SBML Model Report

Model name: "Wodarz1999 - Cytotoxic T lymphocyte memory response to HIV infection"

May 17, 2018

1 General Overview

This is a document in SBML Level 2 Version 4 format. This model was created by the following two authors: Catherine Lloyd[1] and Matthew Grant Roberts[2] at June 25th 2010 at 1:23 p.m. and last time modified at March 14th 2018 at 9:22 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	0
events	0	constraints	0
reactions	0	function definitions	0
global parameters	16	unit definitions	1
rules	7	initial assignments	0

Model Notes

This a model from the article:
Specific therapy regimes could lead to long-term immunological control of HIV.

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Wodarz D, Nowak MA. Proc Natl Acad Sci U S A 1999 Dec 7;96(25):14464-9 10588728 ,
Abstract:
We use mathematical models to study the relationship between HIV and the immunesystem during the natural course of infection and in the context of differentantiviral treatment regimes. The models suggest that an efficient cytotoxic Tlymphocyte (CTL) memory response is required to control the virus. We define CTLmemory as long-term persistence of CTL precursors in the absence of antigen.Infection and depletion of CD4(+) T helper cells interfere with CTL memory-generation, resulting in persistent viral replication and disease progression.We find that antiviral drug therapy during primary infection can enable thedevelopment of CTL memory. In chronically infected patients, specific treatmentschedules, either including deliberate drug holidays or antigenic boosts of theimmune system, can lead to a re-establishment of CTL memory. Whether suchtreatment regimes would lead to long-term immunologic control deservesinvestigation under carefully controlled conditions.

This model was taken from the CellML repository and automatically converted to SBML.
The original model was: **Wodarz D, Nowak MA. (1999) - version=1.0**
The original CellML model was created by:
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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 `time`

Name time

Definition 86400 s

2.2 Unit `substance`

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

Definition mol

2.3 Unit `volume`

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

Definition l

2.4 Unit `area`

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

Definition m^2

2.5 Unit `length`

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

Definition m

3 Compartment

This model contains one compartment.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial Dimensions	Size	Unit	Constant	Outside
`COMpartment`	Patient		3	1	litre	☑	

3.1 Compartment `COMpartment`

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

Name Patient

4 Parameters

This model contains 16 global parameters.

Table 3: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
x	x		10.000		☐
lamda	lamda		1.000		☑
d	d		0.100		☑
y	y		0.100		☐
a	a		0.200		☑
log_y	log_y		-1.000		☐
w	w		0.001		☐
b	b		0.010		☑
log_w	log_w		-3.000		☐
z	z		0.000		☐
h	h		0.100		☑
beta	beta		1.500		☑
p	p		1.000		☑
q	q		0.500		☑
c	c		0.100		☑
s	s		1.000		☐

5 Rules

This is an overview of seven rules.

5.1 Rule `log_y`

Rule `log_y` is an assignment rule for parameter `log_y`:

$$\mathrm{log\_y} = \frac{\log_{10}(\mathrm{y} \cdot 1)}{\log_{10} 10} \tag{1}$$

Derived unit dimensionless

5.2 Rule `log_w`

Rule `log_w` is an assignment rule for parameter `log_w`:

$$\mathrm{log\_w} = \frac{\log_{10}(\mathrm{w} \cdot 1)}{\log_{10} 10} \tag{2}$$

Derived unit dimensionless

5.3 Rule s

Rule s is an assignment rule for parameter s:

$$\mathrm{s} = \begin{cases} 1 & \text{if time} < 1 \\ \begin{cases} 1 & \text{if time} > 15 \\ 0.0042 & \text{otherwise} \end{cases} & \text{otherwise} \end{cases} \tag{3}$$

5.4 Rule x

Rule x is a rate rule for parameter x:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{x} = \mathrm{lamda} - (\mathrm{d} \cdot \mathrm{x} + \mathrm{s} \cdot \mathrm{beta} \cdot \mathrm{x} \cdot \mathrm{y}) \tag{4}$$

5.5 Rule y

Rule y is a rate rule for parameter y:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{y} = \mathrm{s} \cdot \mathrm{beta} \cdot \mathrm{x} \cdot \mathrm{y} - (\mathrm{a} \cdot \mathrm{y} + \mathrm{p} \cdot \mathrm{y} \cdot \mathrm{z}) \tag{5}$$

5.6 Rule w

Rule w is a rate rule for parameter w:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{w} = \mathrm{c} \cdot \mathrm{x} \cdot \mathrm{y} \cdot \mathrm{w} - (\mathrm{c} \cdot \mathrm{q} \cdot \mathrm{y} \cdot \mathrm{w} + \mathrm{b} \cdot \mathrm{w}) \tag{6}$$

5.7 Rule z

Rule z is a rate rule for parameter z:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{z} = \mathrm{c} \cdot \mathrm{q} \cdot \mathrm{y} \cdot \mathrm{w} - \mathrm{h} \cdot \mathrm{z} \tag{7}$$

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.

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