

Heidelberger Institut für
Theoretische Studien



Upload of Kinetic Data into SABIO-RK via SBML

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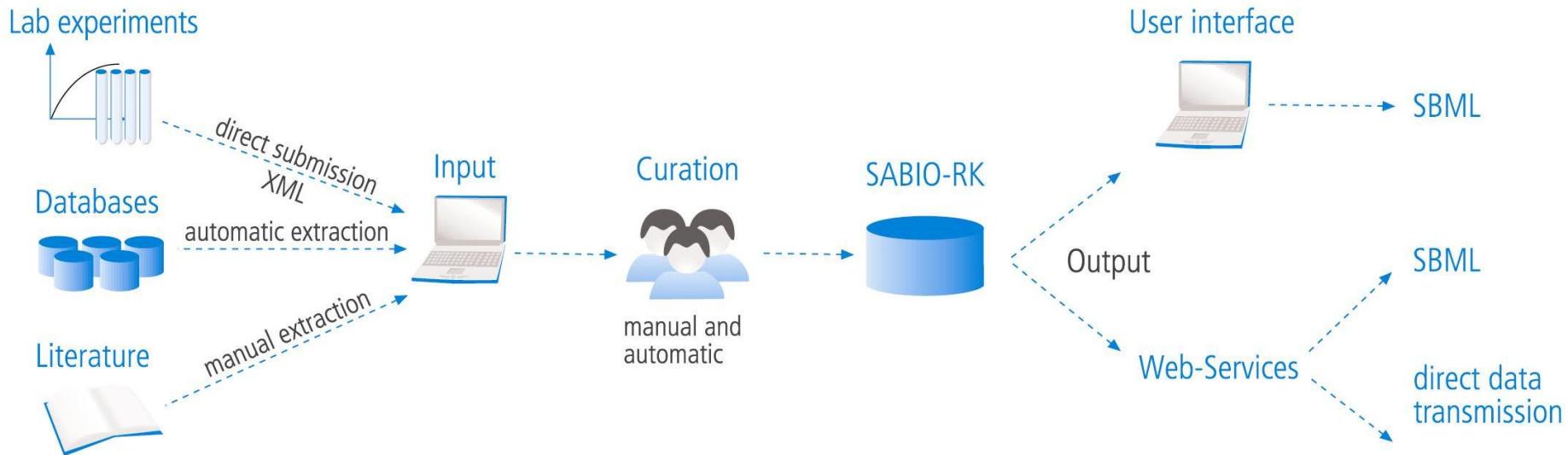
COMBINE 2014, Los Angeles, August 18-22



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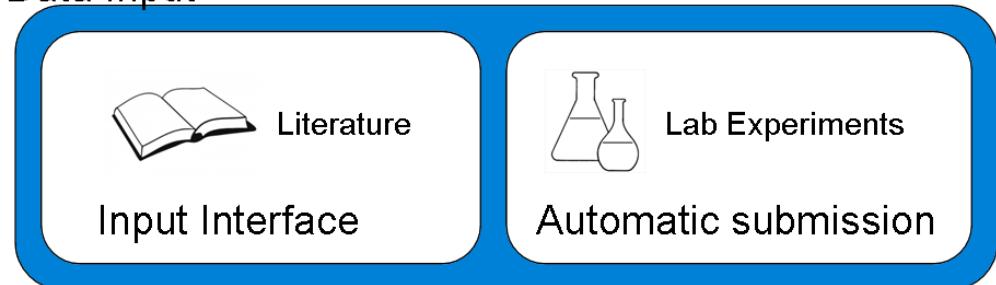
Database Population and Access



- Kinetic data from **literature** and directly from **experiments** merged with data describing biochemical reactions and pathways from **other resources**
- Data about **metabolic** and **signalling** reactions, as well as **reaction mechanisms**
- Data is unified, structured, normalized, interrelated and annotated
- Access through a web-based **user interface** and through **web-services (API)**
- Proprietary levels can be defined to restrict access to sensitive data
- Data export possible in spreadsheet and standard formats (**SBML & BIOPAX**)

Database for Reaction Kinetics

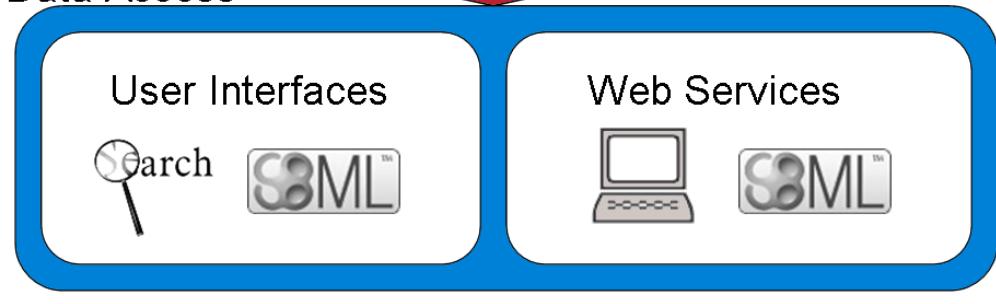
Data Input



Curation /Annotation



Data Access



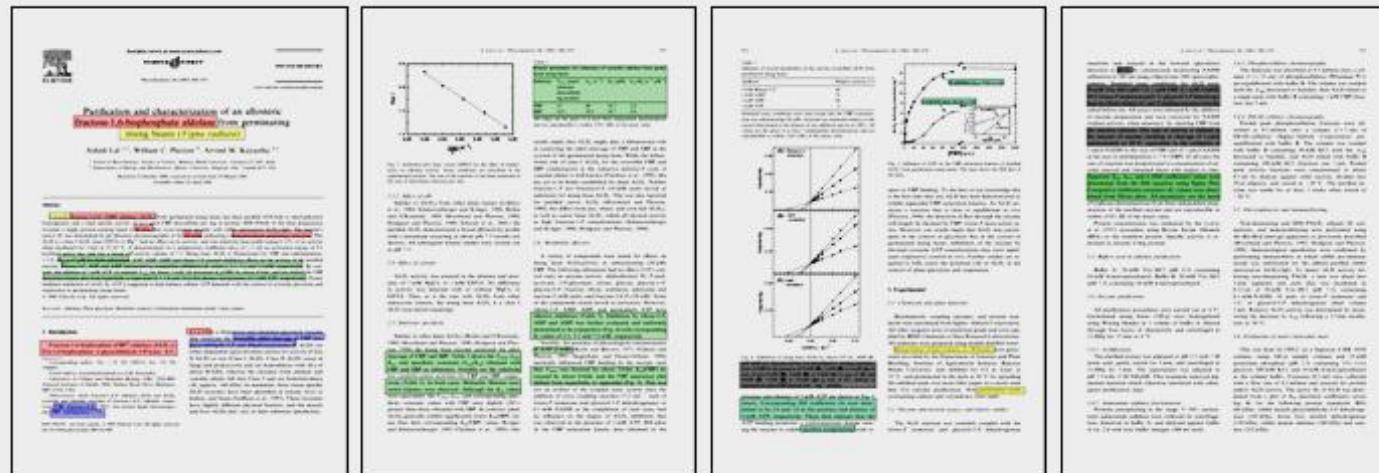
SABIO-RK

<http://sabiork.h-its.org>

Biochemical reaction kinetics

Data is

- Unified
- Structured
- Curated
- Normalized
- Interrelated
- Annotated

A

B

Kinetic Data Available for Reaction:

D-Fructose 1,6-bisphosphate <=> D-Glyceraldehyde 3-phosphate + Glycerone phosphate

SABIO-RK

Entry Nr. 34171

Organism: **Vigna radiata (strain cv. Wilczek)**

Tissue: **germinating seed**

EC Class: **4.1.2.13** wildtype

Substrates: name location comment
D-Fructose 1,6-bisphosphate

Products: name location comment
D-Glyceraldehyde 3-phosphate
Glycerone phosphate

Modifiers: name location effect comment protein complex
Fructose-biphosphate aldolase (enzyme) Modifies-Catalysis (ALD2)*4

Enzyme (protein data): UniProt ID: name mol. weight (kDa) deviation (kDa)
subunit: - - -
complex: - - 160.0 -

Kinetic Law: type formula
Michaelis-Menten $V_{max} \cdot S / (K_m + S)$

Parameters: name type species start val. end val. deviat. unit comment
Km Km D-Fructose 1,6-bisphosphate 16.7 - - μM -
S concentration D-Fructose 1,6-bisphosphate 0 1 - mM -
Vmax Vmax - - - μmol/(l·min·mg⁻¹)
Kcat Kcat - - - s⁻¹ -
kcat/Kcat/Km D-Fructose 1,6-bisphosphate 2.4 - - μM⁻¹·s⁻¹·mg⁻¹

Added Value:

- Clean
 - Standardized
 - Coherent
 - Interlinked
- High quality data

- Protein- bzw. Enzymdaten
- Reaktionen und chemische Verbindungen
- kinetische Daten
- experimentelle Bedingungen
- biologische Quelle (Organismus, Gewebe, Zelltyp)



Welcome!

SABIO-RK is a curated database that contains information about biochemical reactions, their kinetic rate equations with parameters and experimental conditions.



SABIO-RK database search

News

[COMBINE & ERASysAPP Tutorial](#)

18-06-2014

SABIO-RK at the tutorial "Modelling and Simulation of Biological Models" on Sunday, September 14th, 2014 at the ICSB in Melbourne [more>>](#)

[STRENDA Special Issue](#)

16-06-2014

Special Issue: Reporting Enzymology Data – STRENDA Recommendations and Beyond – a highly educational, open access collection of 14 articles [more>>](#)

<http://sabiork.h-its.org>



Search

Organism:"mammalia (NCBI)" AND Tissue:"liver (BTO)" NOT
UniprotID:P00637 AND Substrate:"D-Fructose 1,6-bisphosphate"



Reset



▼ Advanced Search

AND Substrate

d-fructo

Add & Search

- [d-fructose, 6-\(dihydrogen phosphate\)](#) (0)
- [d-fructose 6-phosphoric acid](#) (0)
- [d-fructose 2,6-bisphosphate](#) (0)
- [d-fructose 6-phosphate](#) (0)
- [d-fructose](#) (0)

[Entry View](#)

[Reaction View](#)

Filter Options

Enzyme

Wildtype Mutant Recombinant

Kinetic Data

Rate Equation

Environmental Conditions

pH: 0 - 14

Temperature: -10 C° - 115 C°

Source

Direct Submission

Journal

Entries inserted since:

15/10/2008



Total number of kinetic law entries found: 40

1 2 3 Next

display 15 entries per page

Kinetic data	Reaction	Enzyme			Tissue	Organism	Parameter (besides concentration)	Environment		Add to export cart?
		ECNumber	Protein	Variant				°C	pH	
	D-Fructose 1,6-bisphosphate + H ₂ O = D-Fructose 6-phosphate + Orthophosphate	3.1.3.11	Q9N0J6	wildtype	liver	<i>Oryctolagus cuniculus</i>	Kd Km Vmax	25.0	9.5	<input type="checkbox"/>
	H ₂ O + D-Fructose 1,6-bisphosphate =	3.1.3.11	Q3SZB7	wildtype	liver	<i>Bos taurus</i>	Km Vmax	28.0	6.5	<input type="checkbox"/>

D-Fructose 1,6-bisphosphate = Glycerone phosphate + D-Glyceraldehyde 3-phosphate	4.1.2.13	P05062 ↗	wildtype aldolase B	liver ↗	Homo sapiens	Vmax Km	22.0	7.6	<input checked="" type="checkbox"/>
--	----------	--------------------------	------------------------	-------------------------	-----------------	------------	------	-----	-------------------------------------

Entry ID: 2175

General information

Organism	Homo sapiens		
Tissue	liver ↗		
EC Class	4.1.2.13		
SABIO reaction id	1338		
Variant	wildtype aldolase B		
Recombinant	expressed in Escherichia coli BL21(DE3)		

Substrates

name	location	comment
D-Fructose 1,6-bisphosphate	-	-

Products

name	location	comment
Glycerone phosphate	-	-
D-Glyceraldehyde 3-phosphate	-	-

Modifiers

name	location	effect	comment	protein complex
fructose-bisphosphate aldolase(Enzyme)	-	Modifier-Catalyst	-	(P05062 ↗)*4;

Enzyme (protein data)

	UniProt-ID	name	mol. weight (kDa)	deviation (kDa)
subunit	P05062	-	-	-
complex	-	-	-	-

Kinetic Law

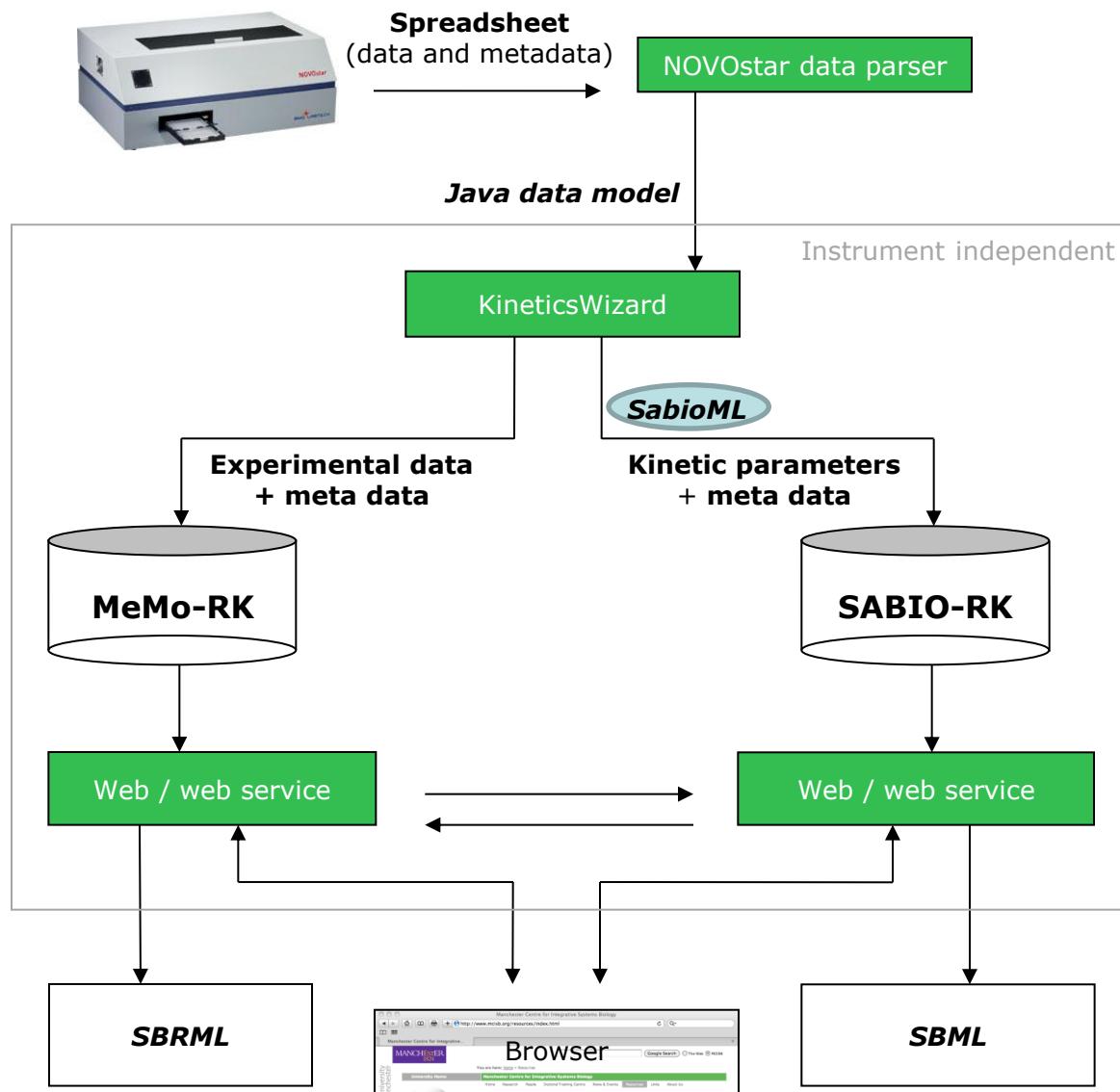
type	formula
Michaelis-Menten	Vmax*S/(Km+S)

Parameter

name	type	species	start val.	end val.	deviat.	unit	comment
S	concentration	D-Fructose 1,6-bisphosphate	-	-	-	-	--
Km	Km	D-Fructose 1,6-bisphosphate	4.0	-	0.6	μM	-

Substrates											
name			location		comment						
D-Fructose 1,6-bisphosphate			-		-						
Products											
name			location		comment						
Glycerone phosphate			-		-						
D-Glyceraldehyde 3-phosphate			-		-						
Modifiers											
name		location	effect	comment	protein complex						
fructose-bisphosphate aldolase(Enzyme)		-	Modifier-Catalyst	-	(P05062 ↗)*4;						
Enzyme (protein data)											
	UniProt-ID	name	mol. weight (kDa)	deviation (kDa)							
subunit	P05062	-		-							
complex	-	-		-							
Kinetic Law											
type			formula								
Michaelis-Menten			$V_{max} \cdot S / (K_m + S)$								
Parameter											
name	type	species	start val.	end val.	deviat.	unit					
S	concentration	D-Fructose 1,6-bisphosphate	-	-	-	-					
Km	Km	D-Fructose 1,6-bisphosphate	4.0	-	0.6	μM					
Vmax	Vmax	-	4.787	-	-	μmol/(min*mg)					
Experimental conditions											
	start value		end value		unit						
temperature	22.0		-		°C						
pH	7.6		-		-						
buffer	50 mM Tris-acetate, 0.15 mM NADH, 10 mM EDTA, 100 mg/ml bovine serum albumin, 2 mg/ml alpha-glycerophosphate dehydrogenase/triose phosphate isomerase										
comment	-										
Reference											
title		author	year	journal	volume	pages					
Expression, purification, and characterization of natural mutants of human aldolase B. Role of quaternary structure in catalysis.		Rellos P, Sygusch J, Cox TM.	2000	J Biol Chem	275	1145-51 10625657 ↗					

Direct Data Submission





Enzyme kinetics informatics: from instrument to browser

Neil Swainston^{1,†}, Martin Golebiewski^{2,†},
Hanen L. Messiha¹, Naglis Malys¹, Renate
Kania², Sylvestre Kengne², Olga Krebs²,
Saqib Mir², Heidrun Sauer-Danzwith²,
Kieran Smallbone¹, Andreas Weidemann²,
Ulrike Wittig², Douglas B. Kell¹, Pedro
Mendes^{1,3}, Wolfgang Müller², Norman W.
Paton¹, Isabel Rojas²

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FEBS

Issue



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3769–3779, September 2010

Additional Information (Show All)

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†*

These authors contributed equally to this work

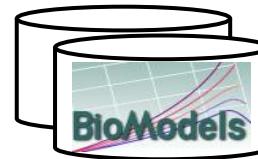


Data Input

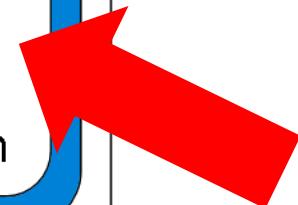


Literature

Input Interface



Automatic submission



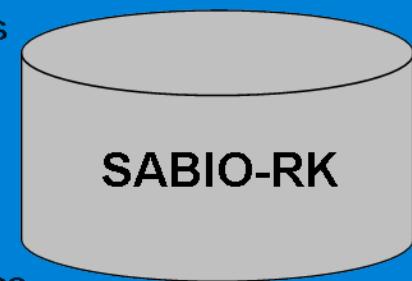
Curation /Annotation



Ontologies



External databases



SABIO-RK



Rights
management



Quality
control

Data Access

User Interfaces



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Reference Publication

Rohwer JM, Botha FC.

Analysis of sucrose accumulation in the sugar cane culm on the basis of in vitro kinetic data.

Biochem. J. 2001 Sep; 358(Pt 2): 437-445

Department of Biochemistry, University of Stellenbosch, Private Bag X1, 7602 Matieland, South Africa. jr@maties.sun.ac.za [\[more\]](#)
Model

Original Model: [BIOMD0000000023.xml.origin](#)

set #1 bqbiol:is [KEGG Pathway map00500](#)

Submitter: [Nicolas Le Novère](#)

set #1 bqbiol:isVersionOf [Gene Ontology sucrose biosynthetic process](#)

Submission ID: MODEL6618063111

set #2 bqbiol:occursIn [Taxonomy Saccharum officinarum](#)

Submission Date: 13 Sep 2005 13:28:04 UTC

Last Modification Date: 20 May 2012 12:43:33 UTC

Creation Date: 03 May 2005 13:08:30 UTC

Encoders: [Jacky L Snoep](#)
Notes

SBML Level 2 code generated for the JWS Online project by Jacky Snoep using [PySCeS](#).

Run this model online at <http://jws.biochem.sun.ac.za>.

To cite JWS Online please refer to: Olivier, B.G. and Snoep, J.L. (2004) [Web-based modelling using JWS Online](#), Bioinformatics, 20:2143-2144.

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SBML:

FREI:

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SABIO-RK SBML upload interface

Kinetic Data Import from Models

Publication entries

Publication ID 4864 (11 entries)

Reference

ID	Title	Authors	Journal	Volume	Pages	Year	PubMed	Type	Identifier	Organization	Responsible Person	Contact Email	Contact Phone	Base Url
4864	Analysis of sucrose accumulation in the sugar cane culm on the basis of in vitro kinetic data.	Rohwer JM, Botha FC.	Biochem J	358(Pt 2)	437-45	2001	11513743	BioModel	MODEL6618063111	Stellenbosch University;	Snoep,Jacky L;	jls@sun.ac.za	null	http://www.ebi.ac.uk/biomodels-main/

General

ID	Organism	Org ID	Strain	Experiment Type	Pathway	Path ID	Mechanism	Tissue	Tiss ID	Comment	Select	Edit
63457	Saccharum officinarum	1541	strain	in silico	Starch and Sucrose metabolism	26	unknown	culm	1476	Bio Model Import	<input type="checkbox"/>	edit
63458	Saccharum officinarum	1541	strain	in silico	Starch and Sucrose metabolism	26	unknown	culm	1476	Bio Model Import	<input type="checkbox"/>	edit
63459	Saccharum officinarum	1541	strain	in silico	Starch and Sucrose metabolism	26	unknown	culm	1476	Bio Model Import	<input type="checkbox"/>	edit
63460	Saccharum officinarum	1541	strain	in silico	Starch and Sucrose metabolism	26	unknown	culm	1476	Bio Model Import	<input type="checkbox"/>	edit
63461	Saccharum officinarum	1541	strain	in silico	Starch and Sucrose metabolism	26	unknown	culm	1476	Bio Model Import	<input type="checkbox"/>	edit
63462	Saccharum officinarum	1541	strain	in silico	Starch and Sucrose metabolism	26	unknown	culm	1476	Bio Model Import	<input type="checkbox"/>	edit
63463	Saccharum officinarum	1541	strain	in silico	Starch and Sucrose metabolism	26	unknown	culm	1476	Bio Model Import	<input type="checkbox"/>	edit
63464	Saccharum officinarum	1541	strain	in silico	Starch and Sucrose metabolism	26	unknown	culm	1476	Bio Model Import	<input type="checkbox"/>	edit
63465	Saccharum officinarum	1541	strain	in silico	Starch and Sucrose metabolism	26	unknown	culm	1476	Bio Model Import	<input type="checkbox"/>	edit
63466	Saccharum officinarum	1541	strain	in silico	Starch and Sucrose metabolism	26	unknown	culm	1476	Bio Model Import	<input type="checkbox"/>	edit
63467	Saccharum officinarum	1541	strain	in silico	Starch and Sucrose metabolism	26	unknown	culm	1476	Bio Model Import	<input type="checkbox"/>	edit

Reaction

ID	Reaction	Reaction ID	Transport	Select	Edit
63457	D-Fructose=D-Fructose	13415	true	<input type="checkbox"/>	edit
63458	D-Glucose=D-Glucose	7002	true	<input type="checkbox"/>	edit
63459	ATP + D-Glucose = D-Glucose 6-phosphate + ADP	793		<input type="checkbox"/>	edit
63460	D-Fructose + ATP = D-Fructose 6-phosphate + ADP	1116		<input type="checkbox"/>	edit
63461	D-Fructose + ATP = D-Fructose 6-phosphate + ADP	1116		<input type="checkbox"/>	edit
63462	D-Fructose 6-phosphate + UDP-D-glucose = UDP + Sucrose 6-phosphate	8678		<input type="checkbox"/>	edit
63463	Sucrose 6-phosphate + H2O = Sucrose + Phosphate	1150		<input type="checkbox"/>	edit
63464	UDP-D-glucose + D-Fructose = Sucrose + UDP	8404		<input type="checkbox"/>	edit
63465	Sucrose + H2O = D-Fructose + D-Glucose	1146		<input type="checkbox"/>	edit
63466	D-Fructose 6-phosphate + ATP = D-Fructose 1,6-bisphosphate + ADP	1113		<input type="checkbox"/>	edit
63467	Sucrose=Sucrose	13123	true	<input type="checkbox"/>	edit

Kinetic Data Import from Models

Kinetic law

ID	Type	Type ID	Kinetic law	Reversible	Select	Edit
63457	Michaelis-Menten with product inhibition	0	vol*Vmax1*Fruex/(Km1Fruex*(1+Fru/Ki1Fru)+Fruex)	reversible	<input type="checkbox"/>	edit
63458	Michaelis-Menten with product inhibition	0	vol*Vmax2*Glcex/(Km2Glcex*(1+Glc/Ki2Glc)+Glcex)	reversible	<input type="checkbox"/>	edit
63459	irreversible random Bi	0	vol*Vmax3*Glc/Km3Glc*ATP/Km3ATP(((1+ATP/Km3ATP)*(1+Glc/Km3Glc+Fru/Km4Fru+0.113*HexP/Ki3G6P+0.0575*HexP/Ki4F6P))	reversible	<input type="checkbox"/>	edit
63460	irreversible random Bi	0	vol*Vmax4*Fru/Km4Fru*ATP/Km4ATP(((1+ATP/Km4ATP)*(1+Glc/Km3Glc+Fru/Km4Fru+0.113*HexP/Ki3G6P+0.0575*HexP/Ki4F6P))	reversible	<input type="checkbox"/>	edit
63461	irreversible random Bi	0	vol*Vmax5/(1+Fru/Ki5Fru)*Fru/Km5Fru*ATP/Km5ATP/(1+Fru/Km5Fru+ATP/Km5ATP+Fru*ATP/(Km5Fru*Km5ATP)+ADP/Ki5ADP)	reversible	<input type="checkbox"/>	edit
63462	reversible ordered Bi	0	vol*Vmax6*(0.0575*HexP*0.8231*HexP-Suc6P*UDP/Keq6)/(0.0575*HexP*0.8231*HexP*(1+Suc6P/Ki6Suc6P)+Km6F6P*(1+phos/Ki6Pi))*(0.8231*HexP+Ki6UDPGlc)+Km6UDPGlc*0.0575*HexP+Vmax6f/(Vmax6f*Keq6)*(Km6UDPGlc*Suc6P*(1+0.8231*HexP/Ki6UDPGlc)+UDP*(Km6Suc6P*(1+0.0575*HexP/Ki6Pi))+Suc6P*(1+0.0575*HexP/Ki6F6P)))	reversible	<input type="checkbox"/>	edit
63463	Michaelis-Menten	23	vol*Vmax7*Suc6P/(Km7Suc6P+Suc6P)	reversible	<input type="checkbox"/>	edit
63464	reversible ordered Bi	0	vol*(-Vmax8f)*(Suc*UDP-Fru*0.8231*HexP/Keq8)/(Suc*UDP*(1+Fru/Ki8Fru)+Km8Suc*(UDP+Ki8UDP)+Km8UDP*Suc+Vmax8f/(Vmax8f*Keq8)*(Km8UDPGlc*Fru*(1+UDP/Ki8UDP)+0.8231*HexP*(Km8Fru*(1+Km8UDP*Suc/(Ki8UDP/Km8Suc))+Fru*(1+Suc/Ki8Suc))))	reversible	<input type="checkbox"/>	edit
63465	Michaelis-Menten with product inhibition	0	vol*Vmax9/(1+Glc/Ki9Glc)*Suc/(Km9Suc*(1+Fru/Ki9Fru)+Suc)	reversible	<input type="checkbox"/>	edit
63466	Michaelis-Menten	23	vol*Vmax10*0.0575*HexP/(Km10F6P+0.0575*HexP)	reversible	<input type="checkbox"/>	edit
63467	Michaelis-Menten	23	vol*Vmax11*Suc/(Km11Suc+Suc)	reversible	<input type="checkbox"/>	edit

Variables

ID	Name	Term	Not replaced	Comment	Edit
----	------	------	--------------	---------	------

Parameter

ID	Name	Role	Type	Compound	Start	End	Deviation	Unit	Comment	Select	Edit
63457	vol	Constant	volume		1			l		<input type="checkbox"/>	edit
63457	Vmax1	Constant	Vmax		0.286			mM/min		<input type="checkbox"/>	edit
63457	Fruex	Variable	concentration	D-Fructose	5.0			mM		<input type="checkbox"/>	edit
63457	Km1Fruex	Constant	Km	D-Fructose	0.2			mM		<input type="checkbox"/>	edit
63457	Fru	Variable	concentration	D-Fructose	1.0			mM		<input type="checkbox"/>	edit
63457	Ki1Fru	Constant	Km	D-Fructose	1.0			mM	competitive	<input type="checkbox"/>	edit
63458	vol	Constant	volume		1			l		<input type="checkbox"/>	edit
63458	Vmax2	Constant	Vmax		0.286			mM/min		<input type="checkbox"/>	edit
63458	Glcex	Variable	concentration	D-Glucose	5.0			mM		<input type="checkbox"/>	edit
63458	Km2Glcex	Constant	Km	D-Glucose	0.2			mM		<input type="checkbox"/>	edit
63458	Glc	Variable	concentration	D-Glucose	1.0			mM		<input type="checkbox"/>	edit
63458	Ki2Glc	Constant	Km	D-Glucose	1.0			mM	competitive	<input type="checkbox"/>	edit
63459	vol	Constant	volume		1			l		<input type="checkbox"/>	edit
63459	Vmax3	Constant	Vmax		0.197			mM/min		<input type="checkbox"/>	edit
63459	Glc	Variable	concentration	D-Glucose	1.0			mM		<input type="checkbox"/>	edit
63459	Km3Glc	Constant	Km	D-Glucose	0.07			mM		<input type="checkbox"/>	edit
63459	ATP	Variable	concentration	ATP	1.0			mM		<input type="checkbox"/>	edit

Kinetic Data Import from Models

Edit entry

Publication ID: 4864 Entry ID: 63463

Pathway		Starch and Sucrose metabolism		26									
Reaction		Sucrose 6-phosphate + H ₂ O = Sucrose + Phosphate		1150	Transport:	<input type="checkbox"/>	Reverse reaction						
Compounds													
Stoich.	Name	Name Abbr./Synonym Name	Role	Cell. location	Loc. ID	Complex Protein		Comment	Comp. ID				
1	Enzyme		Modifier-Catalyst	cytoplasm	54	Protein Identifier	Protein Name						
1	Sucrose 6-phosphate		Substrate	cytoplasm	54				1373				
1	Sucrose		Product	cytoplasm	54			-	1294				
1	Phosphate		Product	cytoplasm	54			-	36				
1	H ₂ O		Substrate unknown Substrate Product Modifier-unknown Modifier-Activator Modifier-Inhibitor Modifier-Catalyst Modifier-Cofactor	cytoplasm	54				40				
<input type="button" value="add species row"/> <input type="button" value="add 5 species rows"/>													
<input type="button" value="search compounds"/> <input type="button" value="search reactions"/> <input type="button" value="search locations"/>													
Enter compound(s): <input type="text"/> <input type="button" value="search compounds"/> Choose location: <input type="button" value="Please Select"/> <input type="button" value="search locations"/> Choose pathway: <input type="button" value="Please Select"/>													
<input type="button" value="clear reaction fields"/>													

Signalling event (reaction_based)

Event Description:

Event type(s)

Event type ID

Event type description

Event type annotation (GO)

SABIO-RK curation interface: Data entry editing

Kinetic Data Import from Models

Kinetic law											
Type	Michaelis-Menten				23						
Formula	vol*Vmax7*Suc6P/(Km7Suc6P+Suc6P)				reversible						
Variables											
Name	Term		Do not replace variable in formula				Comment				
			<input type="checkbox"/>								
Parameter											
Name	Role	Type	Species	Value start	Value end	Deviation	Unit	Unit ID	Unit def.	Comment	
vol	Constant ▾	volume		1			l	64	-		
Vmax7	Constant ▾	Vmax		0.5			mM/min	11	-		
Suc6P	Variable ▾	concentration	Sucrose 6-phosphate	1.0			mM	29	-		
Km7Suc6P	Constant ▾	Km	Sucrose 6-phosphate	0.1			mM	29	-		
	unknown ▾	area bimolecular rate constant concentration EC50 enz. activity forward bimolecular rate constant forward rate constant forward unimolecular rate constant half-life Hill coefficient Hill constant IC50 kcat kcat/Km kcat/S_half Kd Keq Ki kinact						null	-		
Choose kinetic law type: <input type="button" value="Please Select"/> <input type="button" value="add variable row"/> <input type="button" value="add parameter row"/> <input type="button" value="add 10 parameter rows"/> <input type="button" value="clear kinetic law fields"/>											
Enzyme description											
Complex information (UniProtID)		Q4FCW1									
Complex information (names)		(enter complex information separated by semicolon)									
EC number											
Protein		wildtype	Recombinant <input type="checkbox"/>		Expressed in						
Stoeh.	Name	UniProt ID			Mol. weight (kDa)	Deviation (kDa)					
	native complex	Q4FCW1									
1											
<input type="button" value="add row"/> <input type="button" value="add 5 rows"/> <input type="button" value="clear enzyme description fields"/>											

Experimental conditions				
pH	Temperature (°C)		Buffer	
Start	End	Start	End	Composition



Search

🔍
Reset
?

Advanced Search

OR
PubMedID

Add & Search

Filter Options

Enzyme
 Wildtype Mutant Recombinant

Kinetic Data
 Rate Equation

Reaction
 Transport Reaction

Environmental Conditions

pH: **0 - 14**

Temperature: **-10 C° - 115 C°**

Source
 Direct Submission

 Publication

 BioModel

 Entries inserted since:

14/10/2008



SABIO-RK public user interface

[Entry View](#) [Reaction View](#) [Visual Search \(beta\)](#)

 Total number of kinetic law entries found: **11**

 display **15** entries per page

Kinetic data	Reaction	Enzyme			Tissue	Organism	Parameter (besides concentration)	Environment		Add to export cart?
		ECNumber	Protein	Variant				°C	pH	
▶	D-Fructose = D-Fructose	-		wildtype	stem ↗	Saccharum officinarum	Km Vmax Volume			<input type="checkbox"/>
▶	D-Glucose = D-Glucose	-		wildtype	stem ↗	Saccharum officinarum	Km Vmax Volume			<input type="checkbox"/>

Kinetic Data Import from Models

	UDP-D-glucose + D-Fructose 6-phosphate = UDP + Sucrose 6-phosphate	2.4.1.14	wildtype	stem ↗	Saccharum officinarum	Keq Ki Km Vmax Volume		
	H2O + Sucrose 6-phosphate = Sucrose + Phosphate	3.1.3.24	Q4FCW1 ↗	wildtype	stem ↗	Saccharum officinarum	Km Vmax Volume	

Entry ID: 49364

General information

Organism	Saccharum officinarum
Tissue	stem ↗
EC Class	3.1.3.24
SABIO reaction id	1150
Variant	wildtype
Experiment Type	in silico
Pathways	Starch and Sucrose metabolism
Event Description	-

Substrates

name	location	comment
H2O	cytoplasm ↗	-
Sucrose 6-phosphate	cytoplasm ↗	-

Products

name	location	comment
Sucrose	cytoplasm ↗	-
Phosphate	cytoplasm ↗	-

Modifiers

name	location	effect	comment	protein complex
sucrose-phosphate phosphatase(Enzyme)	cytoplasm ↗	Modifier-Catalyst	-	Q4FCW1 ↗

Kinetic Data Import from Models

Modifiers					
name		location	effect	comment	protein complex
sucrose-phosphate phosphatase(Enzyme)		cytoplasm	Modifier-Catalyst	-	Q4FCW1
Enzyme (protein data)					
	UniProtKB_AC	name	mol. weight (kDa)	deviation (kDa)	
subunit	-	-		-	-
complex	-	-		-	-
Kinetic Law					
type	formula			annotation	
Michaelis-Menten	vol*Vmax7*Suc6P/(Km7Suc6P+Suc6P)			SBO:0000029	
Parameter					
name	type	species	start val.	end val.	deviat.
Suc6P	concentration	Sucrose 6-phosphate	1.0	-	-
Km7Suc6P	Km	Sucrose 6-phosphate	0.1	-	-
Vmax7	Vmax	-	0.5	-	-
vol	volume	-	1.0	-	-
General comment					
Bio Model Import					
Reference					
title	author	year	data identifier		
Analysis of sucrose accumulation in the sugar cane culm on the basis of in vitro kinetic data.	Rohwer JM, Botha FC.	2001	MODEL6618063111		

 UDP-D-glucose + D-Fructose = UDP + Sucrose	2.4.1.13	Q9LKR0	wildtype	<u>stem</u>	Saccharum officinarum	Keq					
						Ki					
						Km					
						Vmax					
						Volume					
						...					

Data Export: Spreadsheets



SABIO-RK

Biochemical Reaction Kinetics Database

Login | Contact

Entries to Export: 5 

Home Search Web Services News Documentation Publications Statistics Links About

Selected kinetics data

Entry ID	Selected Reaction	Organism	Tissue	Kinetic law type	View details	Remove entry (Select all: <input type="checkbox"/>)
49364	$H_2O + Sucrose\ 6-phosphate \leftrightarrow Phosphate + Sucrose$	Saccharum officinarum	stem	Michaelis-Menten	view	<input type="checkbox"/>
49363	$UDP-D-glucose + D-Fructose\ 6-phosphate \leftrightarrow UDP + Sucrose\ 6-phosphate$	Saccharum officinarum	stem	reversible ordered Bi	view	<input type="checkbox"/>
12527	$H_2O + Sucrose\ 6-phosphate \leftrightarrow \alpha-D-Glucose\ 6-phosphate + \beta-D-Fructose$	Lactococcus lactis subsp. lactis	-	Michaelis-Menten	view	<input type="checkbox"/>
18577	$\alpha-D-Glucose\ 1-phosphate \leftrightarrow \alpha-D-Glucose\ 6-phosphate$	Lactococcus lactis subsp. cremoris	-	Michaelis-Menten	view	<input type="checkbox"/>
3460	$D-Glucose\ 1-phosphate \leftrightarrow \alpha-D-Glucose\ 6-phosphate$	Rattus norvegicus	heart	Michaelis-Menten	view	<input type="checkbox"/>

[remove selected Reactions](#)

SABIO-RK public user interface

[Back to Results](#)

[Write spreadsheet](#)

[Write SBML](#)

[Write BioPAX](#)



Data Export: Spreadsheets

Save Excelsheet

Select Columns to Export

	Add all	5 items selected	Remove all	
ReggReactionID	+	EntryID	-	
KineticMechanism	+	Reaction	-	
Other Modifier	+	Organism	-	
Pathway	+	Rate Equation	-	
Product	+	Parameter	-	
PubMedID	+			
Publication	+			
SabioReactionID	+			
Substrate	+			

Export Distinct Rows Only

[Export xls](#) [Export tsv](#) [Reset](#)

[Back to Results](#)

SABIO-RK public user interface

Preview of the first 5 entries

Sabio Excel Export Preview						
A	B	C	D	E	F	G
1 EntryID	Reaction	Organism	Rate Equation	parameter.type	parameter.asso...	parameter.sta...
2 49363	UDP-D-glucose ...	Saccharum offic...	vol*Vmax6f*(0.0...	Km	Sucrose 6-phos...	1.0E-4
3 49363	UDP-D-glucose ...	Saccharum offic...	vol*Vmax6f*(0.0...	concentration	D-Fructose 6-p...	0.001
4 49363	UDP-D-glucose ...	Saccharum offic...	vol*Vmax6f*(0.0...	Keq		10.0
5 49363	UDP-D-glucose ...	Saccharum offic...	vol*Vmax6f*(0.0...	Ki	Sucrose 6-phos...	7.0E-5
6 49363	UDP-D-glucose ...	Saccharum offic...	vol*Vmax6f*(0.0...	Km	UDP	3.0E-4
7 49363	UDP-D-glucose ...	Saccharum offic...	vol*Vmax6f*(0.0...	Km	UDP-D-glucose	0.0018
8 49363	UDP-D-glucose ...	Saccharum offic...	vol*Vmax6f*(0.0...	concentration	UDP	2.0E-4
9 49363	UDP-D-glucose ...	Saccharum offic...	vol*Vmax6f*(0.0...	Ki	Phosphate	0.003
10 49363	UDP-D-glucose ...	Saccharum offic...	vol*Vmax6f*(0.0...	Km	D-Fructose 6-p...	6.0E-4



Data Export: Spreadsheets



**Selected kinetics data**

Entry ID	Selected Reaction	Organism	Tissue	Kinetic law type	View details	Remove entry (Select all: <input checked="" type="checkbox"/>)
49364	$H_2O + Sucrose\ 6-phosphate \leftrightarrow Phosphate + Sucrose$	<i>Saccharum officinarum</i>	stem	Michaelis-Menten	view	<input type="checkbox"/>
49363	$UDP-D-glucose + D-Fructose\ 6-phosphate \leftrightarrow UDP + Sucrose\ 6-phosphate$	<i>Saccharum officinarum</i>	stem	reversible ordered Bi	view	<input type="checkbox"/>
12527	$H_2O + Sucrose\ 6-phosphate \leftrightarrow \alpha-D-Glucose\ 6-phosphate + \beta-D-Fructose$	<i>Lactococcus lactis</i> subsp. <i>lactis</i>	-	Michaelis-Menten	view	<input type="checkbox"/>
18577	$\alpha-D-Glucose\ 1-phosphate \leftrightarrow \alpha-D-Glucose\ 6-phosphate$	<i>Lactococcus lactis</i> subsp. <i>cremoris</i>	-	Michaelis-Menten	view	<input type="checkbox"/>
3460	$D-Glucose\ 1-phosphate \leftrightarrow \alpha-D-Glucose\ 6-phosphate$	<i>Rattus norvegicus</i>	heart	Michaelis-Menten	view	<input type="checkbox"/>

[remove selected Reactions](#)[Back to Results](#)[Write spreadsheet](#)[Write SBML](#)[Write BioPAX](#)



Save Model

Enter name of model: SBML level 3, version 1 ▾

Export parameters normalized to SI base units

Choose the annotation schema *:

- identifier.org ▾
- identifier.org**
- Miriam URI

Save Model on Disk as SBML

Save Model on Disk as PDF

Back to Results



* For details please refer to <http://identifiers.org/> or http://co.mbine.org/standards/miriam_uris.

This model has been created with the help of the SABIO-RK Database
(<http://sabio.h-its.org/>)
(c) 2005-2014 HITS gGmbH <http://www.h-its.org>

</p>

To cite SABIO-RK Database, please use
["http://www.ncbi.nlm.nih.gov/pubmed/22102587"](http://www.ncbi.nlm.nih.gov/pubmed/22102587)

SABIO-RK - database for biochemical reaction kinetics. Wittig U, Kania R, Golebiewski M,
Rey M, Shi L, Jong L, Algaia E, Weidemann A, Sauer-Danzwith H, Mir S, Krebs O, Bittkowski
M, Wetsch E, Rojas I, Mueller W. Nucleic Acids Res. 2012;40(Database issue):790-6
</body></notes>

```
<listOfFunctionDefinitions>
<functionDefinition id="KL_49364" sboTerm="SBO:0000029">
  <math xmlns="http://www.w3.org/1998/Math/MathML">
    <lambda>
      <bvar>
        <ci> Km7Suc6P </ci>
      </bvar>
      <bvar>
        <ci> Suc6P </ci>
      </bvar>
      <bvar>
        <ci> vol </ci>
      </bvar>
      <bvar>
        <ci> Vmax7 </ci>
      </bvar>
      <apply>
        <divide/>
        <apply>
          <times/>
          <apply>
            <times/>
            <ci> vol </ci>
            <ci> Vmax7 </ci>
          </apply>
          <ci> Suc6P </ci>
        </apply>
        <apply>
          <plus/>
          <ci> Km7Suc6P </ci>
          <ci> Suc6P </ci>
        </apply>
      </lambda>
    </math>
  </functionDefinition>
</listOfFunctionDefinitions>
```

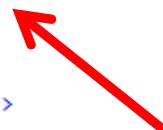


Kinetic Rate Equations

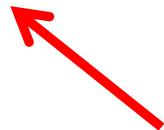
```

</listOfFunctionDefinitions>
<listOfUnitDefinitions>
  <unitDefinition id="M" name="M">
    <listOfUnits>
      <unit scale="0" exponent="-1" multiplier="1" kind="litre"/>
      <unit scale="0" exponent="1" multiplier="1" kind="mole"/>
    </listOfUnits>
  </unitDefinition>
  <unitDefinition id="molswedgeonegwedgeone" name="mol*s^(-1)*g^(-1)">
    <listOfUnits>
      <unit scale="0" exponent="1" multiplier="1" kind="mole"/>
      <unit scale="0" exponent="-1" multiplier="1" kind="second"/>
      <unit scale="0" exponent="-1" multiplier="1" kind="gram"/>
    </listOfUnits>
  </unitDefinition>
</listOfUnitDefinitions>
<listOfCompartments>
  <compartment id="compart_Cell" constant="true" name="Cell"/>
</listOfCompartments>
<listOfSpecies>
  <species id="SPC_1465_Cell" initialConcentration="1" constant="false" hasOnlySubstanceUnits="false" name="D-Fructose 1,6-bisphosphate"
metaid="META_SPC_1465_Cell" boundaryCondition="false" compartment="compart_Cell">
    <annotation>
      <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns:bqbiol="http://biomodels.net/biology-qualifiers/"
      xmlns:bqmodel="http://biomodels.net/model-qualifiers/">
        <rdf:Description rdf:about="#META_SPC_1465_Cell">
          <bqbiol:is>
            <rdf:Bag>
              <rdf:li rdf:resource="urn:miriam:obo.chebi:16905"/>
              <rdf:li rdf:resource="urn:miriam:obo.chebi:37736"/>
              <rdf:li rdf:resource="urn:miriam:kegg.compound:C00354"/>
            </rdf:Bag>
          </bqbiol:is>
        </rdf:Description>
      </rdf:RDF>
    </annotation>
  </species>
  <species id="SPC_27_Cell" initialConcentration="1" constant="false" hasOnlySubstanceUnits="false" name="D-Glyceraldehyde 3-phosphate"
metaid="META_SPC_27_Cell" boundaryCondition="false" compartment="compart_Cell">
    <annotation>
      <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns:bqbiol="http://biomodels.net/biology-qualifiers/">

```



Parameter Units



Reactants
(+ Annotations)

Data Export in SBML

```

<rui:Bag>
  <rdf:li rdf:resource="http://identifiers.org/kegg.reaction/R00959"/>
</rdf:Bag>
</bqbiol:is>
<bqbiol:hasTaxon>
  <rdf:Bag>
    <rdf:li rdf:resource="http://identifiers.org/taxonomy/10116"/>
  </rdf:Bag>
</bqbiol:hasTaxon>
<bqbiol:is>
  <rdf:Bag>
    <rdf:li rdf:resource="http://identifiers.org/sabiork.reaction/11"/>
  </rdf:Bag>
</bqbiol:is>
</rdf:Description>
</rdf:RDF>
</annotation>
<listOfReactants>
  <speciesReference constant="true" species="SPC_1450_Cell" sboTerm="SBO:0000015" stoichiometry="1"/>
</listOfReactants>
<listOfProducts>
  <speciesReference constant="true" species="SPC_24_Cell" sboTerm="SBO:0000011" stoichiometry="1"/>
</listOfProducts>
<listOfModifiers>
  <modifierSpeciesReference species="ENZ_140996_Cell" sboTerm="SBO:0000460"/>
</listOfModifiers>
<kineticLaw metaid="META_KL_3460" sboTerm="SBO:0000029">
  <annotation sbrk="http://sabiork.h-its.org" bqbiol="http://biomodels.net/biology-qualifiers/" rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"/>
<sbrk:sabiork xmlns:sbrk="http://sabiork.h-its.org">
<sbrk:kineticLawID>3460</sbrk:kineticLawID>
<sbrk:experimentalConditions>
<sbrk:temperature>
<sbrk:startValueTemperature>38.0</sbrk:startValueTemperature>
<sbrk:temperatureUnit>°C</sbrk:temperatureUnit>
</sbrk:temperature>
<sbrk:pH>
<sbrk:startValuepH>7.2</sbrk:startValuepH>
</sbrk:pH>
<sbrk:buffer> 10 mM K2HPO4/KH2PO4, 20 mM imidazole-HCl, 150 mM KCl, 5 mM MgCl2</sbrk:buffer>
</sbrk:experimentalConditions>
</sbrk:sabiork>
  <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns:bqbiol="http://biomodels.net/biology-qualifiers/">
    <rdf:Description rdf:about="#META_KL_3460">
      <bqbiol:isDescribedBy>
        <rdf:Bag>
          <rdf:li rdf:resource="http://identifiers.org/sabiork.reaction/11"/>
        </rdf:Bag>
      </bqbiol:isDescribedBy>
    </rdf:Description>
  </rdf:RDF>

```

Reactions
(+ Annotations)

SABIO-RK
Annotations

Experimental Conditions
(SABIO-RK namespace)

Data Export in SBML

```

</listOfModifiers>
<kineticLaw metaid="META_KL_3460" sboTerm="SBO:0000029">
    <annotation sbrk="http://sabiork.h-its.org" bqbiol="http://biomodels.net/biology-qualifiers/" rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#">
        <sbrk:sabiork xmlns:sbrk="http://sabiork.h-its.org">
            <sbrk:kineticLawID>3460</sbrk:kineticLawID>
        <sbrk:experimentalConditions>
            <sbrk:temperature>
                <sbrk:startValueTemperature>38.0</sbrk:startValueTemperature>
                <sbrk:temperatureUnit>°C</sbrk:temperatureUnit>
            </sbrk:temperature>
            <sbrk:pH>
                <sbrk:startValuepH>7.2</sbrk:startValuepH>
            </sbrk:pH>
            <sbrk:buffer> 10 mM K2HPO4/KH2PO4, 20 mM imidazole-HCl, 150 mM KCl, 5 mM MgCl2</sbrk:buffer>
        </sbrk:experimentalConditions>
    </sbrk:sabiork>
        <rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#" xmlns:bqbiol="http://biomodels.net/biology-qualifiers/">
            <annotation sbrk="http://sabiork.h-its.org" bqbiol="http://biomodels.net/biology-qualifiers/">
                <bqmodel="http://biomodels.net/model-qualifiers/">
                    <rdf:Description rdf:about="#META_KL_3460">
                        <bqbiol:isDescribedBy>
                            <rdf:Bag>
                                <rdf:li rdf:resource="http://identifiers.org/pubmed/7929251"/>
                            </rdf:Bag>
                        </bqbiol:isDescribedBy>
                        <bqbiol:isDescribedBy>
                            <rdf:Bag>
                                <rdf:li rdf:resource="http://identifiers.org/sabiork.kineticrecord/3460"/>
                            </rdf:Bag>
                        </bqbiol:isDescribedBy>
                    </rdf:Description>
                </rdf:RDF>
            </annotation>
        <math xmlns="http://www.w3.org/1998/Math/MathML">
            <apply>
                <ci> KL_3460 </ci>
                <ci> Km_SPC_1450_Cell </ci>
                <ci> SPC_1450_Cell </ci>
                <ci> V </ci>
            </apply>
        </math>
        <listOfLocalParameters>
            <localParameter id="Km_SPC_1450_Cell" name="Km_DGlucose_1phosphate" value="4.5E-5" sboTerm="SBO:0000027" units="M"/>
            <localParameter id="V" name="V" value="0.00193333333" sboTerm="SBO:0000186"/>
        </listOfLocalParameters>
    </kineticLaw>

```

← Primary data source

← SABIO-RK entry ID

← Kinetic Parameters
(+ SBO Annotations)

- Currently up to **SBML Level 3 Version 1**
- **Reaction Kinetics Warehouse:**
Reactions, kinetic equations and parameters (with corresponding units) from different database entries can be exported in one SBML file
- Data annotated (RDF) with [identifiers.org](#) or [MIRIAM](#) URLs:
 - Annotations to [reaction](#), [protein](#) and [chemical compound databases](#)
 - Annotations of reactions to [organism](#) and [tissue databases](#)
 - Annotations to [SABIO-RK Ids](#) (reaction and kinetic data entry) for tracking
 - Annotations to [primary data source](#): Publications (PubMed Ids)
 - Content fully annotated to [Systems Biology Ontology \(SBO\)](#)
- Export with **experimental conditions** (SABIO-RK specific namespace)
- Optional **normalization of kinetic parameters** to SI base units
- Export also as human readable PDF (only SBML level 2) → **SBML2LaTeX**



Save Model

Enter name of model: SABIOmdl15Aug201440

SBML level 2, version 4 ▾

SBML level 3, version 1

SBML level 2, version 4

SBML level 2, version 3

SBML level 2, version 2

Export parameters normalized to SI base units

Choose the annotation schema *: identifier.org ▾

Save Model on Disk as SBML

Save Model on Disk as PDF

Bioinformatics. 2009 June 1; 25(11): 1455–1456.

PMCID: PMC2682517

Published online 2009 March 23. doi: [10.1093/bioinformatics/btp170](https://doi.org/10.1093/bioinformatics/btp170).

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SBML2L^AT_EX: Conversion of SBML files into human-readable reports

Andreas Dräger,^{1*} Hannes Planatscher,¹ Dieudonné Motsou Wouamba,¹ Adrian Schröder,¹ Michael Hucka,² Lukas Endler,³ Martin Golebiewski,⁴ Wolfgang Müller,⁴ and Andreas Zell¹



- **Reaction Kinetics Warehouse:**
Reactions, kinetic equations and parameters (with corresponding units) from different database entries can be exported in one BioPAX file
- Data is annotated according to **MIRIAM**
- **SBPAX3** (Systems Biology Pathway Exchange) is used to represent the reaction kinetics data and experimental conditions (<http://www.sbpax.org>)
- Parameter units are described via the **UOME** (Units of Measurement Expressions) extension to BioPax (<http://www.sbpax.org/uome/>)
- BioPAX export is available in both web search interface and web services (<http://sabio.h-its.org/sabioRestWebServices/searchKineticLaws/biopax> endpoint)

Data Export in BioPAX

```

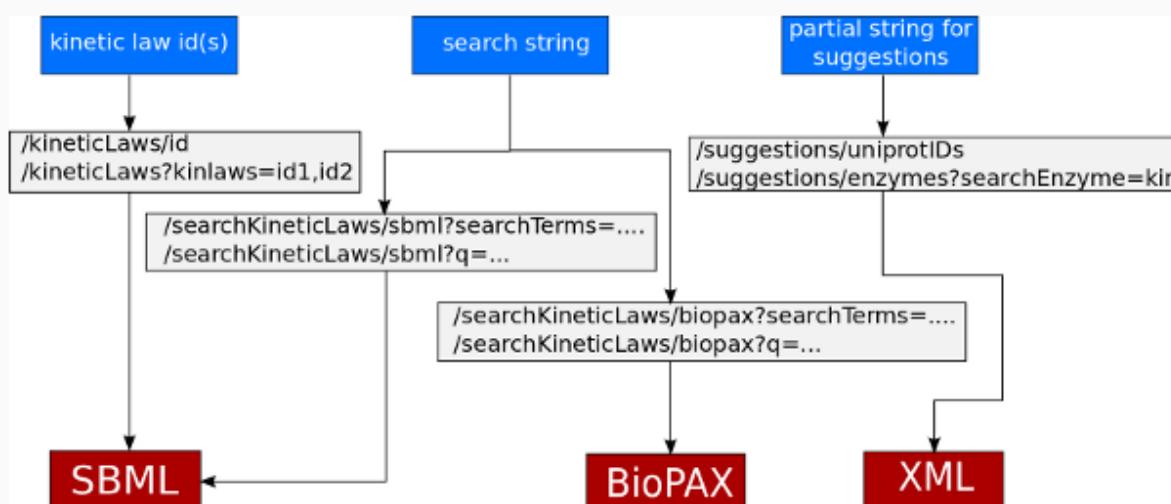
<?xml version="1.0" encoding="UTF-8"?>
<rdf:RDF
    xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
    xmlns:bp3="http://www.biopax.org/release/biopax-level3.owl#"
    xmlns:sbx3="http://vcell.org/sbpax3#"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
    xmlns:uome-core="http://www.sbpax.org/uome/core.owl#"
    xmlns:owl="http://www.w3.org/2002/07/owl#"
    xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:sabio="http://sabio.h-its.org/biopax#"
    xmlns:uome-list="http://www.sbpax.org/uome/list.owl#">
<owl:Ontology rdf:about="http://sabio.h-its.org/biopax">
    <owl:imports rdf:resource="http://vcell.org/sbpax3"/>
    <owl:imports rdf:resource="http://www.biopax.org/release/biopax-level3.owl"/>
    <owl:imports rdf:resource="http://www.sbpax.org/uome/core.owl"/>
    <owl:imports rdf:resource="http://www.sbpax.org/uome/list.owl"/>
</owl:Ontology>
<bp3:UnificationXref rdf:about="http://sabio.h-its.org/biopax#Brenda_Tissue_Ontology:BT0:0000424">
    <bp3:db rdf:datatype="http://www.w3.org/2001/XMLSchema#string">Brenda Tissue Ontology</bp3:db>
    <bp3:id rdf:datatype="http://www.w3.org/2001/XMLSchema#string">BT0:0000424</bp3:id>
    <bp3:id rdf:datatype="http://www.w3.org/2001/XMLSchema#string">BT0:0000424</bp3:id>
    <bp3:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">D-Glucose</bp3:name>
</bp3:UnificationXref>
<bp3:SmallMolecule rdf:about="http://sabio.h-its.org/biopax#D-Glucose">
    <bp3:name rdf:datatype="http://www.w3.org/2001/XMLSchema#string">D-Glucose</bp3:name>
</bp3:SmallMolecule>
<sbx3:SBMeasurable rdf:about="http://sabio.h-its.org/biopax#temperature714">
    <sbx3:SBVocabulary rdf:resource="http://sabio.h-its.org/biopax#SBO:0000147"/>
    <sbx3:hasNumber rdf:datatype="http://www.w3.org/2001/XMLSchema#double">37.0</sbx3:hasNumber>
    <sbx3:hasUnit rdf:resource="http://www.sbpax.org/uome/list.owl#DegreeCelsius"/>
    <sbx3:sbTerm rdf:resource="http://sabio.h-its.org/biopax#SBO:0000147"/>
</sbx3:SBMeasurable>
<bp3:TissueVocabulary rdf:about="http://sabio.h-its.org/biopax#tissue_erythrocyte">
    <bp3:term rdf:datatype="http://www.w3.org/2001/XMLSchema#string">erythrocyte</bp3:term>
    <bp3:xref rdf:resource="http://sabio.h-its.org/biopax#Brenda_Tissue_Ontology:BT0:0000424"/>
</bp3:TissueVocabulary>
<uome-core:UnitOfMeasurement rdf:nodeID="node16t8bg47mx420">
    <uome-core:unitSymbol rdf:datatype="http://www.w3.org/2001/XMLSchema#string">M</uome-core:unitSymbol>
</uome-core:UnitOfMeasurement>
</rdf:RDF>

```



RESTful Web Services Introduction

RESTful Web Services are implemented offering data access via HTTP requests following a Representational State Transfer (REST) approach. Data can be accessed using simple http GET requests to either retrieve a complete SBML model, or a BioPAX/SBPAX3 representation of the requested entries, or pieces of information in a tailored format (in plain text or XML). Entries can be requested directly by using the database entry ID or can be searched for using the same format query built in user interface advanced search.



RESTFUL

- [Introduction](#)
- [Manual - including request examples](#)
- [Search Keyword Vocabulary](#)

SOAP

- [Manual](#)
- [Sample Client Code](#)
- [WSDL \[xsd\]](#)

Example requests:

Entries may be requested directly if the database entry ID is known

<http://sabio.h-its.org/sabioRestWebServices/kineticLaws/20147>

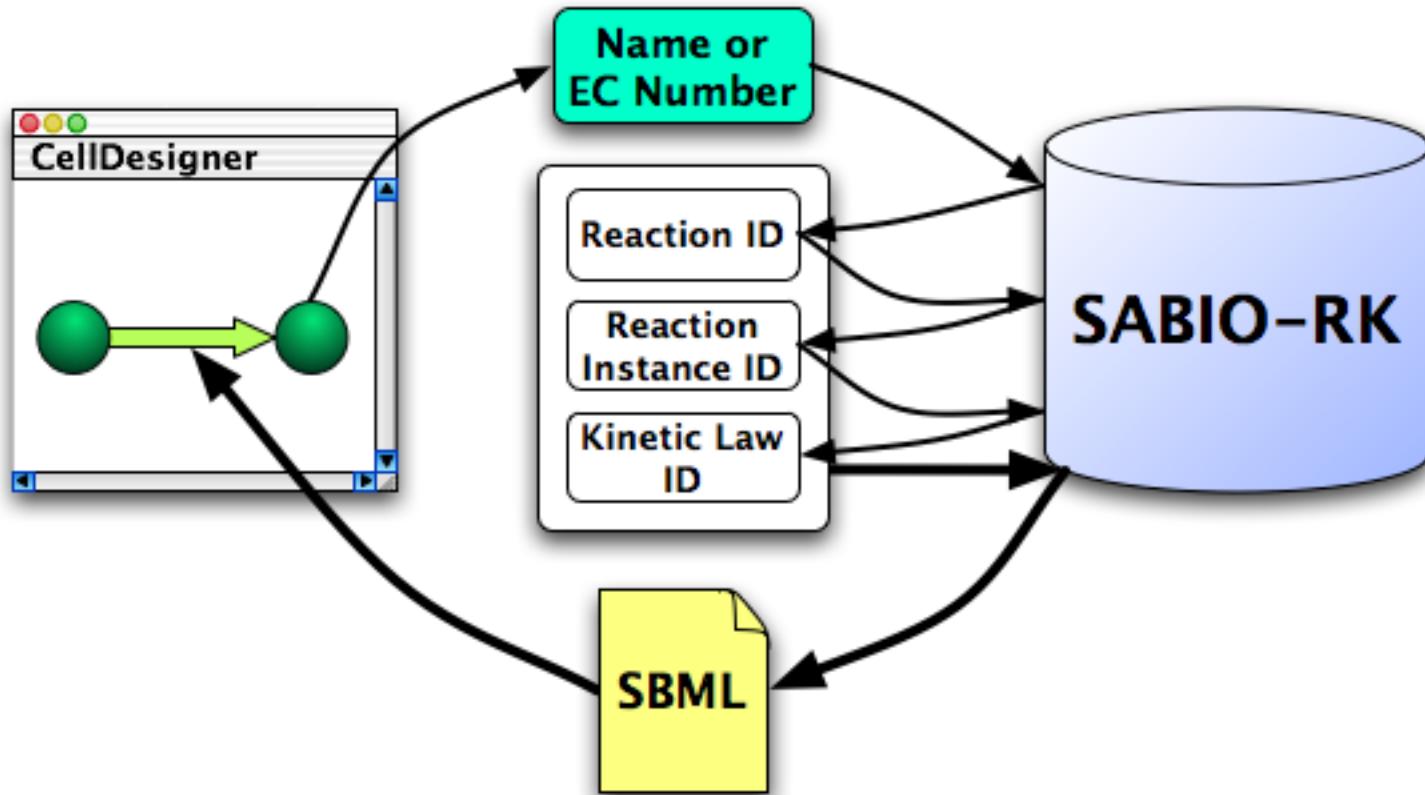
Entries may be searched for using the same search options available in the browser search interface

[http://sabio.h-its.org/sabioRestWebServices/searchKineticLaws/
sbml?searchTerms=ORGANISM=Homo sapiens;TISSUE=liver](http://sabio.h-its.org/sabioRestWebServices/searchKineticLaws/sbml?searchTerms=ORGANISM=Homo%20sapiens;TISSUE=liver)

Suggestions for search terms can be done

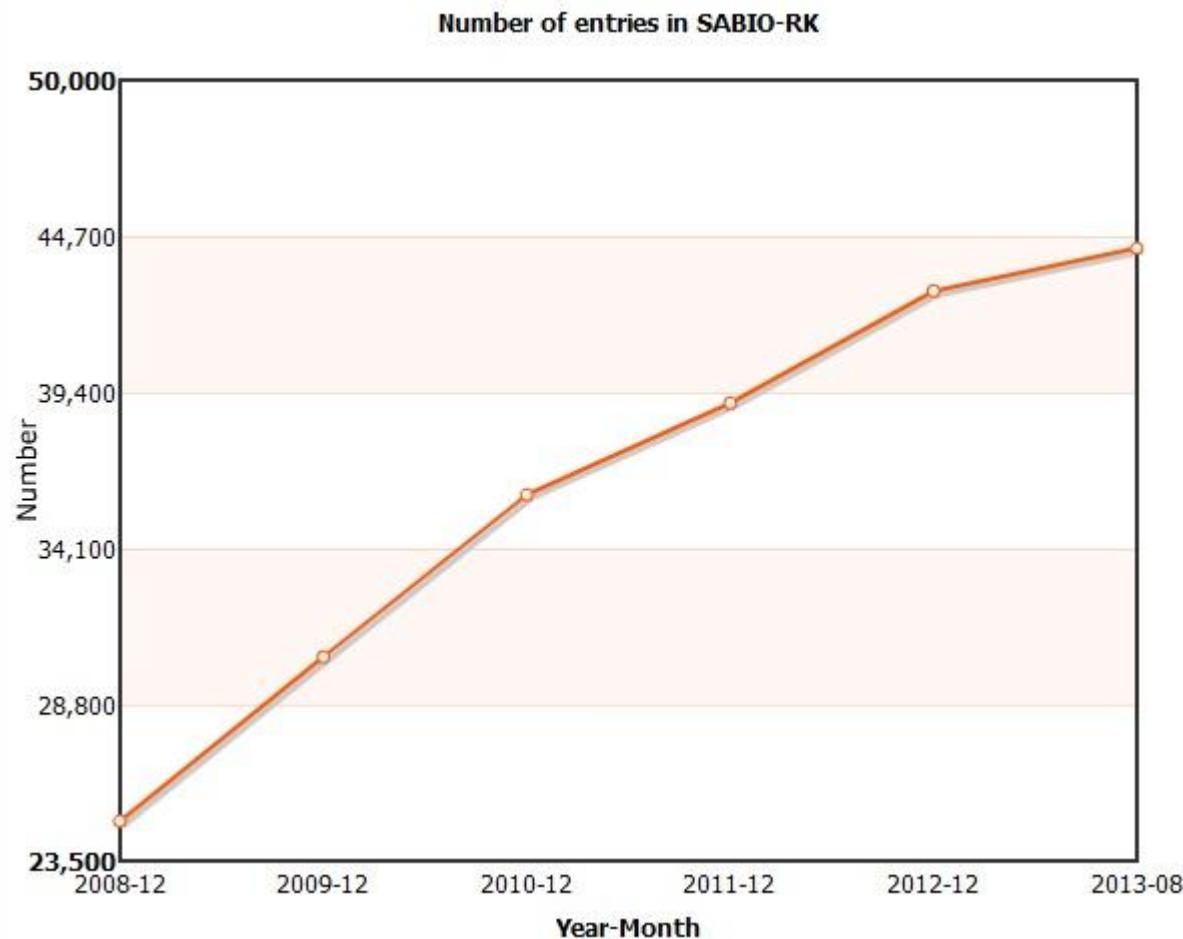
[http://sabio.h-its.org/sabioRestWebServices/suggestions/compounds?search
Compounds=glycoch](http://sabio.h-its.org/sabioRestWebServices/suggestions/compounds?searchCompounds=glycoch)

SABIO-RK API Access Integration into Modeling Tools

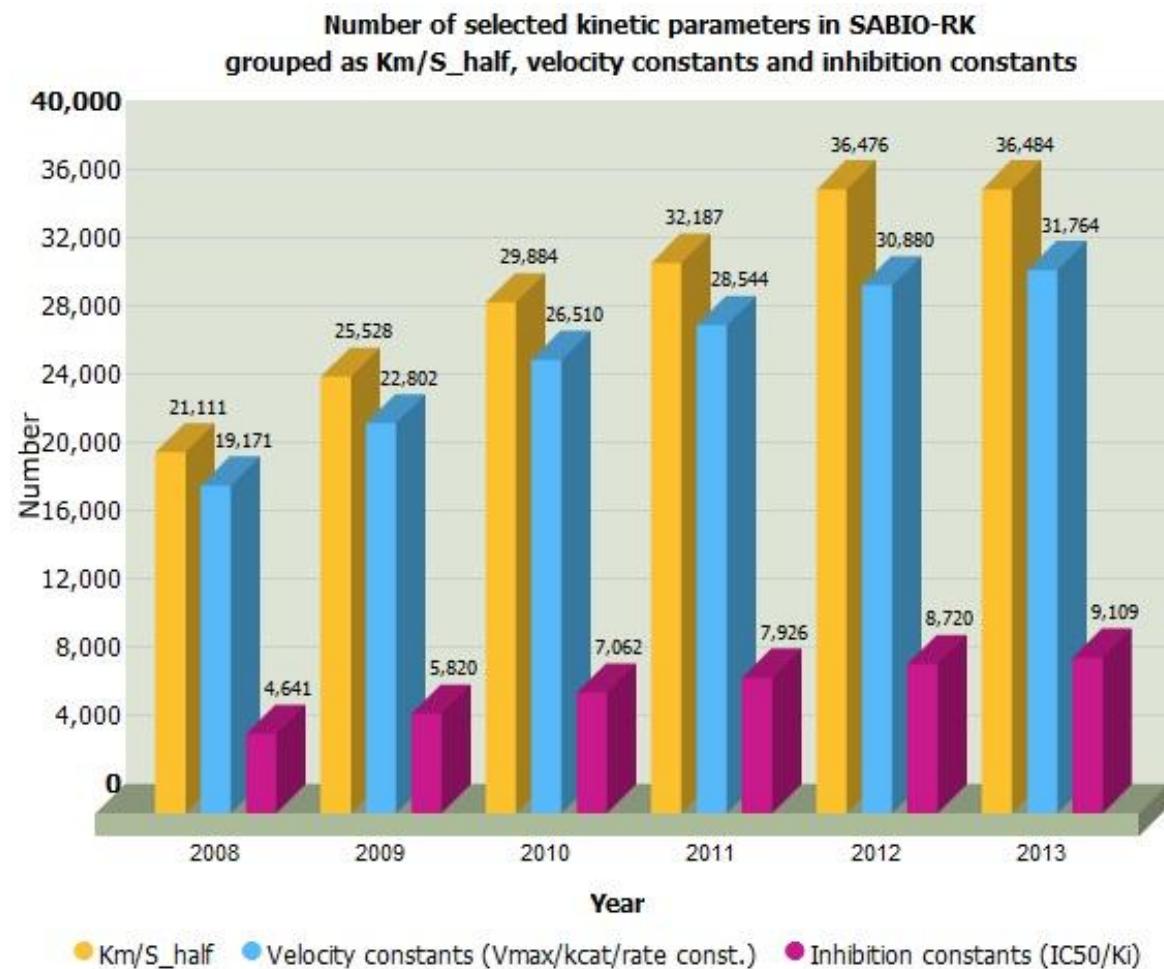


<http://www.celldesigner.org>

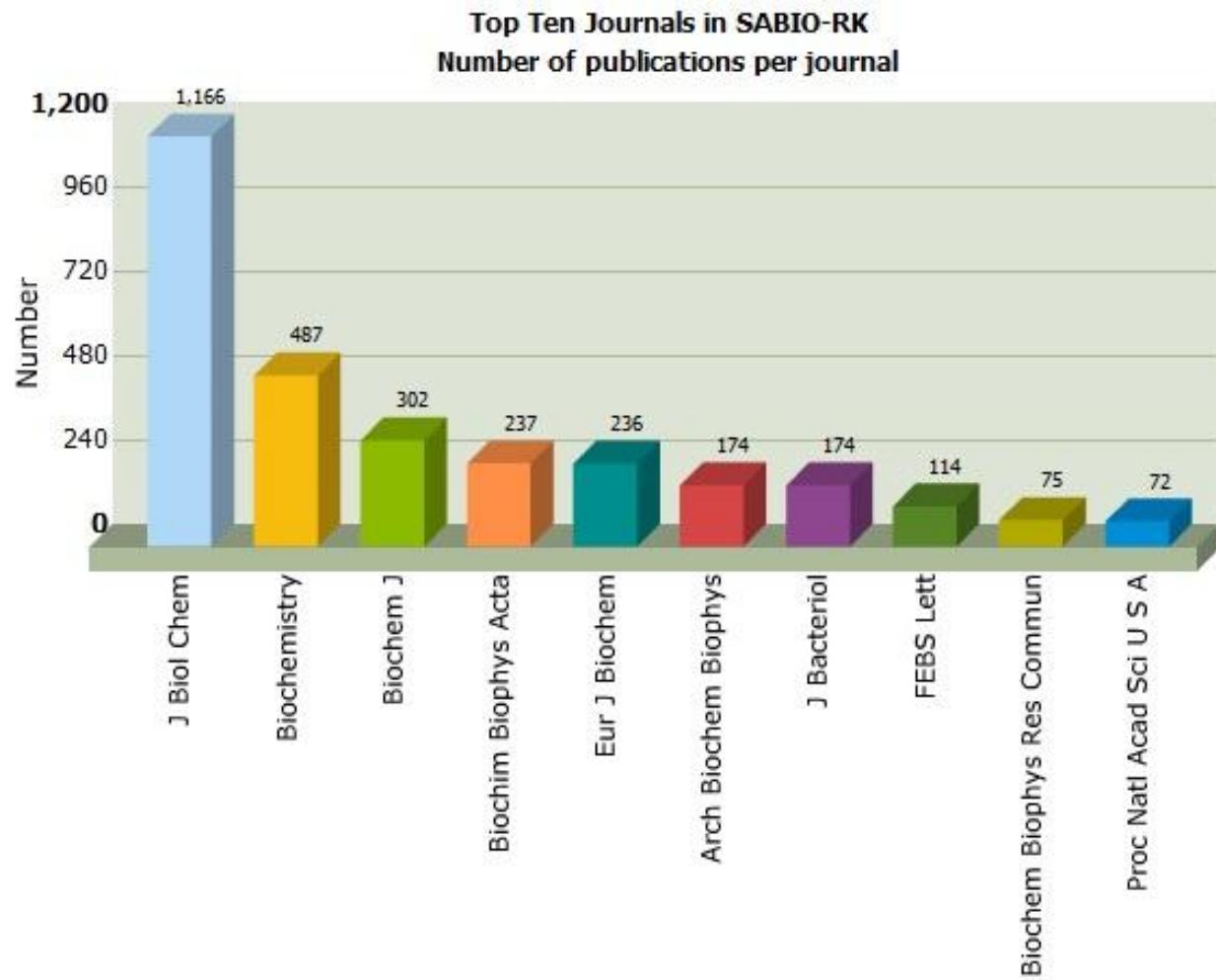
SABIO-RK Content



SABIO-RK Content

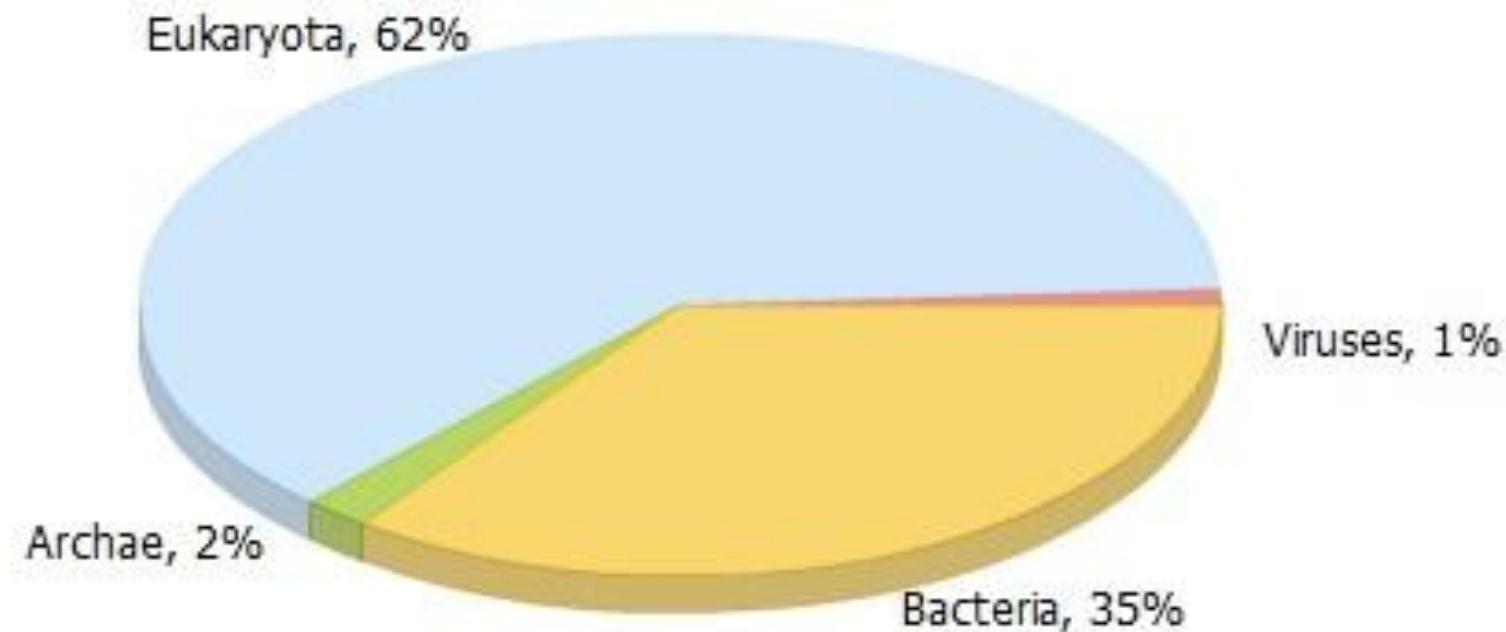


SABIO-RK Content



SABIO-RK Content

Taxonomic distribution of organisms in SABIO-RK





<http://sabio.h-its.org>



SABIO-RK

<http://sabiork.h-its.org>

Wittig U, Kania R, Golebiewski M, Rey M, Shi L, Jong L, Algaa E, Weidemann A, Sauer-Danzwith H, Mir S, Krebs O, Bittkowski M, Wetsch E, Rojas I, Müller W

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