SBML Model Report

Model name: "Scheper1999_CircClock"

December 11, 2012

1 General Overview

This is a document in SBML Level 2 Version 1 format. This model was created by Nicolas Le Novre[1] at June 24th 2005 at 12:13 a. m. and last time modified at May 20th 2012 at 12:35 a. m. Table 1 gives 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	4	function definitions	0
global parameters	0	unit definitions	1
rules	0	initial assignments	0

Model Notes

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)

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BioModels Database: An enhanced, curated and annotated resource for published quantitative kinetic models. BMC Syst Biol., 4:92.

Model Annotation

The following resources provide further information about this model:
This model is urn:miriam:biomodels.db:BIOMD0000000024.
This model is urn:miriam:biomodels.db:MODEL6618241436.
This model is described by urn:miriam:pubmed:9870936.
This biological entity has something to do with:

- urn:miriam:taxonomy:10036.
- urn:miriam:taxonomy:7227.

This biological entity is a version of urn:miriam:obo.go:GO%3A0007623.
This biological entity is urn:miriam:kegg.pathway:dme04710.

2 Unit Definitions

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

2.1 Unit time

Definition 3600 s

2.2 Unit substance

Notes Mole is the predefined SBML unit for substance.

Definition mol

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_0000004	cytoplasm		3	10^{-15}	l	☑	

3.1 Compartment compartment_0000004

This is a three dimensional compartment with a constant size of 10^{-15} litre.

Name cytoplasm

MIRIAM Annotation This biological entity is urn:miriam:obo.go:GO%3A0005737.

4 Species

This model contains three species. The boundary condition of one of these species is set to `true` so that this species' amount cannot be changed by any reaction. Section 6 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
`EmptySet`		`compartment_0000004`	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	☑	☑
`M`	mRNA	`compartment_0000004`	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	☐	☐
`P`	protein	`compartment_0000004`	$\mathrm{mol} \cdot \mathrm{l}^{-1}$	☐	☐

5 Reactions

This model contains four 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 4: Overview of all reactions

№	Id	Name	Reaction Equation	SBO
1	TC	mRNA production	EmptySet $\xrightarrow{P}$ M	
2	TL	protein production	EmptySet $\xrightarrow{M}$ P	
3	Md	messenger degradation	M $\longrightarrow$ EmptySet	
4	Pd	protein degradation	P $\longrightarrow$ EmptySet	

5.1 Reaction TC

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Name mRNA production

MIRIAM Annotation This biological entity is a version of urn:miriam:obo.go:GO%3A0009299.

Reaction equation

$$\text{EmptySet} \xrightarrow{\text{P}} \text{M} \tag{1}$$

Reactant

Table 5: Properties of each reactant.

Id	Name	SBO
EmptySet		

Modifier

Table 6: Properties of each modifier.

Id	Name	SBO
P	protein	

Product

Table 7: Properties of each product.

Id	Name	SBO
M	mRNA	

Kinetic Law

Derived unit contains undeclared units

$$v_1 = \text{vol}\left(\text{compartment\_0000004}\right) \cdot \frac{\text{rM}}{1 + \left(\frac{[\text{P}]}{\text{k}}\right)^{\text{n}}} \tag{2}$$

Table 8: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
rM			1.0		☑
k			1.0		☑
n			2.0		☑

5.2 Reaction TL

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

Name protein production

MIRIAM Annotation This biological entity is a version of urn:miriam:obo.go:GO%3A0006412.

Reaction equation

$$\text{EmptySet} \xrightarrow{\text{M}} \text{P} \tag{3}$$

Reactant

Table 9: Properties of each reactant.

Id	Name	SBO
EmptySet		

Modifier

Table 10: Properties of each modifier.

Id	Name	SBO
M	mRNA	

Product

Table 11: Properties of each product.

Id	Name	SBO
P	protein	

Kinetic Law

Derived unit contains undeclared units

$$v_2 = \mathrm{vol}\,(\mathrm{compartment\_0000004}) \cdot \mathrm{rP} \cdot (\mathrm{delay})^{\mathrm{m}} \tag{4}$$

Table 12: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
rP			1.0		☑
m			3.0		☑
parameter_0000009	tau		4.0		☑

5.3 Reaction Md

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

Name messenger degradation

MIRIAM Annotation This biological entity is a version of urn:miriam:obo.go:GO%3A0006402.

Reaction equation

$$\mathrm{M} \longrightarrow \mathrm{EmptySet} \tag{5}$$

Reactant

Table 13: Properties of each reactant.

Id	Name	SBO
M	mRNA	

Product

Table 14: Properties of each product.

Id	Name	SBO
EmptySet		

Kinetic Law

Derived unit contains undeclared units

$$v_3 = \mathrm{vol}\,(\mathrm{compartment\_0000004}) \cdot \mathrm{qM} \cdot [\mathrm{M}] \tag{6}$$

Table 15: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
qM			0.21		☑

5.4 Reaction Pd

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

Name protein degradation

MIRIAM Annotation This biological entity is a version of urn:miriam:obo.go:GO%3A0030163.

Reaction equation

$$\mathrm{P} \longrightarrow \mathrm{EmptySet} \tag{7}$$

Reactant

Table 16: Properties of each reactant.

Id	Name	SBO
P	protein	

Product

Table 17: Properties of each product.

Id	Name	SBO
EmptySet		

Kinetic Law

Derived unit contains undeclared units

$$v_4 = \mathrm{vol}\,(\mathrm{compartment\_0000004}) \cdot \mathrm{qP} \cdot [\mathrm{P}] \tag{8}$$

Table 18: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
qP			0.21		☑

6 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.

6.1 Species `EmptySet`

Initial amount 0 mol

This species takes part in four reactions (as a reactant in `TC`, `TL` and as a product in `Md`, `Pd`), which do not influence its rate of change because this constant species is on the boundary of the reaction system:

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{EmptySet} = 0 \tag{9}$$

6.2 Species `M`

Name mRNA

MIRIAM Annotation This biological entity is a version of:

- `urn:miriam:obo.chebi:CHEBI%3A33699`.
- `urn:miriam:kegg.compound:C00046`.

Initial amount 10^{-15} mol

This species takes part in three reactions (as a reactant in `Md` and as a product in `TC` and as a modifier in `TL`).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{M} = v_1 - v_3 \tag{10}$$

6.3 Species P

Name protein

MIRIAM Annotation This biological entity is urn:miriam:kegg.compound:C00017.

Initial amount 10^{-15} mol

This species takes part in three reactions (as a reactant in Pd and as a product in TL and as a modifier in TC).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{P} = v_2 - v_4 \tag{11}$$

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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