

SBML Model Report

Model name: “Zatorsky2006_p53_Model5”



May 5, 2016

1 General Overview

This is a document in SBML Level 2 Version 1 format. This model was created by the following two authors: Harish Dharuri¹ and Vijayalakshmi Chelliah² at January tenth 2008 at 5:38 p. m. and last time modified at March 20th 2014 at 4:28 p. 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	3
events	0	constraints	0
reactions	5	function definitions	0
global parameters	7	unit definitions	2
rules	0	initial assignments	0

Model Notes

The model reproduces time profile of p53 and Mdm2 as depicted in Fig 6B of the paper for Model 5. Results obtained using MathSBML.

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¹California Institute of Technology, hdharuri@cds.caltech.edu

²EMBL-EBI, viji@ebi.ac.uk

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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 `substance`

Name dimensionless

Definition item

2.2 Unit `time`

Name hours

Definition 3600 s

2.3 Unit `volume`

Notes Litre is the predefined SBML unit for volume.

Definition 1

2.4 Unit `area`

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

Definition m²

2.5 Unit `length`

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

Definition m

3 Compartment

This model contains one compartment.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial Dimensions	Size	Unit	Constant	Outside
compartment	cell		3	1	litre	<input checked="" type="checkbox"/>	

3.1 Compartment `compartment`

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

Name cell

4 Species

This model contains three species. Section 7 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 Condi- tion
x	p53	compartment	$\text{item} \cdot \text{l}^{-1}$	\square	\square
y	Mdm2	compartment	$\text{item} \cdot \text{l}^{-1}$	\square	\square
y0	precursor Mdm2	compartment	$\text{item} \cdot \text{l}^{-1}$	\square	\square

5 Parameters

This model contains seven global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
psi			1.0		<input checked="" type="checkbox"/>
alpha_x			0.0		<input checked="" type="checkbox"/>
alpha_xy			3.7		<input checked="" type="checkbox"/>
beta_y			1.5		<input checked="" type="checkbox"/>
alpha_y			0.9		<input checked="" type="checkbox"/>
alpha_0			1.1		<input checked="" type="checkbox"/>
Theta			2.0		<input checked="" type="checkbox"/>

6 Reactions

This model contains five reactions. 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

Nº	Id	Name	Reaction Equation	SBO
1	R1	p53 production	$\emptyset \longrightarrow x$	
2	R3	Mdm2 dependent p53 degradation	$x \xrightarrow{y} \emptyset$	
3	R4	p53 dependent Mdm2 precursor production	$\emptyset \xrightarrow{x} y0$	
4	R5	Mdm2 synthesis from precursor	$y0 \longrightarrow y$	
5	R6	Mdm2 degradation	$y \rightleftharpoons \emptyset$	

6.1 Reaction R1

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

Name p53 production

Reaction equation



Product

Table 6: Properties of each product.

Id	Name	SBO
x	p53	

Kinetic Law

Derived unit contains undeclared units

$$v_1 = \text{vol}(\text{compartment}) \cdot \text{Theta} \cdot [x] \cdot \text{psi} \quad (2)$$

6.2 Reaction R3

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

Name Mdm2 dependent p53 degradation

Reaction equation



Reactant

Table 7: Properties of each reactant.

Id	Name	SBO
x	p53	

Modifier

Table 8: Properties of each modifier.

Id	Name	SBO
y	Mdm2	

Kinetic Law

Derived unit contains undeclared units

$$v_2 = \text{vol}(\text{compartment}) \cdot \alpha_{xy} \cdot [y] \cdot [x] \quad (4)$$

6.3 Reaction R4

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

Name p53 dependent Mdm2 precursor production

Reaction equation



Modifier

Table 9: Properties of each modifier.

Id	Name	SBO
x	p53	

Product

Table 10: Properties of each product.

Id	Name	SBO
y0	precursor Mdm2	

Kinetic Law

Derived unit contains undeclared units

$$v_3 = \text{vol}(\text{compartment}) \cdot \beta_{xy} \cdot [x] \cdot \psi \quad (6)$$

6.4 Reaction R5

This is an irreversible reaction of one reactant forming one product.

Name Mdm2 synthesis from precursor

Reaction equation



Reactant

Table 11: Properties of each reactant.

Id	Name	SBO
y0	precursor Mdm2	

Product

Table 12: Properties of each product.

Id	Name	SBO
y	Mdm2	

Kinetic Law

Derived unit contains undeclared units

$$v_4 = \text{vol}(\text{compartment}) \cdot \text{alpha_0} \cdot [y0] \quad (8)$$

6.5 Reaction R6

This is a reversible reaction of one reactant forming no product.

Name Mdm2 degradation

Reaction equation



Reactant

Table 13: Properties of each reactant.

Id	Name	SBO
y	Mdm2	

Kinetic Law

Derived unit contains undeclared units

$$v_5 = \text{vol}(\text{compartment}) \cdot \text{alpha_y} \cdot [y] \quad (10)$$

7 Derived Rate Equations

When interpreted as an ordinary differential equation framework, this model implies the following set of equations for the rates of change of each 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.

7.1 Species x

Name p53

Initial concentration $0.02 \text{ item} \cdot \text{l}^{-1}$

This species takes part in three reactions (as a reactant in R3 and as a product in R1 and as a modifier in R4).

$$\frac{d}{dt}x = v_1 - v_2 \quad (11)$$

7.2 Species y

Name Mdm2

Initial concentration $0.2 \text{ item} \cdot \text{l}^{-1}$

This species takes part in three reactions (as a reactant in R6 and as a product in R5 and as a modifier in R3).

$$\frac{d}{dt}y = v_4 - v_5 \quad (12)$$

7.3 Species y_0

Name precursor Mdm2

Initial concentration $0.5 \text{ item} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in R5 and as a product in R4).

$$\frac{d}{dt}y_0 = v_3 - v_4 \quad (13)$$

SBML2^ATeX 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.

^aCenter for Bioinformatics Tübingen (ZBIT), Germany

^bCalifornia Institute of Technology, Beckman Institute BNMC, Pasadena, United States

^cEuropean Bioinformatics Institute, Wellcome Trust Genome Campus, Hinxton, United Kingdom

^dEML Research gGmbH, Heidelberg, Germany