SBML Model Report

Model identifier: "VDCC_L_version_2_0_20110511"

July 2, 2015

1 General Overview

This is a document in SBML Level 2 Version 4 format. Table 1 shows an overview of the quantities of all components of this model.

Table 1: The SBML components in this model.
All components are described in more detail in the following sections.

Element	Quantity	Element	Quantity
compartment types	0	compartments	1
species types	0	species	2
events	0	constraints	0
reactions	0	function definitions	0
global parameters	21	unit definitions	12
rules	10	initial assignments	0

Model Notes

2 Unit Definitions

This is an overview of twelve unit definitions.

2.1 Unit pS

Name pS

Definition pS

2.2 Unit pA

Name pA

Definition pA

2.3 Unit mV

Name mV

Definition mV

2.4 Unit msec

Name msec

Definition ms

2.5 Unit mM

Name milliMolar

Definition $\mathrm{mmol} \cdot \mathrm{l}^{-1}$

2.6 Unit substance

Name substance

Definition mol

2.7 Unit volume

Name volume

Definition l

2.8 Unit area

Name area

Definition m^2

2.9 Unit length

Name length

Definition m

2.10 Unit time

Name time

Definition s

2.11 Unit per_mV_per_ms

Name per_mV_per_ms

Definition $\mathrm{mV}^{-1} \cdot \mathrm{ms}^{-1}$

2.12 Unit per_ms

Name per_ms

Definition ms^{-1}

3 Compartment

This model contains one compartment.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial Dimensions	Size	Unit	Constant	Outside
default			3	1	litre	☑	

3.1 Compartment default

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

4 Species

This model contains two species. The boundary condition of two of these species is set to `true` so that these species' amount cannot be changed by any reaction. Section **??** 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
`V`	V	`default`	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	⊟	☑
`Cai`	Cai	`default`	mol	⊟	☑

5 Parameters

This model contains 21 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
alpham	alpham		0.000	dimensionless	⊟
betam	betam		0.000	dimensionless	⊟
m	m		$3.42574 \cdot 10^{-6}$	dimensionless	⊟
a	a		15.690	$mV^{-1} \cdot ms^{-1}$	☑
b	b		81.500	mV	☑
c	c		0.290	ms^{-1}	☑
d	d		10.860	mV	☑
Icanm	nonModulatedCaCurrent		0.000	pA	⊟
Cao	extracellularCalcium		2.000	$mmol \cdot l^{-1}$	⊟
T	Temperature		300.000	K	☑
conduct	conductance		0.000	pS	⊟
conductMax	conductMax		25.000	pS	☑
Ica	Ica		0.000	pA	⊟
inhibitFact_CB1	inhibitFact_CB1		0.000	dimensionless	⊟
inhibitFact_mGluR	inhibitFact_mGluR		0.000	dimensionless	⊟
inhibitFact_H3R	inhibitFact_H3R		0.000	dimensionless	⊟
temp1	temp1		0.000	dimensionless	⊟
temp2	temp2		0.000	dimensionless	⊟
temp3	temp3		0.000	dimensionless	⊟
dvf	dvf		0.000	dimensionless	⊟
nb_VDCC_Ltype	nb_VDCC_Ltype		1.000	dimensionless	☑

6 Rules

This is an overview of ten rules.

6.1 Rule 1

Rule is an assignment rule for parameter betam:

$$\texttt{betam} = \texttt{c} \cdot \exp\left(\frac{-[\texttt{V}]}{\texttt{d}}\right) \tag{1}$$

6.2 Rule 2

Rule is an assignment rule for parameter alpham:

$$\mathtt{alpham} = \frac{\mathtt{a} \cdot (-[\mathtt{V}] + \mathtt{b})}{\exp\left(\frac{-[\mathtt{V}]+\mathtt{b}}{10}\right) - 1} \tag{2}$$

6.3 Rule 3

Rule is a rate rule for parameter m:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathtt{m} = \mathtt{alpham} \cdot (1 - \mathtt{m}) - \mathtt{betam} \cdot \mathtt{m} \tag{3}$$

6.4 Rule 4

Rule is an assignment rule for parameter conduct:

$$\mathtt{conduct} = \mathtt{m}^2 \cdot \mathtt{conductMax} \tag{4}$$

6.5 Rule 5

Rule is an assignment rule for parameter Icanm:

$$\mathtt{Icanm} = (-\mathtt{conduct}) \cdot \mathtt{dvf} \cdot \mathtt{nb\_VDCC\_Ltype} \tag{5}$$

Derived unit pS

6.6 Rule 6

Rule is an assignment rule for parameter Ica:

$$\begin{aligned}\mathtt{Ica} = \mathtt{Icanm} \cdot (1 - \mathtt{inhibitFact\_CB1} - \mathtt{inhibitFact\_mGluR} - \mathtt{inhibitFact\_H3R} \\ + \mathtt{inhibitFact\_CB1} \cdot \mathtt{inhibitFact\_mGluR} \cdot \mathtt{inhibitFact\_H3R})\end{aligned} \tag{6}$$

6.7 Rule 7

Rule is an assignment rule for parameter temp1:

$$\mathtt{temp1} = \frac{0.0853 \cdot \mathtt{T}}{2} \tag{7}$$

6.8 Rule 8

Rule is an assignment rule for parameter temp2:

$$\mathtt{temp2} = \frac{[\mathtt{V}]}{\mathtt{temp1}} \tag{8}$$

6.9 Rule 9

Rule is an assignment rule for parameter `dvf`:

$$\mathtt{dvf} = \frac{0.001 \cdot \mathtt{temp1} \cdot \mathtt{temp3} \cdot \left(1 - \frac{\mathtt{Cai} \cdot \exp(\mathtt{temp2})}{\mathtt{Cao}}\right)}{0.001 + \mathtt{Cai}} \tag{9}$$

6.10 Rule 10

Rule is an assignment rule for parameter `temp3`:

$$\mathtt{temp3} = \begin{cases} 1 - \dfrac{\mathtt{temp2}}{2} & \text{if } |\mathtt{temp2}| \leq 0.0001 \\ \dfrac{\mathtt{temp2}}{\exp(\mathtt{temp2}) - 1} & \text{otherwise} \end{cases} \tag{10}$$

References

Dräger, A., Planatscher, H., Wouamba, D. M., Schröder, A., Hucka, M., Endler, L., Golebiewski, M., Müller, W., and Zell, A. (2009). SBML2LaTeX: Conversion of SBML files into human-readable reports. Bioinformatics, **25**(11), 1455–1456. 10.1093/bioinformatics/btp170.