SBML Model Report

Model name: "Kirschner1998_Immunotherapy_Tumour"

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 12:43 a. m. and last time modified at June 25th 2010 at 12:43 a. 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	17	unit definitions	5
rules	3	initial assignments	0

Model Notes

This a model from the article:
Modeling immunotherapy of the tumor-immune interaction.
Kirschner D, Panetta JC. J Math Biol 1998 Sep;37(3):235-52 9785481 ,

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Abstract:
A number of lines of evidence suggest that immunotherapy with the cytokineinterleukin-2 (IL-2) may boost the immune system to fight tumors. CD4+ T cells,the cells that orchestrate the immune response, use these cytokines as signalingmechanisms for immune-response stimulation as well as lymphocyte stimulation,growth, and differentiation. Because tumor cells begin as 'self', the immunesystem may not respond in an effective way to eradicate them. Adoptive cellularimmunotherapy can potentially restore or enhance these effects. We illustratethrough mathematical modeling the dynamics between tumor cells, immune-effectorcells, and IL-2. These efforts are able to explain both short tumor oscillationsin tumor sizes as well as long-term tumor relapse. We then explore the effectsof adoptive cellular immunotherapy on the model and describe under whatcircumstances the tumor can be eliminated.

This model was taken from the CellML repository and automatically converted to SBML.
The original model was: **Kirschner D, Panetta JC. (1998) - version=1.0**
The original CellML model was created by:
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2 Unit Definitions

This is an overview of ten unit definitions of which five 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 `cells_per_microlitre`

Name cells_per_microlitre

Definition $\mu\mathrm{l}^{-1}$

2.4 Unit `flux`

Name flux

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

2.5 Unit `micromolar`

Name micromolar

Definition $\mu\mathrm{mol} \cdot \mathrm{l}^{-1}$

2.6 Unit `substance`

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

Definition mol

2.7 Unit `volume`

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

Definition l

2.8 Unit `area`

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

Definition m^2

2.9 Unit `length`

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

Definition m

2.10 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			3	1		☑	

3.1 Compartment COMpartment

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

4 Parameters

This model contains 17 global parameters.

Table 3: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
tau	tau		0.000	dimensionless	☑
mu2	mu2		0.030	dimensionless	☑
c	c		0.025	dimensionless	☑
p1	p1		0.125	dimensionless	☑
g1	g1		$2 \cdot 10^{-7}$	dimensionless	☑
s1	s1		0.000	dimensionless	☑
x	x		0.000	dimensionless	☐
y	y		1.000	dimensionless	☐
r2	r2		0.180	dimensionless	☑
a	a		1.000	dimensionless	☑
b	b		10^{-9}	dimensionless	☑
g2	g2		100000.000	dimensionless	☑
z	z		0.000	dimensionless	☐
mu3	mu3		10.000	dimensionless	☑
p2	p2		5.000	dimensionless	☑
g3	g3		1000.000	dimensionless	☑

Id	Name	SBO	Value	Unit	Constant
s2	s2		0.000	dimensionless	☑

5 Rules

This is an overview of three rules.

5.1 Rule x

Rule x is a rate rule for parameter x:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{x} = \mathrm{c}\cdot\mathrm{y} - \mathrm{mu2}\cdot\mathrm{x} + \frac{\mathrm{p1}\cdot\mathrm{x}\cdot\mathrm{z}}{\mathrm{g1}+\mathrm{z}} + \mathrm{s1} \tag{1}$$

Derived unit dimensionless

5.2 Rule y

Rule y is a rate rule for parameter y:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{y} = \mathrm{r2}\cdot\mathrm{y}\cdot(1-\mathrm{b}\cdot\mathrm{y}) - \frac{\mathrm{a}\cdot\mathrm{x}\cdot\mathrm{y}}{\mathrm{g2}+\mathrm{y}} \tag{2}$$

5.3 Rule z

Rule z is a rate rule for parameter z:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{z} = \frac{\mathrm{p2}\cdot\mathrm{x}\cdot\mathrm{y}}{\mathrm{g3}+\mathrm{y}} - \mathrm{mu3}\cdot\mathrm{z} + \mathrm{s2} \tag{3}$$

Derived unit dimensionless

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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