SBML Model Report

Model name: "Holmes2006_MuscleContration"



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: Paul Harrington¹, Paul Harrington² and Paul Harrington³ at June 25th 2010 at 12:07 a.m. and last time modified at June 25th 2010 at 12:07 a.m. Table 1 shows 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	10	unit definitions	3
rules	5	initial assignments	0

Model Notes

This a model from the article:

Teaching from classic papers: Hill's model of muscle contraction. Holmes JW. Adv Physiol Educ 2006 Jun;30(2):67-72 16709736,

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Abstract:

A. V. Hill's 1938 paper "The heat of shortening and the dynamic constants ofmuscle,, is an enduring classic, presenting detailed methods, meticulousexperiments, and the model of muscle contraction that now bears Hill's name. Pairing a simulation based on Hill's model with a reading of his paper allowsstudents to follow his thought process to discover key principles of muscle-physiology and gain insight into how to develop quantitative models of physiological processes. In this article, the experience of the author using this approach in a graduate biomedical engineering course is outlined, along with suggestions for adapting this approach to other audiences.

This model was taken from the CellML repository and automatically converted to SBML.

The original model was: Holmes JW. (2006) - version=1.0

The original CellML model was created by:

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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

Name ms

Definition ms

2.2 Unit mNpermmsq

Name mNpermmsq

Definition $mN \cdot mm^{-2}$

2.3 Unit pms

Name pms

Definition ms^{-1}

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 1

2.6 Unit area

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

Definition m²

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.

racio 2. I repetites of all compartments.								
Id	Name	SBO	Spatial	Size	Unit	Constant	Outside	
			Dimensions					
COMpartment			3	1		Z		

3.1 Compartment COMpartment

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

4 Parameters

This model contains ten global parameters.

Table 3: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
a	a		37.240		$\overline{\hspace{1cm}}$
b	b		0.325		$\overline{\mathbf{Z}}$
Po	Po		144.900		$ \overline{\mathbf{Z}} $
alpha	alpha		1449.027		$\overline{\mathbf{Z}}$
L_se_o	L_se_o		0.300		$\overline{\mathbf{Z}}$
L	L		0.000		
V	V		0.000		\Box
$L_{ t se}$	L_se		0.000		
$L_{ extsf{ce}}$	$L_{-}ce$		0.700		
P	P		0.000		

5 Rules

This is an overview of five rules.

5.1 Rule L_ce

Rule L_ce is a rate rule for parameter L_ce:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{L}_{-}\mathrm{ce} = \mathrm{v} \tag{1}$$

5.2 Rule L_se

Rule L_se is an assignment rule for parameter L_se:

$$L_se = L - L_ce$$
 (2)

5.3 Rule L

Rule L is an assignment rule for parameter L:

$$L = \begin{cases} 1 & \text{if time} \le 1\\ 0.92 & \text{if (time} > 1) \land (\text{time} < 5)\\ 0.9 & \text{otherwise} \end{cases} \tag{3}$$

5.4 Rule P

Rule P is an assignment rule for parameter P:

$$P = alpha \cdot (L_se - L_se_o) \tag{4}$$

5.5 Rule v

Rule v is an assignment rule for parameter v:

$$v = \frac{b \cdot (Po - P)}{P + a} \tag{5}$$

 $\mathfrak{BML2}^{lag}$ 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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