SBML Model Report

Model name: "Zatorsky2006_p53_Model2"

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1 General Overview

This is a document in SBML Level 2 Version 1 format. This model was created by the following two authors: Harish Dharuri[1] and Vijayalakshmi Chelliah[2] at January tenth 2008 at 5:38 p. m. and last time modified at March 20th 2014 at 4:30 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	2	constraints	0
reactions	6	function definitions	0
global parameters	14	unit definitions	2
rules	1	initial assignments	0

Model Notes

The model reproduces time profile of p53 and Mdm2 as depicted in Fig 6B of the paper for Model 2. Results obtained using MathSBML.

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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 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 l

2.4 Unit `area`

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

Definition m^2

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	☑	

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 9 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
x	p53	compartment	$\text{item} \cdot \text{l}^{-1}$	⊟	⊟
y	Mdm2	compartment	$\text{item} \cdot \text{l}^{-1}$	⊟	⊟
y0	precursor Mdm2	compartment	$\text{item} \cdot \text{l}^{-1}$	⊟	⊟

5 Parameters

This model contains 14 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
beta_x			2.55		☑
psi			1.00		☑
alpha_x			0.00		☑
alpha_xy			3.15		☑
beta_y			0.85		☑
alpha_y			0.60		☑
alpha_0			55.00		☑
fx			0.00		⊟
flag1			0.00		⊟
flag2			0.00		⊟
flag3			1.00		⊟
M			34.00		☑
xmax			0.92		⊟
xmin			0.12		⊟

6 Rule

This is an overview of one rule.

6.1 Rule fx

Rule fx is an assignment rule for parameter fx:

$$\mathrm{fx} = \mathrm{beta\_x} \cdot \mathrm{flag1} + \frac{\mathrm{beta\_x}}{\mathrm{M}} \cdot \mathrm{flag2} + \frac{\mathrm{flag3} \cdot \mathrm{beta\_x}}{\mathrm{M}} \cdot \left(1 + (\mathrm{M} - 1) \cdot \frac{[\mathrm{x}] - \mathrm{xmin}}{\mathrm{xmax} - \mathrm{xmin}}\right) \quad (1)$$

7 Events

This is an overview of two events. Each event is initiated whenever its trigger condition switches from false to true. A delay function postpones the effects of an event to a later time point. At the time of execution, an event can assign values to species, parameters or compartments if these are not set to constant.

7.1 Event event_0000001

Trigger condition

$$[\mathrm{x}] \geq \mathrm{xmax} \quad (2)$$

Assignments

$$\text{flag1} = 1 \tag{3}$$
$$\text{flag2} = 0 \tag{4}$$
$$\text{flag3} = 0 \tag{5}$$

7.2 Event event_0000002

Trigger condition

$$[\text{x}] < \text{xmax} \tag{6}$$

Assignments

$$\text{flag1} = 0 \tag{7}$$
$$\text{flag2} = 0 \tag{8}$$
$$\text{flag3} = 1 \tag{9}$$

8 Reactions

This model contains six 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

№	Id	Name	Reaction Equation	SBO
1	R1	p53 production	$\emptyset \longrightarrow x$	
2	R2	Mdm2 independent p53 degradation	$x \longrightarrow \emptyset$	
3	R3	Mdm2 dependent p53 degradation	$x \xrightarrow{y} \emptyset$	
4	R4	p53 dependent Mdm2 precursor production	$\emptyset \xrightarrow{x} y0$	
5	R5	Mdm2 synthesis from precursor	$y0 \longrightarrow y$	
6	R6	Mdm2 degradation	$y \rightleftharpoons \emptyset$	

8.1 Reaction R1

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

Name p53 production

Reaction equation

$$\emptyset \longrightarrow \mathrm{x} \tag{10}$$

Product

Table 6: Properties of each product.

Id	Name	SBO
x	p53	

Kinetic Law

Derived unit contains undeclared units

$$v_1 = \mathrm{vol}\,(\mathrm{compartment}) \cdot \mathrm{fx} \cdot \mathrm{psi} \tag{11}$$

8.2 Reaction R2

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

Name Mdm2 independent p53 degradation

Reaction equation

$$\mathrm{x} \longrightarrow \emptyset \tag{12}$$

Reactant

Table 7: Properties of each reactant.

Id	Name	SBO
x	p53	

Kinetic Law

Derived unit contains undeclared units

$$v_2 = \mathrm{vol}\,(\mathrm{compartment}) \cdot \mathrm{alpha\_x} \cdot [\mathrm{x}] \tag{13}$$

8.3 Reaction R3

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

Name Mdm2 dependent p53 degradation

Reaction equation

$$\mathrm{x} \xrightarrow{\mathrm{y}} \emptyset \tag{14}$$

Reactant

Table 8: Properties of each reactant.

Id	Name	SBO
x	p53	

Modifier

Table 9: Properties of each modifier.

Id	Name	SBO
y	Mdm2	

Kinetic Law

Derived unit contains undeclared units

$$v_3 = \mathrm{vol}\,(\mathrm{compartment}) \cdot \mathrm{alpha\_xy} \cdot [\mathrm{y}] \cdot [\mathrm{x}] \tag{15}$$

8.4 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

$$\emptyset \xrightarrow{\mathrm{x}} \mathrm{y0} \tag{16}$$

Modifier

Table 10: Properties of each modifier.

Id	Name	SBO
x	p53	

Product

Table 11: Properties of each product.

Id	Name	SBO
y0	precursor Mdm2	

Kinetic Law

Derived unit contains undeclared units

$$v_4 = \mathrm{vol}\,(\mathrm{compartment}) \cdot \mathrm{beta\_y} \cdot [\mathrm{x}] \cdot \mathrm{psi} \tag{17}$$

8.5 Reaction R5

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

Name Mdm2 synthesis from precursor

Reaction equation

$$\mathrm{y0} \longrightarrow \mathrm{y} \tag{18}$$

Reactant

Table 12: Properties of each reactant.

Id	Name	SBO
y0	precursor Mdm2	

Product

Table 13: Properties of each product.

Id	Name	SBO
y	Mdm2	

Kinetic Law

Derived unit contains undeclared units

$$v_5 = \mathrm{vol}\,(\mathrm{compartment}) \cdot \mathrm{alpha\_0} \cdot [\mathrm{y0}] \tag{19}$$

8.6 Reaction R6

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

Name Mdm2 degradation

Reaction equation

$$\mathrm{y} \rightleftharpoons \emptyset \tag{20}$$

Reactant

Table 14: Properties of each reactant.

Id	Name	SBO
y	Mdm2	

Kinetic Law

Derived unit contains undeclared units

$$v_6 = \mathrm{vol}\,(\mathrm{compartment}) \cdot \mathrm{alpha\_y} \cdot [\mathrm{y}] \tag{21}$$

9 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.

9.1 Species x

Name p53

Initial concentration $0.28\ \text{item} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in R2, R3 and as a product in R1 and as a modifier in R4).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{x} = v_1 - v_2 - v_3 \tag{22}$$

9.2 Species y

Name Mdm2

Initial concentration $0.73\ \text{item} \cdot \text{l}^{-1}$

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

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{y} = v_5 - v_6 \tag{23}$$

9.3 Species y0

Name precursor Mdm2

Initial concentration $0\ \text{item} \cdot \text{l}^{-1}$

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

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{y0} = v_4 - v_5 \tag{24}$$

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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