1	0000339	$7.4 \cdot 10^{-4}$		☑
kd09_2	kd09_2	0000338	0.001		☑
kd10_1	kd10_1	0000025	71.171		☑
kd10_2	kd10_2	0000027	3796.227		☑
kd11_1	kd11_1	0000025	38.963		☑
kd11_2	kd11_2	0000027	5972.306		☑
kg01_1	kg01_1	0000339	0.091		☑
kg01_2	kg01_2	0000338	0.051		☑
kg02_1	kg02_1	0000339	0.037		☑
kg02_2	kg02_2	0000338	0.100		☑
kg03_1	kg03_1	0000025	66.378		☑
kg03_2	kg03_2	0000027	829.116		☑
kg04_1	kg04_1	0000025	1.100		☑

Id	Name	SBO	Value	Unit	Constant
kg04_2	kg04_2	0000027	2000.000		☑
kt01	kt01	0000035	$3.42266 \cdot 10^{-4}$		☑
kt02	kt02	0000035	0.493		☑
kt03	kt03	0000035	0.047		☑
kt04_1	kt04_1	0000339	0.000		☑
kt04_2	kt04_2	0000338	0.000		☑

6 Function definition

This is an overview of one function definition.

6.1 Function definition function_1

Name my-MM

Arguments k, E, S, Km

Mathematical Expression

$$\frac{\mathrm{k} \cdot \mathrm{E} \cdot \mathrm{S}}{\mathrm{Km} + \mathrm{S}} \tag{1}$$

7 Rule

This is an overview of one rule.

7.1 Rule mC3

Rule mC3 is an assignment rule for parameter mC3:

$$\mathrm{mC3} = [\mathrm{dC3b}] \tag{2}$$

Derived unit $\mathrm{nmol} \cdot \mathrm{ml}^{-1}$

8 Reactions

This model contains 45 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	a_01	a_01	$\mathrm{PC} + \mathrm{CRP} \rightleftharpoons \mathrm{PC\_CRP}$	0000177
2	a_02	a_02	$\mathrm{PC\_CRP} + \mathrm{C1} \rightleftharpoons \mathrm{PC\_CRP\_C1}$	0000177
3	a_03	a_03	$\mathrm{C4} \xrightarrow{\mathrm{PC\_CRP\_C1}} \mathrm{C4a} + \mathrm{C4b}$	0000178
4	a_04	a_04	$\mathrm{C2} \xrightarrow{\mathrm{PC\_CRP\_C1}} \mathrm{C2a} + \mathrm{C2b}$	0000178
5	c_01	c_01	$\mathrm{C4b} + \mathrm{C2a} \rightleftharpoons \mathrm{C4b\_C2a}$	0000177
6	c_02	c_02	$\mathrm{C4b\_C2a} + \mathrm{C3} \longrightarrow \mathrm{C4b\_C2a} + \mathrm{C3a} + \mathrm{C3b}$	0000177
7	c_03	c_03	$\mathrm{C3b} \rightleftharpoons \mathrm{dC3b}$	0000185
8	c_04	c_04	$\mathrm{C4b\_C2a} \rightleftharpoons \mathrm{dC4b\_C2a}$	0000185
9	d_01	d_01	$\mathrm{PC\_CRP} + \mathrm{LF} \rightleftharpoons \mathrm{PC\_CRP\_LF}$	0000177
10	d_02	d_02	$\mathrm{PC\_CRP\_LF} + \mathrm{MASP} \rightleftharpoons \mathrm{PC\_CRP\_LF\_MASP}$	0000177
11	d_03	d_03	$\mathrm{C4} \xrightarrow{\mathrm{PC\_CRP\_LF\_MASP}} \mathrm{C4a} + \mathrm{C4b}$	0000178
12	d_04	d_04	$\mathrm{C2} \xrightarrow{\mathrm{PC\_CRP\_LF\_MASP}} \mathrm{C2a} + \mathrm{C2b}$	0000178
13	b_01	b_01	$\mathrm{GlcNac} + \mathrm{LF} \rightleftharpoons \mathrm{GlcNac\_LF}$	0000177
14	b_02	b_02	$\mathrm{GlcNac\_LF} + \mathrm{MASP} \rightleftharpoons \mathrm{GlcNac\_LF\_MASP}$	0000177
15	b_03	b_03	$\mathrm{C4} \xrightarrow{\mathrm{GlcNac\_LF\_MASP}} \mathrm{C4a} + \mathrm{C4b}$	0000178
16	b_04	b_04	$\mathrm{C2} \xrightarrow{\mathrm{GlcNac\_LF\_MASP}} \mathrm{C2a} + \mathrm{C2b}$	0000178
17	e_01	e_01	$\mathrm{GlcNac\_LF} + \mathrm{CRP} \rightleftharpoons \mathrm{GlcNac\_LF\_CRP}$	0000177
18	e_02	e_02	$\mathrm{GlcNac\_LF\_CRP} + \mathrm{C1} \rightleftharpoons \mathrm{GlcNac\_LF\_CRP\_C1}$	0000177
19	e_03	e_03	$\mathrm{C4} \xrightarrow{\mathrm{GlcNac\_LF\_CRP\_C1}} \mathrm{C4a} + \mathrm{C4b}$	0000178
20	e_04	e_04	$\mathrm{C2} \xrightarrow{\mathrm{GlcNac\_LF\_CRP\_C1}} \mathrm{C2a} + \mathrm{C2b}$	0000178

№	Id	Name	Reaction Equation	SBO
21	f_01	f_01	$C4BP + PC\_CRP \rightleftharpoons C4BP\_PC\_CRP$	0000177
22	f_02	f_02	$C4BP + GlcNac\_LF\_CRP \rightleftharpoons C4BP\_GlcNac\_LF\_CRP$	0000177
23	f_03	f_03	$C4b\_C2a + C4BP \longrightarrow iC4b\_C2a + C4BP$	0000176
24	f_04	f_04	$C4BP + C4b \rightleftharpoons C4BP\_C4b$	0000177
25	f_05	f_05	$C4b\_C2a + C4BP \longrightarrow C4b + C2a + C4BP$	0000180
26	f_06	f_06	$C4b\_C2a + C4BP \rightleftharpoons C4b\_C2a\_C4BP$	0000177
27	f_07	f_07	$dC4b\_C2a + C4BP \rightleftharpoons dC4b\_C2a\_C4BP$	0000177
28	t_01	t_01	$C4BP \longrightarrow \emptyset$	0000185
29	t_02	t_02	$C3b \longrightarrow \emptyset$	0000185
30	t_03	t_03	$C4b\_C2a \longrightarrow \emptyset$	0000185
31	d_05	d_05	$PC\_CRP\_LF + C1 \rightleftharpoons PC\_CRP\_LF\_C1$	0000177
32	d_06	d_06	$C4 \xrightarrow{PC\_CRP\_LF\_C1} C4a + C4b$	0000178
33	d_07	d_07	$C2 \xrightarrow{PC\_CRP\_LF\_C1} C2a + C2b$	0000178
34	t_04	t_04	$C4BP + PC\_CRP\_LF \rightleftharpoons C4BP\_PC\_CRP\_LF$	0000177
35	e_05	e_05	$GlcNac\_LF\_CRP + MASP \rightleftharpoons GlcNac\_LF\_CRP\_MASP$	0000177
36	e_06	e_06	$C4 \xrightarrow{GlcNac\_LF\_CRP\_MASP} C4a + C4b$	0000178
37	e_07	e_07	$C2 \xrightarrow{GlcNac\_LF\_CRP\_MASP} C2a + C2b$	0000178
38	d_08	d_08	$PC\_CRP\_LF\_C1 + MASP \rightleftharpoons PC\_CRP\_LF\_C1\_MASP$	0000177
39	d_09	d_09	$PC\_CRP\_LF\_MASP + C1 \rightleftharpoons PC\_CRP\_LF\_C1\_MASP$	0000177
40	d_10	d_10	$C4 \xrightarrow{PC\_CRP\_LF\_C1\_MASP} C4a + C4b$	0000178
41	d_11	d_11	$C2 \xrightarrow{PC\_CRP\_LF\_C1\_MASP} C2a + C2b$	0000178
42	g_01	g_01	$X + HF \rightleftharpoons GlcNac\_HF$	0000177
43	g_02	g_02	$GlcNac\_HF + MASP \rightleftharpoons GlcNac\_HF\_MASP$	0000177
44	g_03	g_03	$C4 \xrightarrow{GlcNac\_HF\_MASP} C4a + C4b$	0000178

№	Id	Name	Reaction Equation	SBO
45	g_04	g_04	$C2 \xrightarrow{GlcNac\_HF\_MASP} C2a + C2b$	0000178

8.1 Reaction a_01

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

Name a_01

SBO:0000177 non-covalent binding

Reaction equation

$$\mathrm{PC} + \mathrm{CRP} \rightleftharpoons \mathrm{PC\_CRP} \tag{3}$$

Reactants

Table 6: Properties of each reactant.

Id	Name	SBO
PC	PC	
CRP	CRP	

Product

Table 7: Properties of each product.

Id	Name	SBO
PC_CRP	PC/CRP	

Kinetic Law

Derived unit contains undeclared units

$$v_1 = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{ka01\_1} \cdot [\mathrm{PC}] \cdot [\mathrm{CRP}] - \mathrm{ka01\_2} \cdot [\mathrm{PC\_CRP}]) \tag{4}$$

8.2 Reaction a_02

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

Name a_02

SBO:0000177 non-covalent binding

Reaction equation

$$\mathrm{PC\_CRP} + \mathrm{C1} \rightleftharpoons \mathrm{PC\_CRP\_C1} \tag{5}$$

Reactants

Table 8: Properties of each reactant.

Id	Name	SBO
PC_CRP	PC/CRP	
C1	C1	

Product

Table 9: Properties of each product.

Id	Name	SBO
PC_CRP_C1	PC/CRP/C1	

Kinetic Law

Derived unit contains undeclared units

$$v_2 = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{ka02\_1} \cdot [\mathrm{PC\_CRP}] \cdot [\mathrm{C1}] - \mathrm{ka02\_2} \cdot [\mathrm{PC\_CRP\_C1}]) \tag{6}$$

8.3 Reaction a_03

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

Name a_03

SBO:0000178 cleavage

Reaction equation

$$\mathrm{C4} \xrightarrow{\mathrm{PC\_CRP\_C1}} \mathrm{C4a} + \mathrm{C4b} \tag{7}$$

Reactant

Table 10: Properties of each reactant.

Id	Name	SBO
C4	C4	

Modifier

Table 11: Properties of each modifier.

Id	Name	SBO
PC_CRP_C1	PC/CRP/C1	0000460

Products

Table 12: Properties of each product.

Id	Name	SBO
C4a	C4a	
C4b	C4b	

Kinetic Law

Derived unit contains undeclared units

$$v_3 = \text{vol}\,(\text{compartment}) \cdot \text{function\_1}\,(\text{ka03\_1}, [\text{PC\_CRP\_C1}], [\text{C4}], \text{ka03\_2}) \tag{8}$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \tag{9}$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \tag{10}$$

8.4 Reaction a_04

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

Name a_04

SBO:0000178 cleavage

Reaction equation

$$\text{C2} \xrightarrow{\text{PC\_CRP\_C1}} \text{C2a} + \text{C2b} \tag{11}$$

Reactant

Table 13: Properties of each reactant.

Id	Name	SBO
C2	C2	

Modifier

Table 14: Properties of each modifier.

Id	Name	SBO
PC_CRP_C1	PC/CRP/C1	0000460

Products

Table 15: Properties of each product.

Id	Name	SBO
C2a	C2a	
C2b	C2b	

Kinetic Law

Derived unit contains undeclared units

$$v_4 = \text{vol}\left(\text{compartment}\right) \cdot \text{function\_1}\left(\text{ka04\_1}, [\text{PC\_CRP\_C1}], [\text{C2}], \text{ka04\_2}\right) \tag{12}$$

$$\text{function\_1}\left(\text{k}, \text{E}, \text{S}, \text{Km}\right) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \tag{13}$$

$$\text{function\_1}\left(\text{k}, \text{E}, \text{S}, \text{Km}\right) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \tag{14}$$

8.5 Reaction c_01

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

Name c_01

SBO:0000177 non-covalent binding

Reaction equation

$$\text{C4b} + \text{C2a} \rightleftharpoons \text{C4b\_C2a} \tag{15}$$

Reactants

Table 16: Properties of each reactant.

Id	Name	SBO
C4b	C4b	
C2a	C2a	

Product

Table 17: Properties of each product.

Id	Name	SBO
C4b_C2a	C4b/C2a	

Kinetic Law

Derived unit contains undeclared units

$$v_5 = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kc01\_1} \cdot [\mathrm{C4b}] \cdot [\mathrm{C2a}] - \mathrm{kc01\_2} \cdot [\mathrm{C4b\_C2a}]) \tag{16}$$

8.6 Reaction c_02

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

Name c_02

SBO:0000177 non-covalent binding

Reaction equation

$$\mathrm{C4b\_C2a} + \mathrm{C3} \longrightarrow \mathrm{C4b\_C2a} + \mathrm{C3a} + \mathrm{C3b} \tag{17}$$

Reactants

Table 18: Properties of each reactant.

Id	Name	SBO
C4b_C2a	C4b/C2a	
C3	C3	

Products

Table 19: Properties of each product.

Id	Name	SBO
C4b_C2a	C4b/C2a	
C3a	C3a	
C3b	C3b	

Kinetic Law

Derived unit contains undeclared units

$$v_6 = \text{vol}\,(\text{compartment}) \cdot \text{kc02} \cdot [\text{C4b\_C2a}] \cdot [\text{C3}] \tag{18}$$

8.7 Reaction c_03

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

Name c_03

SBO:0000185 transport reaction

Reaction equation

$$\text{C3b} \rightleftharpoons \text{dC3b} \tag{19}$$

Reactant

Table 20: Properties of each reactant.

Id	Name	SBO
C3b	C3b	

Product

Table 21: Properties of each product.

Id	Name	SBO
dC3b	dC3b	

Kinetic Law

Derived unit contains undeclared units

$$v_7 = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kc03\_1} \cdot [\mathrm{C3b}] - \mathrm{kc03\_2} \cdot [\mathrm{dC3b}]) \tag{20}$$

8.8 Reaction c_04

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

Name c_04

SBO:0000185 transport reaction

Reaction equation

$$\mathrm{C4b\_C2a} \rightleftharpoons \mathrm{dC4b\_C2a} \tag{21}$$

Reactant

Table 22: Properties of each reactant.

Id	Name	SBO
C4b_C2a	C4b/C2a	

Product

Table 23: Properties of each product.

Id	Name	SBO
dC4b_C2a	dC4b/C2a	

Kinetic Law

Derived unit contains undeclared units

$$v_8 = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kc04\_1} \cdot [\mathrm{C4b\_C2a}] - \mathrm{kc04\_2} \cdot [\mathrm{dC4b\_C2a}]) \tag{22}$$

8.9 Reaction d_01

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

Name d_01

SBO:0000177 non-covalent binding

Reaction equation

$$\mathrm{PC\_CRP} + \mathrm{LF} \rightleftharpoons \mathrm{PC\_CRP\_LF} \tag{23}$$

Reactants

Table 24: Properties of each reactant.

Id	Name	SBO
PC_CRP	PC/CRP	
LF	LF	

Product

Table 25: Properties of each product.

Id	Name	SBO
PC_CRP_LF	PC/CRP/LF	

Kinetic Law

Derived unit contains undeclared units

$$v_9 = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kd01\_1} \cdot [\mathrm{PC\_CRP}] \cdot [\mathrm{LF}] - \mathrm{kd01\_2} \cdot [\mathrm{PC\_CRP\_LF}]) \quad (24)$$

8.10 Reaction d_02

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

Name d_02

SBO:0000177 non-covalent binding

Reaction equation

$$\mathrm{PC\_CRP\_LF} + \mathrm{MASP} \rightleftharpoons \mathrm{PC\_CRP\_LF\_MASP} \quad (25)$$

Reactants

Table 26: Properties of each reactant.

Id	Name	SBO
PC_CRP_LF	PC/CRP/LF	
MASP	MASP	

Product

Table 27: Properties of each product.

Id	Name	SBO
PC_CRP_LF_MASP	PC/CRP/LF/MASP	

Kinetic Law

Derived unit contains undeclared units

$$v_{10} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kd02\_1} \cdot [\mathrm{PC\_CRP\_LF}] \cdot [\mathrm{MASP}] - \mathrm{kd02\_2} \cdot [\mathrm{PC\_CRP\_LF\_MASP}]) \tag{26}$$

8.11 Reaction d_03

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

Name d_03

SBO:0000178 cleavage

Reaction equation

$$\mathrm{C4} \xrightarrow{\mathrm{PC\_CRP\_LF\_MASP}} \mathrm{C4a} + \mathrm{C4b} \tag{27}$$

Reactant

Table 28: Properties of each reactant.

Id	Name	SBO
C4	C4	

Modifier

Table 29: Properties of each modifier.

Id	Name	SBO
PC_CRP_LF_MASP	PC/CRP/LF/MASP	0000460

Products

Table 30: Properties of each product.

Id	Name	SBO
C4a	C4a	
C4b	C4b	

Kinetic Law

Derived unit contains undeclared units

$$v_{11} = \text{vol}\,(\text{compartment}) \cdot \text{function\_1}\,(\text{kd03\_1}, [\text{PC\_CRP\_LF\_MASP}], [\text{C4}], \text{kd03\_2}) \quad (28)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (29)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (30)$$

8.12 Reaction d_04

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

Name d_04

SBO:0000178 cleavage

Reaction equation

$$\text{C2} \xrightarrow{\text{PC\_CRP\_LF\_MASP}} \text{C2a} + \text{C2b} \quad (31)$$

Reactant

Table 31: Properties of each reactant.

Id	Name	SBO
C2	C2	

Modifier

Table 32: Properties of each modifier.

Id	Name	SBO
PC_CRP_LF_MASP	PC/CRP/LF/MASP	0000460

Products

Table 33: Properties of each product.

Id	Name	SBO
C2a	C2a	
C2b	C2b	

Kinetic Law

Derived unit contains undeclared units

$$v_{12} = \text{vol}\,(\text{compartment}) \cdot \text{function\_1}\,(\text{kd04\_1}, [\text{PC\_CRP\_LF\_MASP}], [\text{C2}], \text{kd04\_2}) \quad (32)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (33)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (34)$$

8.13 Reaction b_01

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

Name b_01

SBO:0000177 non-covalent binding

Reaction equation

$$\text{GlcNac} + \text{LF} \rightleftharpoons \text{GlcNac\_LF} \quad (35)$$

Reactants

Table 34: Properties of each reactant.

Id	Name	SBO
GlcNac	GlcNac	
LF	LF	

Product

Table 35: Properties of each product.

Id	Name	SBO
GlcNac_LF	GlcNac/LF	

Kinetic Law

Derived unit contains undeclared units

$$v_{13} = \text{vol}\,(\text{compartment}) \cdot (\text{kb01\_1} \cdot [\text{GlcNac}] \cdot [\text{LF}] - \text{kb01\_2} \cdot [\text{GlcNac\_LF}]) \tag{36}$$

8.14 Reaction b_02

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

Name b_02

SBO:0000177 non-covalent binding

Reaction equation

$$\text{GlcNac\_LF} + \text{MASP} \rightleftharpoons \text{GlcNac\_LF\_MASP} \tag{37}$$

Reactants

Table 36: Properties of each reactant.

Id	Name	SBO
GlcNac_LF	GlcNac/LF	
MASP	MASP	

Product

Table 37: Properties of each product.

Id	Name	SBO
GlcNac_LF_MASP	GlcNac/LF/MASP	

Kinetic Law

Derived unit contains undeclared units

$$v_{14} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kb02\_1} \cdot [\mathrm{GlcNac\_LF}] \cdot [\mathrm{MASP}] - \mathrm{kb02\_2} \cdot [\mathrm{GlcNac\_LF\_MASP}]) \tag{38}$$

8.15 Reaction b_03

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

Name b_03

SBO:0000178 cleavage

Reaction equation

$$\mathrm{C4} \xrightarrow{\mathrm{GlcNac\_LF\_MASP}} \mathrm{C4a} + \mathrm{C4b} \tag{39}$$

Reactant

Table 38: Properties of each reactant.

Id	Name	SBO
C4	C4	

Modifier

Table 39: Properties of each modifier.

Id	Name	SBO
GlcNac_LF_MASP	GlcNac/LF/MASP	0000460

Products

Table 40: Properties of each product.

Id	Name	SBO
C4a	C4a	
C4b	C4b	

Kinetic Law

Derived unit contains undeclared units

$$v_{15} = \text{vol}\left(\text{compartment}\right) \cdot \text{function\_1}\left(\text{kb03\_1}, [\text{GlcNac\_LF\_MASP}], [\text{C4}], \text{kb03\_2}\right) \quad (40)$$

$$\text{function\_1}\left(\text{k}, \text{E}, \text{S}, \text{Km}\right) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (41)$$

$$\text{function\_1}\left(\text{k}, \text{E}, \text{S}, \text{Km}\right) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (42)$$

8.16 Reaction b_04

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

Name b_04

SBO:0000178 cleavage

Reaction equation

$$\text{C2} \xrightarrow{\text{GlcNac\_LF\_MASP}} \text{C2a} + \text{C2b} \quad (43)$$

Reactant

Table 41: Properties of each reactant.

Id	Name	SBO
C2	C2	

Modifier

Table 42: Properties of each modifier.

Id	Name	SBO
GlcNac_LF_MASP	GlcNac/LF/MASP	0000460

Products

Table 43: Properties of each product.

Id	Name	SBO
C2a	C2a	
C2b	C2b	

Kinetic Law

Derived unit contains undeclared units

$$v_{16} = \text{vol}\left(\text{compartment}\right) \cdot \text{function\_1}\left(\text{kb04\_1}, [\text{GlcNac\_LF\_MASP}], [\text{C2}], \text{kb04\_2}\right) \quad (44)$$

$$\text{function\_1}\left(\text{k}, \text{E}, \text{S}, \text{Km}\right) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (45)$$

$$\text{function\_1}\left(\text{k}, \text{E}, \text{S}, \text{Km}\right) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (46)$$

8.17 Reaction e_01

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

Name e_01

SBO:0000177 non-covalent binding

Reaction equation

$$\text{GlcNac\_LF} + \text{CRP} \rightleftharpoons \text{GlcNac\_LF\_CRP} \quad (47)$$

Reactants

Table 44: Properties of each reactant.

Id	Name	SBO
GlcNac_LF	GlcNac/LF	
CRP	CRP	

Product

Table 45: Properties of each product.

Id	Name	SBO
GlcNac_LF_CRP	GlcNac/LF/CRP	

Kinetic Law

Derived unit contains undeclared units

$$v_{17} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{ke01\_1} \cdot [\mathrm{GlcNac\_LF}] \cdot [\mathrm{CRP}] - \mathrm{ke01\_2} \cdot [\mathrm{GlcNac\_LF\_CRP}]) \quad (48)$$

8.18 Reaction e_02

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

Name e_02

SBO:0000177 non-covalent binding

Reaction equation

$$\mathrm{GlcNac\_LF\_CRP} + \mathrm{C1} \rightleftharpoons \mathrm{GlcNac\_LF\_CRP\_C1} \quad (49)$$

Reactants

Table 46: Properties of each reactant.

Id	Name	SBO
GlcNac_LF_CRP	GlcNac/LF/CRP	
C1	C1	

Product

Table 47: Properties of each product.

Id	Name	SBO
GlcNac_LF_CRP_C1	GlcNac/LF/CRP/C1	

Kinetic Law

Derived unit contains undeclared units

$$v_{18} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{ke02\_1} \cdot [\mathrm{GlcNac\_LF\_CRP}] \cdot [\mathrm{C1}] - \mathrm{ke02\_2} \cdot [\mathrm{GlcNac\_LF\_CRP\_C1}]) \tag{50}$$

8.19 Reaction e_03

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

Name e_03

SBO:0000178 cleavage

Reaction equation

$$\mathrm{C4} \xrightarrow{\mathrm{GlcNac\_LF\_CRP\_C1}} \mathrm{C4a} + \mathrm{C4b} \tag{51}$$

Reactant

Table 48: Properties of each reactant.

Id	Name	SBO
C4	C4	

Modifier

Table 49: Properties of each modifier.

Id	Name	SBO
GlcNac_LF_CRP_C1	GlcNac/LF/CRP/C1	0000460

Products

Table 50: Properties of each product.

Id	Name	SBO
C4a	C4a	
C4b	C4b	

Kinetic Law

Derived unit contains undeclared units

$$v_{19} = \text{vol}\left(\text{compartment}\right) \cdot \text{function\_1}\left(\text{ke03\_1}, [\text{GlcNac\_LF\_CRP\_C1}], [\text{C4}], \text{ke03\_2}\right) \quad (52)$$

$$\text{function\_1}\left(\text{k}, \text{E}, \text{S}, \text{Km}\right) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (53)$$

$$\text{function\_1}\left(\text{k}, \text{E}, \text{S}, \text{Km}\right) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (54)$$

8.20 Reaction e_04

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

Name e_04

SBO:0000178 cleavage

Reaction equation

$$\text{C2} \xrightarrow{\text{GlcNac\_LF\_CRP\_C1}} \text{C2a} + \text{C2b} \quad (55)$$

Reactant

Table 51: Properties of each reactant.

Id	Name	SBO
C2	C2	

Modifier

Table 52: Properties of each modifier.

Id	Name	SBO
GlcNac_LF_CRP_C1	GlcNac/LF/CRP/C1	0000460

Products

Table 53: Properties of each product.

Id	Name	SBO
C2a	C2a	
C2b	C2b	

Kinetic Law

Derived unit contains undeclared units

$$v_{20} = \text{vol}\,(\text{compartment}) \cdot \text{function\_1}\,(\text{ke04\_1}, [\text{GlcNac\_LF\_CRP\_C1}], [\text{C2}], \text{ke04\_2}) \quad (56)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (57)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (58)$$

8.21 Reaction f_01

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

Name f_01

SBO:0000177 non-covalent binding

Reaction equation

$$\text{C4BP} + \text{PC\_CRP} \rightleftharpoons \text{C4BP\_PC\_CRP} \quad (59)$$

Reactants

Table 54: Properties of each reactant.

Id	Name	SBO
C4BP	C4BP	
PC_CRP	PC/CRP	

Product

Table 55: Properties of each product.

Id	Name	SBO
C4BP_PC_CRP	C4BP/PC/CRP	

Kinetic Law

Derived unit contains undeclared units

$$v_{21} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kf01\_1} \cdot [\mathrm{C4BP}] \cdot [\mathrm{PC\_CRP}] - \mathrm{kf01\_2} \cdot [\mathrm{C4BP\_PC\_CRP}]) \quad (60)$$

8.22 Reaction f_02

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

Name f_02

SBO:0000177 non-covalent binding

Reaction equation

$$\mathrm{C4BP} + \mathrm{GlcNac\_LF\_CRP} \rightleftharpoons \mathrm{C4BP\_GlcNac\_LF\_CRP} \quad (61)$$

Reactants

Table 56: Properties of each reactant.

Id	Name	SBO
C4BP	C4BP	
GlcNac_LF_CRP	GlcNac/LF/CRP	

Product

Table 57: Properties of each product.

Id	Name	SBO
C4BP_GlcNac_LF_CRP	C4BP/GlcNac/LF/CRP	

Kinetic Law

Derived unit contains undeclared units

$$v_{22} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kf02\_1} \cdot [\mathrm{C4BP}] \cdot [\mathrm{GlcNac\_LF\_CRP}] - \mathrm{kf02\_2} \cdot [\mathrm{C4BP\_GlcNac\_LF\_CRP}]) \tag{62}$$

8.23 Reaction f_03

This is an irreversible reaction of two reactants forming two products.

Name f_03

SBO:0000176 biochemical reaction

Reaction equation

$$\mathrm{C4b\_C2a} + \mathrm{C4BP} \longrightarrow \mathrm{iC4b\_C2a} + \mathrm{C4BP} \tag{63}$$

Reactants

Table 58: Properties of each reactant.

Id	Name	SBO
C4b_C2a	C4b/C2a	
C4BP	C4BP	

Products

Table 59: Properties of each product.

Id	Name	SBO
iC4b_C2a	iC4b/C2a	
C4BP	C4BP	

Kinetic Law

Derived unit contains undeclared units

$$v_{23} = \mathrm{vol}\,(\mathrm{compartment}) \cdot \mathrm{kf03} \cdot [\mathrm{C4b\_C2a}] \cdot [\mathrm{C4BP}] \tag{64}$$

8.24 Reaction f_04

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

Name f_04

SBO:0000177 non-covalent binding

Reaction equation

$$\mathrm{C4BP} + \mathrm{C4b} \rightleftharpoons \mathrm{C4BP\_C4b} \tag{65}$$

Reactants

Table 60: Properties of each reactant.

Id	Name	SBO
C4BP	C4BP	
C4b	C4b	

Product

Table 61: Properties of each product.

Id	Name	SBO
C4BP_C4b	C4BP/C4b	

Kinetic Law

Derived unit contains undeclared units

$$v_{24} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kf04\_1} \cdot [\mathrm{C4BP}] \cdot [\mathrm{C4b}] - \mathrm{kf04\_2} \cdot [\mathrm{C4BP\_C4b}]) \tag{66}$$

8.25 Reaction f_05

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

Name f_05

SBO:0000180 dissociation

Reaction equation

$$\text{C4b\_C2a} + \text{C4BP} \longrightarrow \text{C4b} + \text{C2a} + \text{C4BP} \tag{67}$$

Reactants

Table 62: Properties of each reactant.

Id	Name	SBO
C4b_C2a	C4b/C2a	
C4BP	C4BP	

Products

Table 63: Properties of each product.

Id	Name	SBO
C4b	C4b	
C2a	C2a	
C4BP	C4BP	

Kinetic Law

Derived unit contains undeclared units

$$v_{25} = \text{vol}(\text{compartment}) \cdot \text{kf05} \cdot [\text{C4b\_C2a}] \cdot [\text{C4BP}] \tag{68}$$

8.26 Reaction f_06

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

Name f_06

SBO:0000177 non-covalent binding

Reaction equation

$$\text{C4b\_C2a} + \text{C4BP} \rightleftharpoons \text{C4b\_C2a\_C4BP} \tag{69}$$

Reactants

Table 64: Properties of each reactant.

Id	Name	SBO
C4b_C2a	C4b/C2a	
C4BP	C4BP	

Product

Table 65: Properties of each product.

Id	Name	SBO
C4b_C2a_C4BP	C4b/C2a/C4BP	

Kinetic Law

Derived unit contains undeclared units

$$v_{26} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kf06\_1} \cdot [\mathrm{C4b\_C2a}] \cdot [\mathrm{C4BP}] - \mathrm{kf06\_2} \cdot [\mathrm{C4b\_C2a\_C4BP}]) \quad (70)$$

8.27 Reaction f_07

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

Name f_07

SBO:0000177 non-covalent binding

Reaction equation

$$\mathrm{dC4b\_C2a} + \mathrm{C4BP} \rightleftharpoons \mathrm{dC4b\_C2a\_C4BP} \quad (71)$$

Reactants

Table 66: Properties of each reactant.

Id	Name	SBO
dC4b_C2a	dC4b/C2a	
C4BP	C4BP	

Product

Table 67: Properties of each product.

Id	Name	SBO
dC4b_C2a_C4BP	dC4b/C2a/C4BP	

Kinetic Law

Derived unit contains undeclared units

$$v_{27} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kf07\_1} \cdot [\mathrm{dC4b\_C2a}] \cdot [\mathrm{C4BP}] - \mathrm{kf07\_2} \cdot [\mathrm{dC4b\_C2a\_C4BP}]) \quad (72)$$

8.28 Reaction t_01

This is an irreversible reaction of one reactant forming no product.

Name t_01

SBO:0000185 transport reaction

Reaction equation

$$\mathrm{C4BP} \longrightarrow \emptyset \quad (73)$$

Reactant

Table 68: Properties of each reactant.

Id	Name	SBO
C4BP	C4BP	

Kinetic Law

Derived unit contains undeclared units

$$v_{28} = \mathrm{vol}\,(\mathrm{compartment}) \cdot \mathrm{k1\_4} \cdot [\mathrm{C4BP}] \quad (74)$$

Table 69: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
k1_4	k1		$3.42266 \cdot 10^{-4}$		☑

8.29 Reaction t_02

This is an irreversible reaction of one reactant forming no product.

Name t_02

SBO:0000185 transport reaction

Reaction equation

$$\mathrm{C3b} \longrightarrow \emptyset \tag{75}$$

Reactant

Table 70: Properties of each reactant.

Id	Name	SBO
C3b	C3b	

Kinetic Law

Derived unit contains undeclared units

$$v_{29} = \mathrm{vol}\,(\mathrm{compartment}) \cdot \mathrm{k1\_4} \cdot [\mathrm{C3b}] \tag{76}$$

Table 71: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
k1_4	k1		0.493		☑

8.30 Reaction t_03

This is an irreversible reaction of one reactant forming no product.

Name t_03

SBO:0000185 transport reaction

Reaction equation

$$\mathrm{C4b\_C2a} \longrightarrow \emptyset \tag{77}$$

Reactant

Table 72: Properties of each reactant.

Id	Name	SBO
C4b_C2a	C4b/C2a	

Kinetic Law

Derived unit contains undeclared units

$$v_{30} = \text{vol}\,(\text{compartment}) \cdot \text{k1\_4} \cdot [\text{C4b\_C2a}] \tag{78}$$

Table 73: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
k1_4	k1		0.047		☑

8.31 Reaction d_05

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

Name d_05

SBO:0000177 non-covalent binding

Reaction equation

$$\text{PC\_CRP\_LF} + \text{C1} \rightleftharpoons \text{PC\_CRP\_LF\_C1} \tag{79}$$

Reactants

Table 74: Properties of each reactant.

Id	Name	SBO
PC_CRP_LF	PC/CRP/LF	
C1	C1	

Product

Table 75: Properties of each product.

Id	Name	SBO
PC_CRP_LF_C1	PC/CRP/LF/C1	

Id	Name	SBO

Kinetic Law

Derived unit contains undeclared units

$$v_{31} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kd05\_1} \cdot [\mathrm{PC\_CRP\_LF}] \cdot [\mathrm{C1}] - \mathrm{kd05\_2} \cdot [\mathrm{PC\_CRP\_LF\_C1}]) \quad (80)$$

8.32 Reaction d_06

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

Name d_06

SBO:0000178 cleavage

Reaction equation

$$\mathrm{C4} \xrightarrow{\mathrm{PC\_CRP\_LF\_C1}} \mathrm{C4a} + \mathrm{C4b} \quad (81)$$

Reactant

Table 76: Properties of each reactant.

Id	Name	SBO
C4	C4	

Modifier

Table 77: Properties of each modifier.

Id	Name	SBO
PC_CRP_LF_C1	PC/CRP/LF/C1	0000460

Products

Table 78: Properties of each product.

Id	Name	SBO
C4a	C4a	
C4b	C4b	

Kinetic Law

Derived unit contains undeclared units

$$v_{32} = \mathrm{vol}\left(\mathrm{compartment}\right) \cdot \mathrm{function\_1}\left(\mathrm{kd06\_1}, [\mathrm{PC\_CRP\_LF\_C1}], [\mathrm{C4}], \mathrm{kd06\_2}\right) \tag{82}$$

$$\mathrm{function\_1}\left(\mathrm{k}, \mathrm{E}, \mathrm{S}, \mathrm{Km}\right) = \frac{\mathrm{k} \cdot \mathrm{E} \cdot \mathrm{S}}{\mathrm{Km} + \mathrm{S}} \tag{83}$$

$$\mathrm{function\_1}\left(\mathrm{k}, \mathrm{E}, \mathrm{S}, \mathrm{Km}\right) = \frac{\mathrm{k} \cdot \mathrm{E} \cdot \mathrm{S}}{\mathrm{Km} + \mathrm{S}} \tag{84}$$

8.33 Reaction d_07

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

Name d_07

SBO:0000178 cleavage

Reaction equation

$$\mathrm{C2} \xrightarrow{\mathrm{PC\_CRP\_LF\_C1}} \mathrm{C2a} + \mathrm{C2b} \tag{85}$$

Reactant

Table 79: Properties of each reactant.

Id	Name	SBO
C2	C2	

Modifier

Table 80: Properties of each modifier.

Id	Name	SBO
PC_CRP_LF_C1	PC/CRP/LF/C1	0000460

Products

Table 81: Properties of each product.

Id	Name	SBO
C2a	C2a	
C2b	C2b	

Kinetic Law

Derived unit contains undeclared units

$$v_{33} = \mathrm{vol}\left(\mathrm{compartment}\right) \cdot \mathrm{function\_1}\left(\mathrm{kd07\_1}, [\mathrm{PC\_CRP\_LF\_C1}], [\mathrm{C2}], \mathrm{kd07\_2}\right) \tag{86}$$

$$\mathrm{function\_1}\left(\mathrm{k}, \mathrm{E}, \mathrm{S}, \mathrm{Km}\right) = \frac{\mathrm{k} \cdot \mathrm{E} \cdot \mathrm{S}}{\mathrm{Km} + \mathrm{S}} \tag{87}$$

$$\mathrm{function\_1}\left(\mathrm{k}, \mathrm{E}, \mathrm{S}, \mathrm{Km}\right) = \frac{\mathrm{k} \cdot \mathrm{E} \cdot \mathrm{S}}{\mathrm{Km} + \mathrm{S}} \tag{88}$$

8.34 Reaction t_04

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

Name t_04

SBO:0000177 non-covalent binding

Reaction equation

$$\mathrm{C4BP} + \mathrm{PC\_CRP\_LF} \rightleftharpoons \mathrm{C4BP\_PC\_CRP\_LF} \tag{89}$$

Reactants

Table 82: Properties of each reactant.

Id	Name	SBO
C4BP	C4BP	
PC_CRP_LF	PC/CRP/LF	

Product

Table 83: Properties of each product.

Id	Name	SBO
C4BP_PC_CRP_LF	C4BP/PC/CRP/LF	

Kinetic Law

Derived unit contains undeclared units

$$v_{34} = \text{vol}\,(\text{compartment}) \cdot (\text{k1\_4} \cdot [\text{C4BP}] \cdot [\text{PC\_CRP\_LF}] - \text{k2} \cdot [\text{C4BP\_PC\_CRP\_LF}]) \quad (90)$$

Table 84: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
k1_4	k1		0.0		☑
k2	k2		0.0		☑

8.35 Reaction e_05

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

Name e_05

SBO:0000177 non-covalent binding

Reaction equation

$$\text{GlcNac\_LF\_CRP} + \text{MASP} \rightleftharpoons \text{GlcNac\_LF\_CRP\_MASP} \quad (91)$$

Reactants

Table 85: Properties of each reactant.

Id	Name	SBO
GlcNac_LF_CRP	GlcNac/LF/CRP	
MASP	MASP	

Product

Table 86: Properties of each product.

Id	Name	SBO
GlcNac_LF_CRP_MASP	GlcNac/LF/CRP/MASP	

Kinetic Law

Derived unit contains undeclared units

$$v_{35} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{ke05\_1} \cdot [\mathrm{GlcNac\_LF\_CRP}] \cdot [\mathrm{MASP}] - \mathrm{ke05\_2} \cdot [\mathrm{GlcNac\_LF\_CRP\_MASP}]) \tag{92}$$

8.36 Reaction e_06

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

Name e_06

SBO:0000178 cleavage

Reaction equation

$$\mathrm{C4} \xrightarrow{\mathrm{GlcNac\_LF\_CRP\_MASP}} \mathrm{C4a} + \mathrm{C4b} \tag{93}$$

Reactant

Table 87: Properties of each reactant.

Id	Name	SBO
C4	C4	

Modifier

Table 88: Properties of each modifier.

Id	Name	SBO
GlcNac_LF_CRP_MASP	GlcNac/LF/CRP/MASP	0000460

Products

Table 89: Properties of each product.

Id	Name	SBO
C4a	C4a	
C4b	C4b	

Kinetic Law

Derived unit contains undeclared units

$$v_{36} = \text{vol}\,(\text{compartment}) \cdot \text{function\_1}\,(\text{ke06\_1}, [\text{GlcNac\_LF\_CRP\_MASP}], [\text{C4}], \text{ke06\_2}) \quad (94)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (95)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (96)$$

8.37 Reaction e_07

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

Name e_07

SBO:0000178 cleavage

Reaction equation

$$\text{C2} \xrightarrow{\text{GlcNac\_LF\_CRP\_MASP}} \text{C2a} + \text{C2b} \quad (97)$$

Reactant

Table 90: Properties of each reactant.

Id	Name	SBO
C2	C2	

Modifier

Table 91: Properties of each modifier.

Id	Name	SBO
GlcNac_LF_CRP_MASP	GlcNac/LF/CRP/MASP	0000460

Products

Table 92: Properties of each product.

Id	Name	SBO
C2a	C2a	
C2b	C2b	

Kinetic Law

Derived unit contains undeclared units

$$v_{37} = \text{vol}\left(\text{compartment}\right) \cdot \text{function\_1}\left(\text{ke07\_1}, [\text{GlcNac\_LF\_CRP\_MASP}], [\text{C2}], \text{ke07\_2}\right) \quad (98)$$

$$\text{function\_1}\left(\text{k}, \text{E}, \text{S}, \text{Km}\right) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (99)$$

$$\text{function\_1}\left(\text{k}, \text{E}, \text{S}, \text{Km}\right) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (100)$$

8.38 Reaction d_08

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

Name d_08

SBO:0000177 non-covalent binding

Reaction equation

$$\text{PC\_CRP\_LF\_C1} + \text{MASP} \rightleftharpoons \text{PC\_CRP\_LF\_C1\_MASP} \quad (101)$$

Reactants

Table 93: Properties of each reactant.

Id	Name	SBO
PC_CRP_LF_C1	PC/CRP/LF/C1	
MASP	MASP	

Product

Table 94: Properties of each product.

Id	Name	SBO
PC_CRP_LF_C1_MASP	PC/CRP/LF/C1/MASP	

Kinetic Law

Derived unit contains undeclared units

$$v_{38} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kd08\_1} \cdot [\mathrm{PC\_CRP\_LF\_C1}] \cdot [\mathrm{MASP}] - \mathrm{kd08\_2} \cdot [\mathrm{PC\_CRP\_LF\_C1\_MASP}]) \tag{102}$$

8.39 Reaction d_09

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

Name d_09

SBO:0000177 non-covalent binding

Reaction equation

$$\mathrm{PC\_CRP\_LF\_MASP} + \mathrm{C1} \rightleftharpoons \mathrm{PC\_CRP\_LF\_C1\_MASP} \tag{103}$$

Reactants

Table 95: Properties of each reactant.

Id	Name	SBO
PC_CRP_LF_MASP	PC/CRP/LF/MASP	
C1	C1	

Product

Table 96: Properties of each product.

Id	Name	SBO
PC_CRP_LF_C1_MASP	PC/CRP/LF/C1/MASP	

Kinetic Law

Derived unit contains undeclared units

$$v_{39} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kd09\_1} \cdot [\mathrm{PC\_CRP\_LF\_MASP}] \cdot [\mathrm{C1}] - \mathrm{kd09\_2} \cdot [\mathrm{PC\_CRP\_LF\_C1\_MASP}]) \tag{104}$$

8.40 Reaction d_10

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

Name d_10

SBO:0000178 cleavage

Reaction equation

$$\mathrm{C4} \xrightarrow{\mathrm{PC\_CRP\_LF\_C1\_MASP}} \mathrm{C4a} + \mathrm{C4b} \tag{105}$$

Reactant

Table 97: Properties of each reactant.

Id	Name	SBO
C4	C4	

Modifier

Table 98: Properties of each modifier.

Id	Name	SBO
PC_CRP_LF_C1_MASP	PC/CRP/LF/C1/MASP	0000460

Products

Table 99: Properties of each product.

Id	Name	SBO
C4a	C4a	
C4b	C4b	

Kinetic Law

Derived unit contains undeclared units

$$v_{40} = \text{vol}\,(\text{compartment}) \cdot \text{function\_1}\,(\text{kd10\_1}, [\text{PC\_CRP\_LF\_C1\_MASP}], [\text{C4}], \text{kd10\_2}) \quad (106)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (107)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (108)$$

8.41 Reaction d_11

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

Name d_11

SBO:0000178 cleavage

Reaction equation

$$\text{C2} \xrightarrow{\text{PC\_CRP\_LF\_C1\_MASP}} \text{C2a} + \text{C2b} \quad (109)$$

Reactant

Table 100: Properties of each reactant.

Id	Name	SBO
C2	C2	

Modifier

Table 101: Properties of each modifier.

Id	Name	SBO
PC_CRP_LF_C1_MASP	PC/CRP/LF/C1/MASP	0000460

Products

Table 102: Properties of each product.

Id	Name	SBO
C2a	C2a	
C2b	C2b	

Kinetic Law

Derived unit contains undeclared units

$$v_{41} = \text{vol}\,(\text{compartment}) \cdot \text{function\_1}\,(\text{kd11\_1}, [\text{PC\_CRP\_LF\_C1\_MASP}], [\text{C2}], \text{kd11\_2}) \quad (110)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (111)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (112)$$

8.42 Reaction g_01

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

Name g_01

SBO:0000177 non-covalent binding

Reaction equation

$$\text{X} + \text{HF} \rightleftharpoons \text{GlcNac\_HF} \quad (113)$$

Reactants

Table 103: Properties of each reactant.

Id	Name	SBO
X	X	
HF	HF	

Product

Table 104: Properties of each product.

Id	Name	SBO
GlcNac_HF	GlcNac/HF	

Kinetic Law

Derived unit contains undeclared units

$$v_{42} = \mathrm{vol}\,(\mathrm{compartment}) \cdot (\mathrm{kg01\_1} \cdot [\mathrm{X}] \cdot [\mathrm{HF}] - \mathrm{kg01\_2} \cdot [\mathrm{GlcNac\_HF}]) \tag{114}$$

8.43 Reaction g_02

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

Name g_02

SBO:0000177 non-covalent binding

Reaction equation

$$\mathrm{GlcNac\_HF} + \mathrm{MASP} \rightleftharpoons \mathrm{GlcNac\_HF\_MASP} \tag{115}$$

Reactants

Table 105: Properties of each reactant.

Id	Name	SBO
GlcNac_HF	GlcNac/HF	
MASP	MASP	

Product

Table 106: Properties of each product.

Id	Name	SBO
GlcNac_HF_MASP	GlcNac/HF/MASP	

Kinetic Law

Derived unit contains undeclared units

$$v_{43} = \text{vol}(\text{compartment}) \cdot (\text{kg02\_1} \cdot [\text{GlcNac\_HF}] \cdot [\text{MASP}] - \text{kg02\_2} \cdot [\text{GlcNac\_HF\_MASP}]) \tag{116}$$

8.44 Reaction g_03

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

Name g_03

SBO:0000178 cleavage

Reaction equation

$$\text{C4} \xrightarrow{\text{GlcNac\_HF\_MASP}} \text{C4a} + \text{C4b} \tag{117}$$

Reactant

Table 107: Properties of each reactant.

Id	Name	SBO
C4	C4	

Modifier

Table 108: Properties of each modifier.

Id	Name	SBO
GlcNac_HF_MASP	GlcNac/HF/MASP	0000460

Products

Table 109: Properties of each product.

Id	Name	SBO
C4a	C4a	
C4b	C4b	

Kinetic Law

Derived unit contains undeclared units

$$v_{44} = \text{vol}\,(\text{compartment}) \cdot \text{function\_1}\,(\text{kg03\_1}, [\text{GlcNac\_HF\_MASP}], [\text{C4}], \text{kg03\_2}) \quad (118)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (119)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (120)$$

8.45 Reaction g_04

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

Name g_04

SBO:0000178 cleavage

Reaction equation

$$\text{C2} \xrightarrow{\text{GlcNac\_HF\_MASP}} \text{C2a} + \text{C2b} \quad (121)$$

Reactant

Table 110: Properties of each reactant.

Id	Name	SBO
C2	C2	

Modifier

Table 111: Properties of each modifier.

Id	Name	SBO
GlcNac_HF_MASP	GlcNac/HF/MASP	0000460

Products

Table 112: Properties of each product.

Id	Name	SBO
C2a	C2a	
C2b	C2b	

Kinetic Law

Derived unit contains undeclared units

$$v_{45} = \text{vol}\,(\text{compartment}) \cdot \text{function\_1}\,(\text{kg04\_1}, [\text{GlcNac\_HF\_MASP}], [\text{C2}], \text{kg04\_2}) \quad (122)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (123)$$

$$\text{function\_1}\,(\text{k}, \text{E}, \text{S}, \text{Km}) = \frac{\text{k} \cdot \text{E} \cdot \text{S}}{\text{Km} + \text{S}} \quad (124)$$

9 Derived Rate Equations

When interpreted as an ordinary differential equation framework, this model implies the following set of equations for the rates of change of each species.

Identifiers for kinetic laws highlighted in gray cannot be verified to evaluate to units of SBML `substance` per `time`. As a result, some SBML interpreters may not be able to verify the consistency of the units on quantities in the model. Please check if

- parameters without an unit definition are involved or
- volume correction is necessary because the `hasOnlySubstanceUnits` flag may be set to `false` and `spacialDimensions`> 0 for certain species.

9.1 Species CRP

Name CRP

SBO:0000252 polypeptide chain

Initial concentration $2\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in two reactions (as a reactant in a_01, e_01).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{CRP} = -\ v_1\ -\ v_{17} \tag{125}$$

9.2 Species PC

Name PC

SBO:0000247 simple chemical

Initial concentration $0.0327796\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in one reaction (as a reactant in a_01).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PC} = -\ v_1 \tag{126}$$

9.3 Species PC_CRP

Name PC/CRP

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in four reactions (as a reactant in a_02, d_01, f_01 and as a product in a_01).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PC\_CRP} = v_1\ -\ v_2\ -\ v_9\ -\ v_{21} \tag{127}$$

9.4 Species C4

Name C4

SBO:0000252 polypeptide chain

Initial concentration $770\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in eight reactions (as a reactant in a_03, d_03, b_03, e_03, d_06, e_06, d_10, g_03).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C4} = -\ v_3\ -\ v_{11}\ -\ v_{15}\ -\ v_{19}\ -\ v_{32}\ -\ v_{36}\ -\ v_{40}\ -\ v_{44} \tag{128}$$

9.5 Species C4a

Name C4a

SBO:0000252 polypeptide chain

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in eight reactions (as a product in a_03, d_03, b_03, e_03, d_06, e_06, d_10, g_03).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C4a} = v_3 + v_{11} + v_{15} + v_{19} + v_{32} + v_{36} + v_{40} + v_{44} \tag{129}$$

9.6 Species C4b

Name C4b

SBO:0000252 polypeptide chain

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in eleven reactions (as a reactant in c_01, f_04 and as a product in a_03, d_03, b_03, e_03, f_05, d_06, e_06, d_10, g_03).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C4b} = v_3 + v_{11} + v_{15} + v_{19} + v_{25} + v_{32} + v_{36} + v_{40} + v_{44} - v_5 - v_{24} \tag{130}$$

9.7 Species C2

Name C2

SBO:0000252 polypeptide chain

Initial concentration $310\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in eight reactions (as a reactant in a_04, d_04, b_04, e_04, d_07, e_07, d_11, g_04).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C2} = -v_4 - v_{12} - v_{16} - v_{20} - v_{33} - v_{37} - v_{41} - v_{45} \tag{131}$$

9.8 Species C1

Name C1

SBO:0000252 polypeptide chain

Initial concentration $2470\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in four reactions (as a reactant in a_02, e_02, d_05, d_09).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C1} = -v_2 - v_{18} - v_{31} - v_{39} \tag{132}$$

9.9 Species PC_CRP_C1

Name PC/CRP/C1

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in three reactions (as a product in a_02 and as a modifier in a_03, a_04).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PC\_CRP\_C1} = v_2 \tag{133}$$

9.10 Species C2a

Name C2a

SBO:0000252 polypeptide chain

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in ten reactions (as a reactant in c_01 and as a product in a_04, d_04, b_04, e_04, f_05, d_07, e_07, d_11, g_04).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C2a} = v_4 + v_{12} + v_{16} + v_{20} + v_{25} + v_{33} + v_{37} + v_{41} + v_{45} - v_5 \tag{134}$$

9.11 Species C2b

Name C2b

SBO:0000252 polypeptide chain

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in eight reactions (as a product in a_04, d_04, b_04, e_04, d_07, e_07, d_11, g_04).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C2b} = v_4 + v_{12} + v_{16} + v_{20} + v_{33} + v_{37} + v_{41} + v_{45} \tag{135}$$

9.12 Species C4b_C2a

Name C4b/C2a

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in eight reactions (as a reactant in c_02, c_04, f_03, f_05, f_06, t_03 and as a product in c_01, c_02).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C4b\_C2a} = v_5 + v_6 - v_6 - v_8 - v_{23} - v_{25} - v_{26} - v_{30} \tag{136}$$

9.13 Species C3

Name C3

SBO:0000252 polypeptide chain

Initial concentration 4650 $\mathrm{nmol} \cdot \mathrm{ml}^{-1}$

This species takes part in one reaction (as a reactant in c_02).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C3} = -v_6 \tag{137}$$

9.14 Species C3a

Name C3a

SBO:0000252 polypeptide chain

Initial concentration 0 $\mathrm{nmol} \cdot \mathrm{ml}^{-1}$

This species takes part in one reaction (as a product in c_02).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C3a} = v_6 \tag{138}$$

9.15 Species C3b

Name C3b

SBO:0000252 polypeptide chain

Initial concentration 0 $\mathrm{nmol} \cdot \mathrm{ml}^{-1}$

This species takes part in three reactions (as a reactant in c_03, t_02 and as a product in c_02).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C3b} = v_6 - v_7 - v_{29} \tag{139}$$

9.16 Species dC3b

Name dC3b

SBO:0000252 polypeptide chain

Initial concentration 0 $\mathrm{nmol} \cdot \mathrm{ml}^{-1}$

This species takes part in one reaction (as a product in c_03).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{dC3b} = v_7 \tag{140}$$

9.17 Species MASP

Name MASP

SBO:0000252 polypeptide chain

Initial concentration $6.8\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in five reactions (as a reactant in d_02, b_02, e_05, d_08, g_02).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{MASP} = -\ v_{10} - v_{14} - v_{35} - v_{38} - v_{43} \tag{141}$$

9.18 Species dC4b_C2a

Name dC4b/C2a

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in two reactions (as a reactant in f_07 and as a product in c_04).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{dC4b\_C2a} = v_{8} - v_{27} \tag{142}$$

9.19 Species GlcNac

Name GlcNac

SBO:0000247 simple chemical

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in one reaction (as a reactant in b_01).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{GlcNac} = -\ v_{13} \tag{143}$$

9.20 Species GlcNac_LF

Name GlcNac/LF

SBO:0000247 simple chemical

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in three reactions (as a reactant in b_02, e_01 and as a product in b_01).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{GlcNac\_LF} = v_{13} - v_{14} - v_{17} \tag{144}$$

9.21 Species LF

Name LF

SBO:0000252 polypeptide chain

Initial concentration $20\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in two reactions (as a reactant in d_01, b_01).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{LF} = -\ v_9\ -\ v_{13} \tag{145}$$

9.22 Species GlcNac_LF_MASP

Name GlcNac/LF/MASP

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in three reactions (as a product in b_02 and as a modifier in b_03, b_04).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{GlcNac\_LF\_MASP} = v_{14} \tag{146}$$

9.23 Species PC_CRP_LF

Name PC/CRP/LF

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in four reactions (as a reactant in d_02, d_05, t_04 and as a product in d_01).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PC\_CRP\_LF} = v_9\ -\ v_{10}\ -\ v_{31}\ -\ v_{34} \tag{147}$$

9.24 Species PC_CRP_LF_MASP

Name PC/CRP/LF/MASP

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in four reactions (as a reactant in d_09 and as a product in d_02 and as a modifier in d_03, d_04).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PC\_CRP\_LF\_MASP} = v_{10}\ -\ v_{39} \tag{148}$$

9.25 Species GlcNac_LF_CRP

Name GlcNac/LF/CRP

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in four reactions (as a reactant in e_02, f_02, e_05 and as a product in e_01).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{GlcNac\_LF\_CRP} = v_{17} - v_{18} - v_{22} - v_{35} \tag{149}$$

9.26 Species GlcNac_LF_CRP_C1

Name GlcNac/LF/CRP/C1

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in three reactions (as a product in e_02 and as a modifier in e_03, e_04).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{GlcNac\_LF\_CRP\_C1} = v_{18} \tag{150}$$

9.27 Species C4BP

Name C4BP

SBO:0000252 polypeptide chain

Initial concentration $260\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in eleven reactions (as a reactant in f_01, f_02, f_03, f_04, f_05, f_06, f_07, t_01, t_04 and as a product in f_03, f_05).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C4BP} = v_{23} + v_{25} - v_{21} - v_{22} - v_{23} - v_{24} - v_{25} - v_{26} - v_{27} - v_{28} - v_{34} \tag{151}$$

9.28 Species C4BP_PC_CRP

Name C4BP/PC/CRP

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in one reaction (as a product in f_01).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C4BP\_PC\_CRP} = v_{21} \tag{152}$$

9.29 Species C4BP_GlcNac_LF_CRP

Name C4BP/GlcNac/LF/CRP

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in one reaction (as a product in f_02).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C4BP\_GlcNac\_LF\_CRP} = v_{22} \tag{153}$$

9.30 Species iC4b_C2a

Name iC4b/C2a

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in one reaction (as a product in f_03).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{iC4b\_C2a} = v_{23} \tag{154}$$

9.31 Species C4BP_C4b

Name C4BP/C4b

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in one reaction (as a product in f_04).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C4BP\_C4b} = v_{24} \tag{155}$$

9.32 Species C4b_C2a_C4BP

Name C4b/C2a/C4BP

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in one reaction (as a product in f_06).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C4b\_C2a\_C4BP} = v_{26} \tag{156}$$

9.33 Species dC4b_C2a_C4BP

Name dC4b/C2a/C4BP

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in one reaction (as a product in f_07).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{dC4b\_C2a\_C4BP} = v_{27} \tag{157}$$

9.34 Species PC_CRP_LF_C1

Name PC/CRP/LF/C1

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in four reactions (as a reactant in d_08 and as a product in d_05 and as a modifier in d_06, d_07).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PC\_CRP\_LF\_C1} = v_{31} - v_{38} \tag{158}$$

9.35 Species C4BP_PC_CRP_LF

Name C4BP/PC/CRP/LF

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in one reaction (as a product in t_04).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{C4BP\_PC\_CRP\_LF} = v_{34} \tag{159}$$

9.36 Species GlcNac_LF_CRP_MASP

Name GlcNac/LF/CRP/MASP

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in three reactions (as a product in e_05 and as a modifier in e_06, e_07).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{GlcNac\_LF\_CRP\_MASP} = v_{35} \tag{160}$$

9.37 Species PC_CRP_LF_C1_MASP

Name PC/CRP/LF/C1/MASP

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in four reactions (as a product in d_08, d_09 and as a modifier in d_10, d_11).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{PC\_CRP\_LF\_C1\_MASP} = v_{38} + v_{39} \tag{161}$$

9.38 Species GlcNac_LF_C1_MASP

Name GlcNac/LF/C1/MASP

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

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

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{GlcNac\_LF\_C1\_MASP} = 0 \tag{162}$$

9.39 Species GlcNac_HF

Name GlcNac/HF

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in two reactions (as a reactant in g_02 and as a product in g_01).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{GlcNac\_HF} = v_{42} - v_{43} \tag{163}$$

9.40 Species HF

Name HF

SBO:0000252 polypeptide chain

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in one reaction (as a reactant in g_01).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{HF} = -v_{42} \tag{164}$$

9.41 Species GlcNac_HF_MASP

Name GlcNac/HF/MASP

SBO:0000297 protein complex

Initial concentration $0\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in three reactions (as a product in g_02 and as a modifier in g_03, g_04).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{GlcNac\_HF\_MASP} = v_{43} \tag{165}$$

9.42 Species X

Name X

SBO:0000252 polypeptide chain

Initial concentration $5 \cdot 10^{-4}\ \mathrm{nmol \cdot ml^{-1}}$

This species takes part in one reaction (as a reactant in g_01).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{X} = -v_{42} \tag{166}$$

A Glossary of Systems Biology Ontology Terms

SBO:0000025 catalytic rate constant: Numerical parameter that quantifies the velocity of an enzymatic reaction

SBO:0000027 Michaelis constant: Substrate concentration at which the velocity of reaction is half its maximum. Michaelis constant is an experimental parameter. According to the underlying molecular mechanism it can be interpreted differently in terms of microscopic constants

SBO:0000033 reverse bimolecular rate constant: Numerical parameter that quantifies the reverse velocity of a chemical reaction involving only one product. This parameter encompasses all the contributions to the velocity except the quantity of the product

SBO:0000035 forward unimolecular rate constant, continuous case: Numerical parameter that quantifies the forward velocity of a chemical reaction involving only one reactant. This parameter encompasses all the contributions to the velocity except the quantity of the reactant. It is to be used in a reaction modelled using a continuous framework

SBO:0000036 forward bimolecular rate constant, continuous case: Numerical parameter that quantifies the forward velocity of a chemical reaction involving two reactants. This parameter encompasses all the contributions to the velocity except the quantity of the reactants. It is to be used in a reaction modelled using a continuous framework

SBO:0000038 reverse unimolecular rate constant, continuous case: Numerical parameter that quantifies the reverse velocity of a chemical reaction involving only one product. This parameter encompasses all the contributions to the velocity except the quantity of the product. It is to be used in a reaction modelled using a continuous framework

SBO:0000176 biochemical reaction: An event involving one or more chemical entities that modifies the electrochemical structure of at least one of the participants.

SBO:0000177 non-covalent binding: Interaction between several biochemical entities that results in the formation of a non-covalent comple

SBO:0000178 cleavage: Rupture of a covalent bond resulting in the conversion of one physical entity into several physical entities

SBO:0000180 dissociation: Transformation of a non-covalent complex that results in the formation of several independent biochemical entitie

SBO:0000185 transport reaction: Movement of a physical entity without modification of the structure of the entity

SBO:0000247 simple chemical: Simple, non-repetitive chemical entity

SBO:0000252 polypeptide chain: Naturally occurring macromolecule formed by the repetition of amino-acid residues linked by peptidic bonds. A polypeptide chain is synthesized by the ribosome. CHEBI:1654

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:0000297 protein complex: Macromolecular complex containing one or more polypeptide chains possibly associated with simple chemicals. CHEBI:3608

SBO:0000338 dissociation rate constant: Rate with which a complex dissociates into its components

SBO:0000339 bimolecular association rate constant: Rate with which two components associate into a complex

SBO:0000460 enzymatic catalyst: A substance that accelerates the velocity of a chemical reaction without itself being consumed or transformed, by lowering the free energy of the transition state. The substance acting as a catalyst is an enzyme

SBO:0000472 molar concentration of an entity: Molarity, or molar concentration, denotes the number of moles of a given substance per litre of solution. The unit of measure of molarity is mol/L, molar, or the capital letter M as an abbreviated form

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