SBML Model Report

Model name: “Revilla2003_HIV1therapy”

May 6, 2016

1 General Overview

This is a document in SBML Level 2 Version 4 format. This model was created by the following three authors: Catherine Lloyd[1], Catherine Lloyd[2] and Catherine Lloyd[3] at June 25th 2010 at 1:13 p. m. and last time modified at June 25th 2010 at 1:13 p. m. Table 1 gives 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	8
rules	5	initial assignments	0

Model Notes

This a model from the article:
Fighting a virus with a virus: a dynamic model for HIV-1 therapy.
Revilla T, Garcia-Ramos G. Math Biosci 2003 Oct;185(2):191-203 12941536 ,
Abstract:

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A mathematical model examined a potential therapy for controlling viralinfections using genetically modified viruses. The control of the infection isan indirect effect of the selective elimination by an engineered virus ofinfected cells that are the source of the pathogens. Therefore, this engineeredvirus could greatly compensate for a dysfunctional immune system compromised byAIDS. In vitro studies using engineered viruses have been shown to decrease theHIV-1 load about 1000-fold. However, the efficacy of this potential treatmentfor reducing the viral load in AIDS patients is unknown. The present modelstudied the interactions among the HIV-1 virus, its main host cell (activatedCD4+ T cells), and a therapeutic engineered virus in an in vivo context; and itexamined the conditions for controlling the pathogen. This model predicted asignificant drop in the HIV-1 load, but the treatment does not eradicate HIV. Abasic estimation using a currently engineered virus indicated an HIV-1 loadreduction of 92% and a recovery of host cells to 17% of their normal level.Greater success (98% HIV reduction, 44% host cells recovery) is expected as morecompetent engineered viruses are designed. These results suggest that therapyusing viruses could be an alternative to extend the survival of AIDS patients.

This model was taken from the CellML repository and automatically converted to SBML.
The original model was: **Revilla T, Garcia-Ramos G. (2003) - version=1.0**
The original CellML model was created by:
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2 Unit Definitions

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

2.1 Unit day

Name day

Definition 86400 s

2.2 Unit `first_order_rate_constant`

Name first_order_rate_constant

Definition $(86400\ \mathrm{s})^{-1}$

2.3 Unit `mm3`

Name mm3

Definition mm^3

2.4 Unit `per_mm3`

Name per_mm3

Definition mm^{-3}

2.5 Unit `cell_per_mm3_day`

Name cell_per_mm3_day

Definition $\mathrm{mm}^{-3} \cdot (86400\ \mathrm{s})^{-1}$

2.6 Unit `vir_per_cell_day`

Name vir_per_cell_day

Definition $(86400\ \mathrm{s})^{-1}$

2.7 Unit `mm3_per_vir_day`

Name mm3_per_vir_day

Definition $\mathrm{mm}^3 \cdot (86400\ \mathrm{s})^{-1}$

2.8 Unit `time`

Name time

Definition 86400 s

2.9 Unit `substance`

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

Definition mol

2.10 Unit volume

Notes Litre is the predefined SBML unit for volume.

Definition l

2.11 Unit area

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

Definition m^2

2.12 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			3	1		☑	

3.1 Compartment COMpartment

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

4 Parameters

This model contains 16 global parameters.

Table 3: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
time-_environment	time		0.000	86400 s	☑
x	x		3.000		☐
lamda	lamda		2.000	mm^{-3} $(86400\ \mathrm{s})^{-1}$	☑

Id	Name	SBO	Value	Unit	Constant
d	d		0.010	$(86400 \mathrm{s})^{-1}$	☑
y	y		6.000		☐
a	a		0.330	$(86400 \mathrm{s})^{-1}$	☑
z	z		0.000		☐
b	b		2.000	$(86400 \mathrm{s})^{-1}$	☑
v	v		149.000		☐
k	k		50.000	$(86400 \mathrm{s})^{-1}$	☑
u	u		2.000	$(86400 \mathrm{s})^{-1}$	☑
w	w		1.000		☐
c	c		2000.000	$(86400 \mathrm{s})^{-1}$	☑
q	q		2.000	$(86400 \mathrm{s})^{-1}$	☑
alpha	alpha		0.004	$\mathrm{mm}^3 \cdot (86400 \mathrm{s})^{-1}$	☑
beta	beta		0.004	$\mathrm{mm}^3 \cdot (86400 \mathrm{s})^{-1}$	☑

5 Rules

This is an overview of five rules.

5.1 Rule x

Rule x is a rate rule for parameter x:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{x} = 1 \cdot \mathrm{lamda} - (\mathrm{d} \cdot \mathrm{x} + 1 \cdot \mathrm{beta} \cdot \mathrm{x} \cdot \mathrm{v}) \tag{1}$$

5.2 Rule y

Rule y is a rate rule for parameter y:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{y} = 1 \cdot \mathrm{beta} \cdot \mathrm{x} \cdot \mathrm{v} - (\mathrm{a} \cdot \mathrm{y} + 1 \cdot \mathrm{alpha} \cdot \mathrm{w} \cdot \mathrm{y}) \tag{2}$$

5.3 Rule z

Rule z is a rate rule for parameter z:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{z} = 1 \cdot \mathrm{alpha} \cdot \mathrm{w} \cdot \mathrm{y} - \mathrm{b} \cdot \mathrm{z} \tag{3}$$

5.4 Rule v

Rule v is a rate rule for parameter v:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{v} = \mathrm{k} \cdot \mathrm{y} - \mathrm{u} \cdot \mathrm{v} \tag{4}$$

5.5 Rule `w`

Rule `w` is a rate rule for parameter `w`:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{w} = \mathrm{c} \cdot \mathrm{z} - \mathrm{q} \cdot \mathrm{w} \tag{5}$$

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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