SBML Model Report

Model name: "Tabak2007_dopamine"

May 6, 2016

1 General Overview

This is a document in SBML Level 2 Version 1 format. This model was created by Enuo He[1] at August second 2007 at 10:34 a. m. and last time modified at April first 2014 at 6:01 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	1
events	0	constraints	0
reactions	1	function definitions	0
global parameters	40	unit definitions	3
rules	15	initial assignments	0

Model Notes

The model is encoded according to the paper *Low dose of dopamine may stimulate prolactin secretion by increasing fast potassium currents* Figure5 has been reproduced by MathSBML. One need to change the value of ga in order to get the three correct results.

the xppaut file of the model is avaiable on the following address offered by the author , http://www.math.fsu.edu/%7Ebertram/software/pituitary/JCNS_07.ode

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To cite BioModels Database, please use: Li C, Donizelli M, Rodriguez N, Dharuri H, Endler L, Chelliah V, Li L, He E, Henry A, Stefan MI, Snoep JL, Hucka M, Le Novre N, Laibe C (2010) BioModels Database: An enhanced, curated and annotated resource for published quantitative kinetic models. BMC Syst Biol., 4:92.

2 Unit Definitions

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

2.1 Unit `ms`

Definition ms

2.2 Unit `mV`

Definition mV

2.3 Unit `micro_mole`

Definition µmol

2.4 Unit `substance`

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

Definition mol

2.5 Unit `volume`

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

Definition l

2.6 Unit `area`

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

Definition m^2

2.7 Unit `length`

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

Definition m

2.8 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
`cell`			3	1	litre	☑	

3.1 Compartment `cell`

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

4 Species

This model contains one species. Section 8 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
c	calcium concentration	cell	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	⊟

5 Parameters

This model contains 40 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
vca	reversal potential for Ca		50.000		☑
vk	reversal potential for K		−75.000		☑
Cm	membrane capacitance		10.000		☑
gk			4.000		☑
gcal			2.000		☑
gsk			1.700		☑
ga			0.000		☑
gf			0.000		☑
vn			−5.000		☑
va			−20.000		☑
vm			−20.000		☑
vh			−60.000		☑
vf			−20.000		☑
sn			10.000		☑
sa			10.000		☑
sm			12.000		☑
sh			5.000		☑
sf			5.600		☑
taun			30.000		☑
tauh			20.000		☑
lambda			0.700		☑
kc			0.160		☑
ks			0.500		☑
ff			0.010		☑
alpha			0.002		☑
phik			0.000		☐
phia			0.000		☐
phih			0.000		☐
phif			0.000		☐
phical			0.000		☐
cinf			0.000		☐
ica			0.000		☐
isk			0.000		☐
ibk			0.000		☐

Id	Name	SBO	Value	Unit	Constant
ikdr			0.000		⊟
ia			0.000		⊟
ik			0.000		⊟
n			0.100		⊟
h			0.100		⊟
V			−60.000		⊟

6 Rules

This is an overview of 15 rules.

6.1 Rule phik

Rule phik is an assignment rule for parameter phik:

$$\text{phik} = \frac{1}{1 + \exp\left(\frac{\text{vn} - \text{V}}{\text{sn}}\right)} \tag{1}$$

6.2 Rule phia

Rule phia is an assignment rule for parameter phia:

$$\text{phia} = \frac{1}{1 + \exp\left(\frac{\text{va} - \text{V}}{\text{sa}}\right)} \tag{2}$$

6.3 Rule phih

Rule phih is an assignment rule for parameter phih:

$$\text{phih} = \frac{1}{1 + \exp\left(\frac{\text{V} - \text{vh}}{\text{sh}}\right)} \tag{3}$$

6.4 Rule phif

Rule phif is an assignment rule for parameter phif:

$$\text{phif} = \frac{1}{1 + \exp\left(\frac{\text{vf} - \text{V}}{\text{sf}}\right)} \tag{4}$$

6.5 Rule phical

Rule phical is an assignment rule for parameter phical:

$$\text{phical} = \frac{1}{1 + \exp\left(\frac{\text{vm} - \text{V}}{\text{sm}}\right)} \tag{5}$$

6.6 Rule ica

Rule ica is an assignment rule for parameter ica:

$$\mathrm{ica} = \mathrm{gcal} \cdot \mathrm{phical} \cdot (\mathrm{V} - \mathrm{vca}) \tag{6}$$

6.7 Rule cinf

Rule cinf is an assignment rule for parameter cinf:

$$\mathrm{cinf} = \frac{[\mathrm{c}]^2}{[\mathrm{c}]^2 + \mathrm{ks}^2} \tag{7}$$

6.8 Rule isk

Rule isk is an assignment rule for parameter isk:

$$\mathrm{isk} = \mathrm{gsk} \cdot \mathrm{cinf} \cdot (\mathrm{V} - \mathrm{vk}) \tag{8}$$

6.9 Rule ibk

Rule ibk is an assignment rule for parameter ibk:

$$\mathrm{ibk} = \mathrm{gf} \cdot \mathrm{phif} \cdot (\mathrm{V} - \mathrm{vk}) \tag{9}$$

6.10 Rule ikdr

Rule ikdr is an assignment rule for parameter ikdr:

$$\mathrm{ikdr} = \mathrm{gk} \cdot \mathrm{n} \cdot (\mathrm{V} - \mathrm{vk}) \tag{10}$$

6.11 Rule ia

Rule ia is an assignment rule for parameter ia:

$$\mathrm{ia} = \mathrm{ga} \cdot \mathrm{phia} \cdot \mathrm{h} \cdot (\mathrm{V} - \mathrm{vk}) \tag{11}$$

6.12 Rule ik

Rule ik is an assignment rule for parameter ik:

$$\mathrm{ik} = \mathrm{isk} + \mathrm{ibk} + \mathrm{ikdr} + \mathrm{ia} \tag{12}$$

6.13 Rule V

Rule V is a rate rule for parameter V:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{V} = \frac{(\mathrm{ica} + \mathrm{ik})}{\mathrm{Cm}} \tag{13}$$

6.14 Rule n

Rule n is a rate rule for parameter n:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{n} = \frac{\mathrm{lambda} \cdot (\mathrm{phik} - \mathrm{n})}{\mathrm{taun}} \tag{14}$$

6.15 Rule h

Rule h is a rate rule for parameter h:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{h} = \frac{\mathrm{phih} - \mathrm{h}}{\mathrm{tauh}} \tag{15}$$

7 Reaction

This model contains one reaction. 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	reaction-_0000004		$\emptyset \longrightarrow c$	

7.1 Reaction reaction_0000004

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

Reaction equation

$$\emptyset \longrightarrow \mathrm{c} \tag{16}$$

Product

Table 6: Properties of each product.

Id	Name	SBO
c	calcium concentration	

Kinetic Law

Derived unit contains undeclared units

$$v_1 = \mathrm{ff} \cdot (\mathrm{alpha} \cdot \mathrm{ica} + \mathrm{kc} \cdot [\mathrm{c}]) \cdot \mathrm{vol}(\mathrm{cell}) \tag{17}$$

8 Derived Rate Equation

When interpreted as an ordinary differential equation framework, this model implies the following equation for the rate of change of the following 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.

8.1 Species c

Name calcium concentration

Notes The concentration of Ca range can change from 0.1 to 0.3

Initial concentration $0.3\ \mathrm{mol} \cdot \mathrm{l}^{-1}$

This species takes part in one reaction (as a product in reaction_0000004).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{c} = v_1 \tag{18}$$

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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