SBML Model Report

Model name: “Holmes2006 - Hill’s model of muscle contraction”

May 17, 2018

1 General Overview

This is a document in SBML Level 2 Version 4 format. This model was created by the following two authors: Paul Harrington[1] and Matthew Grant Roberts[2] at February 21st 2018 at 4:45 p. m. and last time modified at March 14th 2018 at 9:36 a. m. Table 1 provides 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	2
rules	5	initial assignments	1

Model Notes

Holmes2006 - Hill’s model of muscle contraction

This model is described in the article:Teaching from classic papers: Hill’s model of muscle contraction.Holmes JW.Adv Physiol Educ 2006 Jun; 30(2): 67-72

Abstract:

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A. V. Hill's 1938 paper „The heat of shortening and the dynamic constants of muscle„ is an enduring classic, presenting detailed methods, meticulous experiments, 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 allows students 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 is hosted on BioModels Database and identified by: BIOMD0000000677.

To cite BioModels Database, please use: Chelliah V et al. BioModels: ten-year anniversary. Nucl. Acids Res. 2015, 43(Database issue):D542-8.

2 Unit Definitions

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

2.1 Unit `volume`

Name volume

Definition ml

2.2 Unit `substance`

Name substance

Definition item

2.3 Unit `area`

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

Definition m^2

2.4 Unit `length`

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

Definition m

2.5 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`	Compartment		3	1	litre	☑	

3.1 Compartment `Compartment`

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

Name Compartment

4 Parameters

This model contains ten global parameters.

Table 3: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
`L_ce`	L_ce		0.700		⊟
`L_se`	L_se		0.300		⊟
`L`	L		1.000		⊟
`P`	P		0.000		⊟
`alpha`	alpha		1449.027		☑
`a`	a		37.240		☑
`b`	b		0.325		☑
`v_ce`	v_ce		−1.265		⊟
`P_0`	P_0		144.900		☑
`ModelValue_1`	Initial for L_se		0.300		☑

5 Initialassignment

This is an overview of one initialassignment.

5.1 Initialassignment ModelValue_1

Derived unit contains undeclared units

Math L_se

6 Rules

This is an overview of five rules.

6.1 Rule L

Rule L is an assignment rule for parameter L:

$$\mathrm{L} = \begin{cases} 1 & \text{if time} < 2 \\ 0.95 & \text{otherwise} \end{cases} \tag{1}$$

6.2 Rule L_se

Rule L_se is an assignment rule for parameter L_se:

$$\mathrm{L\_se} = \mathrm{L} - \mathrm{L\_ce} \tag{2}$$

6.3 Rule P

Rule P is an assignment rule for parameter P:

$$\mathrm{P} = \mathrm{alpha} \cdot (\mathrm{L\_se} - \mathrm{ModelValue\_1}) \tag{3}$$

6.4 Rule v_ce

Rule v_ce is an assignment rule for parameter v_ce:

$$\mathrm{v\_ce} = \frac{\mathrm{b} \cdot (\mathrm{P} - \mathrm{P\_0})}{\mathrm{P} + \mathrm{a}} \tag{4}$$

6.5 Rule L_ce

Rule L_ce is a rate rule for parameter L_ce:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{L\_ce} = \mathrm{v\_ce} \tag{5}$$

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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