

How to Share FAIR — The FAIRDOM Data and Model Management Practice

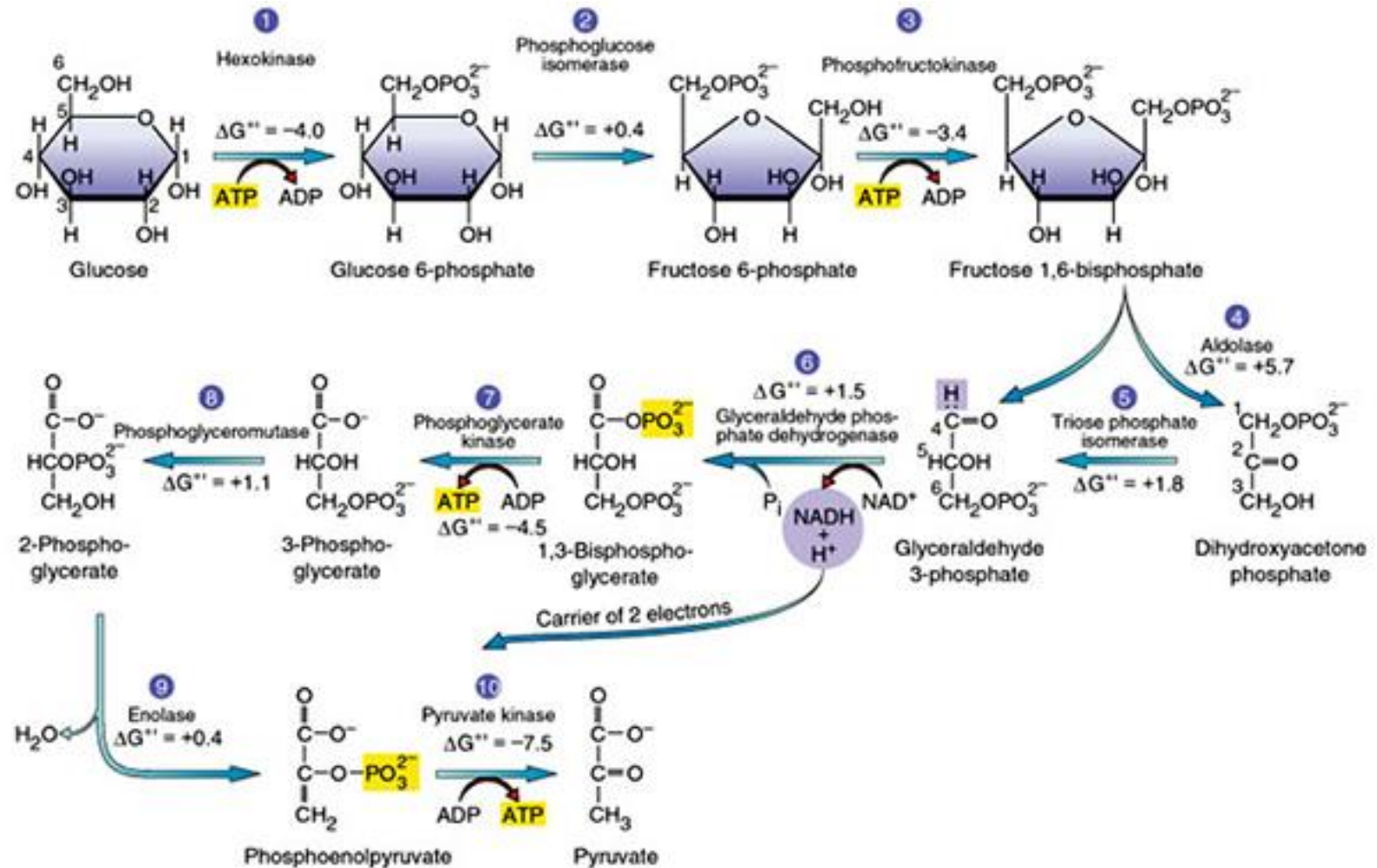


Maja Rey
HITS Heidelberg, Germany

LiSyM/de.NBI/ERASysAPP Tutorial, Bremen, July 4, 2018

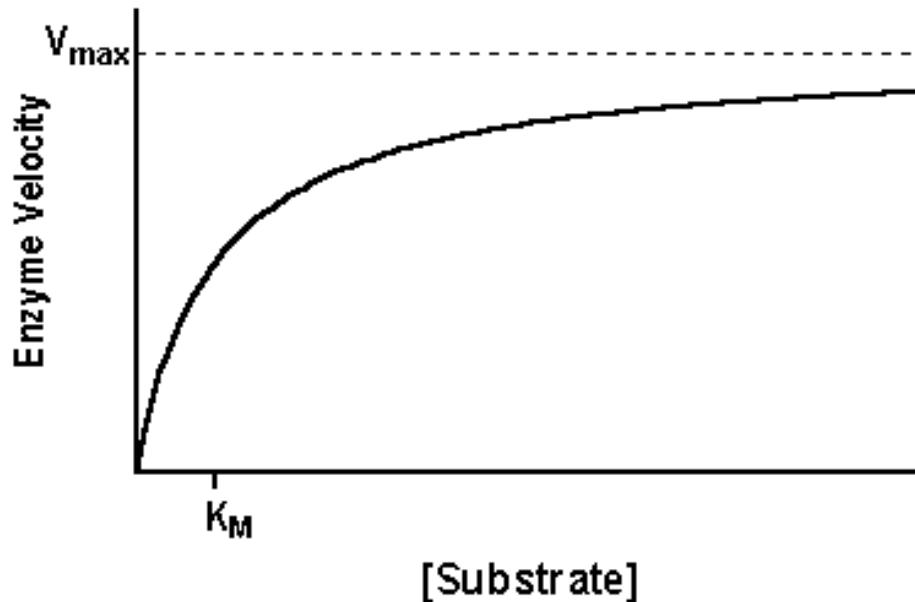
Enzyme kinetics

Example: Glycolysis pathway, conversion of Glucose into Pyruvate



Enzyme kinetics

Kinetic law type: Michaelis–Menten



$$v = \frac{d[P]}{dt} = \frac{V_{\max} [S]}{K_M + [S]}$$

Equation describing the rate of enzymatic reactions

v rate: formation of product P from substrate S

K_M , V_{\max} : specific constants for this reaction

Motivation for an reaction kinetics database

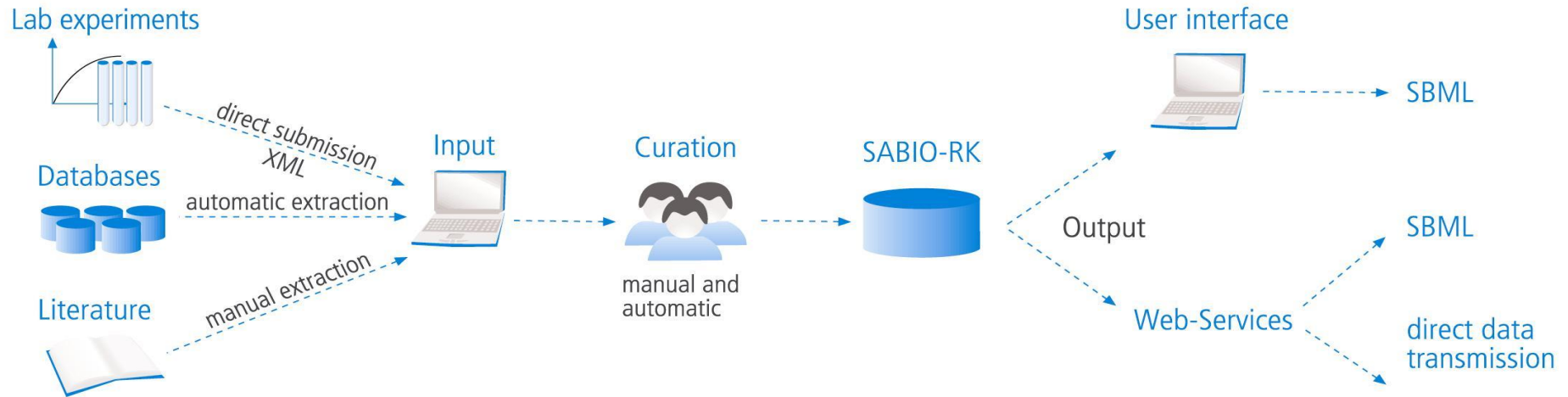
- quantitative data on enzyme kinetics are required e.g. for modellers
- problem: data digging is
 - time consuming
 - hard to find in literature
 - partly hidden in figures and tables

=> 2006 start of collecting reaction kinetics data,
storage in a public accessible database



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

SABIO-RK: data workflow



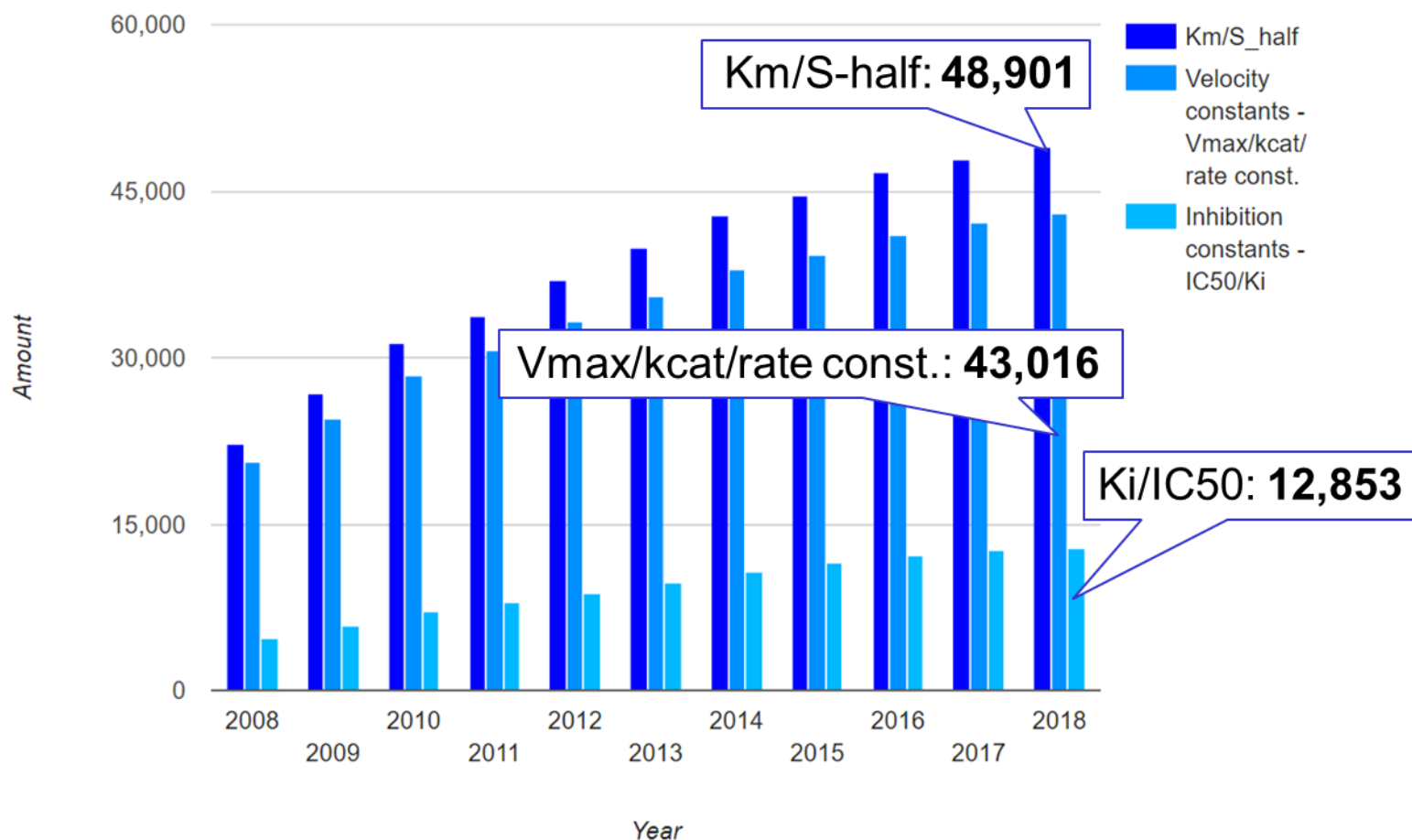
- Kinetic data manually extracted from literature and data from experiments or models entered in a structured manner
- Data are unified, normalized and annotated
- Data access via a web-based user interface, by web-services or Python Scripts
- Data Export in table (csv) or standard exchange formats (XML)

SABIO-RK statistics

Database entries	58,864
for wildtype enzymes	43,876
for mutant enzymes	15,026
Publications	5,844
Reactions	7,752
Compounds	10,412
EC numbers	1,747
UniprotKB_IDs	4,726
Organisms	979
Tissues	340

SABIO-RK statistics

Total amount of selected kinetic parameters



SABIO-RK website

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



SABIO-RK
Biochemical Reaction Kinetics Database

Login | Contact

Home | Search | Services | Web Services | News | Documentation | Evaluation | Statistics | Links | About

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

[STREND DB data in SABIO-RK](#)
03-23-2018
Integration of **STREND DB** data according to the "Standards for Reporting Enzymology Data" [more>>](#)

[SABIO-RK in de.NBI course](#)
01-31-2018
Tools for systems biology modeling and data management in Magdeburg, Germany [more>>](#)


[SABIO-RK](#)
11-06-2017
[more>>](#)

[More export formats supported](#)
10-12-2017
[more>>](#)

**HITS**

Public search interface

Simple free-text search, e.g. for EC number



SABIO-RK
Biochemical Reaction Kinetics Database

[Login](#)

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Search

1.1.1.

1.1.1.1	(758)
1.1.1.2	(424)
1.1.1.8	(54)
1.1.1.3	(26)
1.1.1.9	(10)

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 ☐ Entries inserted since: 14/10/2008
☒ Publication
☒ BioModel

Public search interface

Advanced search with many options for detailed search

Search

Substrate:"atp" AND Organism:"mammalia (NCBI)"

Advanced Search

SearchReset?

AND

Tissue

liver

Add & Search

AnyRole

Substrate

Product

Inhibitor

Catalyst

Cofactor

Activator

OtherModifier

SabioCompoundID

InChI

Smiles

Entry View

Total number of entries: 3293 ☐ expand all displayed entries

display 15 entries per page

Kinetic data

Enzyme

Enzymename

ECNumber

Biological Source

Tissue

Organism

CellularLocation

Kinetic Data

	Enzyme			Tissue	Organism	Parameter (besides concentration)	Cond.		Add to export cart?
	ECNumber	Protein	Variant				°C	pH	
		P06685							
		P06686							
		P06687							
		Q64541							
		P07340	wildtype	heart	Rattus norvegicus	Km Vmax	37.0	7.4	<input type="checkbox"/>
		P13638							

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 ☐ Entries inserted since: 14/10/2008 ☐

☒ Publication

☒ BioModel

Search results

1. Entry View of results

Search for Substrate:"ATP" AND Organism:"mammalia (NCBI)" AND Tissue:"liver"

<div>Entry View</div> <div>Reaction View</div> <div>Visual Search</div>										
Total number of kinetic law entries found: 674 <input type="checkbox"/> expand all displayed entries										
<div>1 2 3 4 5 6 7 8 9 10 .. 45 Next</div> <div>display 15 entries per page</div>										
Kinetic data	Reaction	Enzyme			Tissue	Organism	Parameter (besides concentration)	Cond.		Add to export cart?
		ECNumber	Protein	Variant				°C	pH	
▶	ATP + 3-Phospho-D-glycerate = ADP + 3-Phospho-D-glyceroyl phosphate	2.7.2.3	Q3T0P6 ↗	wildtype	liver ↗	Bos taurus	Km	22.0	7.2	<input type="checkbox"/>
▶	ATP + D-Fructose 6-phosphate = ADP + D-Fructose 1,6-bisphosphate	2.7.1.11	P17858 ↗	wildtype	liver ↗	Homo sapiens	S_half	26.0	7.2	<input type="checkbox"/>
▶	D-Glucose + ATP = ADP + D-Glucose 6-phosphate	2.7.1.1	P27881 ↗	wildtype	liver ↗	Rattus norvegicus	Km	30.0	7.4	<input type="checkbox"/>
▶	ATP + 2-Deoxyglucose = ADP + 2-Deoxyglucose 6-phosphate	2.7.1.1	P27881 ↗	wildtype	liver ↗	Rattus norvegicus	Km	30.0	7.4	<input type="checkbox"/>

Single entry view

<div><div></div><div></div></div>	H2O + L-Arginine = L-Ornithine + Urea	3.5.3.1	P05089 ↗	wildtype	liver ↗	Homo sapiens	Ki	25.0	9.5	<div><div></div></div>
Entry ID: 10093										
General information										
Organism	Homo sapiens									
Tissue	liver ↗									
EC Class	3.5.3.1									
SABIO reaction id	574									
Variant	wildtype									
Recombinant	expressed in Escherichia coli JM109									
Experiment Type	in vitro									
Pathways	Insulin signaling pathway Urea cycle Arginine and Proline metabolism									
Event Description	-									
Substrates										
name	location			comment						
L-Arginine	-			-						
H2O	-			-						
Products										
name	location			comment						
L-Ornithine	-			-						
Urea	-			-						
Modifiers										
name	location	effect	comment	protein complex						
arginase (Enzyme)	-	Modifier-Catalyst	-	(P05089 ↗)*3;						
L-Lysine	-	Modifier-Inhibitor	-	-						
Kinetic Law										
type		formula		annotation						
Competitive inhibition		-		SBO:0000260 ↗						
Parameter										
name	type	species	start val.	end val.	deviat.	unit	comment			
S	concentration ↗	L-Arginine	0.0	0.002	-	M	-			
Ki	Ki ↗	L-Lysine	2.0	-	0.2	mM	-			
Experimental conditions										
		start value		end value			unit			
pH				9.5			-			
temperature				25.0			- °C			
buffer		50 mM glycine-NaOH, 2 mM MnCl2								
comment		-								
Reference										
title		author	year	journal	volume	pages	PubMed			
Chemical modification and site-directed mutagenesis of human liver arginase: evidence that the imidazole group of histidine-141 is not involved in substrate binding		Carvajal N, Olate J, Salas M, Uribe E, Lopez V, Herrera P, Cerpa J	1999	Arch Biochem Biophys	371	202-6	10545206 ↗			

Organism

Tissue

Compounds

Enzyme details

Kinetic law

Kinetic data

Exp. conditions

Reference

Organism

Tissue

Compounds

Enzyme details

Kinetic law

Kinetic data

Exp. conditions

Reference



Search results

2. Reaction View of results

Entry View Reaction View Visual Search					
There are 674 entries in 99 reaction(s) matching your query <input type="checkbox"/> expand all displayed reaction entries					
1 2 3 4 5 6 7 Next				display 15 ▾	reactions per page
Kinetic data	[Sabio ID]: Reaction	Kegg ID	Visualization (Please allow pop-up windows in your browser)	Number of Entries	Add to export cart? <input type="checkbox"/>
▶	[7644]: ATP + 3-Phospho-D-glycerate = ADP + 3-Phospho-D-glyceroyl phosphate	R01512 ↗	Click here to view visualization	1	<input type="checkbox"/>
▶	[1113]: ATP + D-Fructose 6-phosphate = ADP + D-Fructose 1,6-bisphosphate	R00756 ↗	Click here to view visualization	38	<input type="checkbox"/>
▶	[793]: D-Glucose + ATP = ADP + D-Glucose 6-phosphate	R00299 ↗	Click here to view visualization	45	<input type="checkbox"/>
▶	[6883]: ATP + 2-Deoxyglucose = ADP + 2-Deoxyglucose 6-phosphate	-	Click here to view visualization	11	<input type="checkbox"/>
▶	[3359]: ATP + D-Allose = D-Allose 6-phosphate + ADP	R03576 ↗	Click here to view visualization	1	<input type="checkbox"/>
▶	[9559]: ATP + D-Gulose = ADP + D-Gulose 6-phosphate	-	Click here to view visualization	1	<input type="checkbox"/>
▶	[1116]: ATP + D-Fructose = ADP + D-Fructose 6-phosphate	R00760 ↗	Click here to view visualization	6	<input type="checkbox"/>
▶	[576]: ATP + D-Fructose = ADP + D-Fructose 1-phosphate	R00866 ↗	Click here to view visualization	16	<input type="checkbox"/>

Search results

3. Visualization of search results with option to confine the query

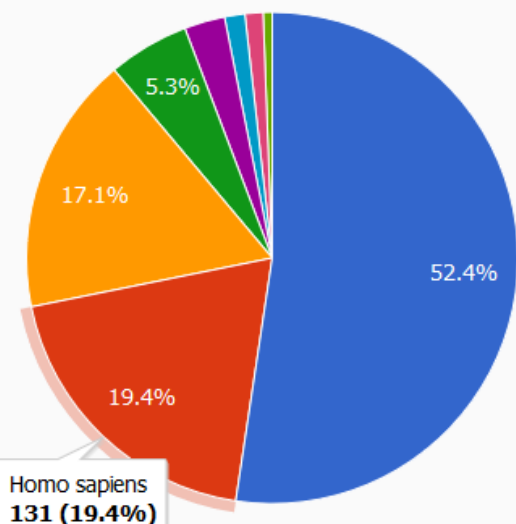
Entry View

Reaction View

Visual Search

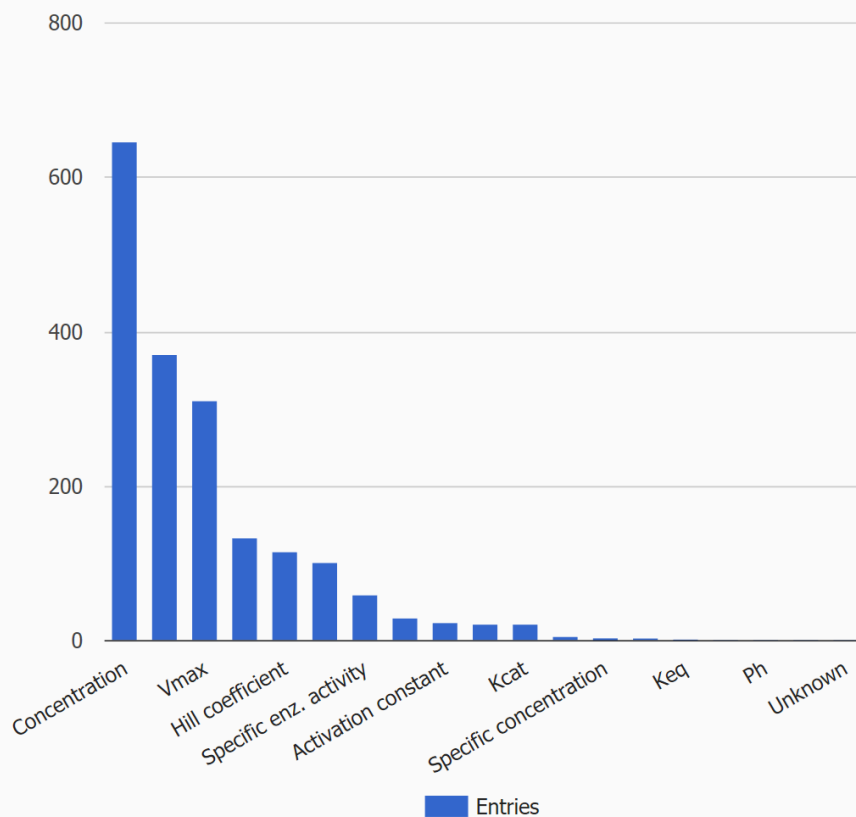
Organisms

- Rattus norvegicus
- Homo sapiens
- Bos taurus
- Sus scrofa
- Mus musculus
- Oryctolagus cuniculus
- Zapus hudsonius
- Macaca fascicularis



Homo sapiens
131 (19.4%)

Parameter Types



Confine search result

Substrate:"ATP" AND Organism:"mammalia (NCBI)" AND Tissue:"liver"
recommendedOrganismName:"Homo sapiens"

sabiork.h-its.org/newSearch/index

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Search

Substrate:"ATP" AND Organism:"mammalia (NCBI)" AND Tissue:"liver" recommendedOrganismName:"Homo sapiens"

Advanced 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 ☐ Entries inserted since: 14/10/2008

☒ Publication

☒ BioModel

Entry View Reaction View Visual Search

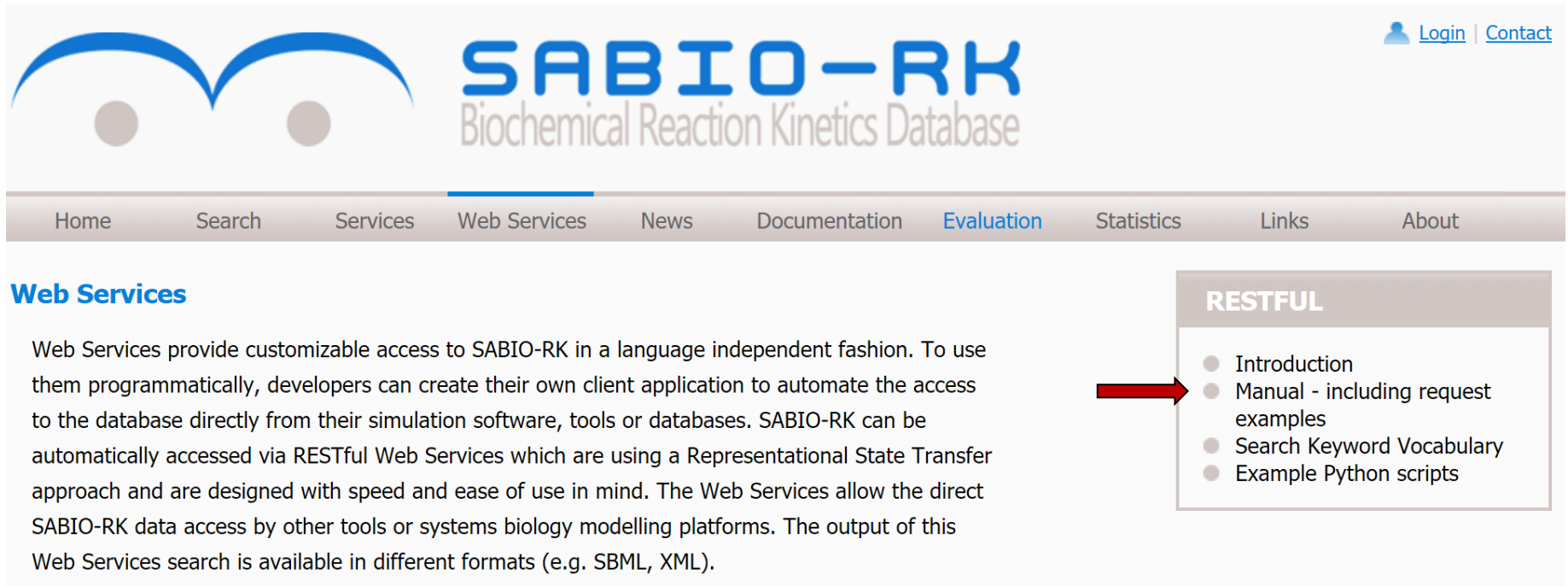
Total number of kinetic law entries found: 131 ☐ expand all displayed entries

1 2 3 4 5 6 7 8 9 Next display 15 entries per page

Kinetic data	Reaction	Enzyme			Tissue	Organism	Parameter (besides concentration)	Cond.		Add to export cart?
		ECNumber	Protein	Variant				°C	pH	
▶	ATP + D-Fructose 6-phosphate = ADP + D-Fructose 1,6-bisphosphate	2.7.1.11	P17858	wildtype	liver	Homo sapiens	S_half	26.0	7.2	<input type="checkbox"/>
▶	ATP + D-Fructose = ADP + D-Fructose 1-phosphate	2.7.1.3	P50053	wildtype	liver	Homo sapiens	Km Specific enz. activity Vmax	37.0	7.5	<input type="checkbox"/>
▶	alpha-D-Xylose + ATP = alpha-D-Xylose 1-phosphate + ADP	2.7.1.3	P50053	wildtype	liver	Homo sapiens	Km Specific enz. activity Vmax	37.0	7.5	<input type="checkbox"/>

Programmatic data access

Programmatic search of SABIO-RK using RESTful web services



The screenshot shows the SABIO-RK Biochemical Reaction Kinetics Database website. The header includes the SABIO-RK logo and navigation links for Login and Contact. The main navigation bar contains links for Home, Search, Services, Web Services (highlighted), News, Documentation, Evaluation, Statistics, Links, and About. The Web Services section is active, displaying a paragraph about customizable access to the database via RESTful Web Services. To the right, a RESTFUL menu is shown with a red arrow pointing to the 'Manual - including request examples' option.

Web Services

Web Services provide customizable access to SABIO-RK in a language independent fashion. To use them programmatically, developers can create their own client application to automate the access to the database directly from their simulation software, tools or databases. SABIO-RK can be automatically accessed via RESTful Web Services which are using a Representational State Transfer approach and are designed with speed and ease of use in mind. The Web Services allow the direct SABIO-RK data access by other tools or systems biology modelling platforms. The output of this Web Services search is available in different formats (e.g. SBML, XML).

RESTFUL

- Introduction
- Manual - including request examples
- Search Keyword Vocabulary
- Example Python scripts

Example URL:

[sabiork.h-its.org/sabioRestWebServices/searchKineticLaws/sbml?q=Tissue:"liver" AND Organism:"Homo sapiens"](http://sabiork.h-its.org/sabioRestWebServices/searchKineticLaws/sbml?q=Tissue:)

Integration of SABIO-RK to other tools



VCell



SBMLsqueezer



Data export formats

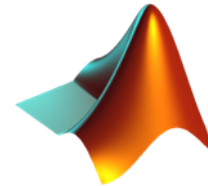
- Public search interface, export of result set:

SBML format

XML

Tables (xls, tsv)

BioPax, Matlab, Octave,...



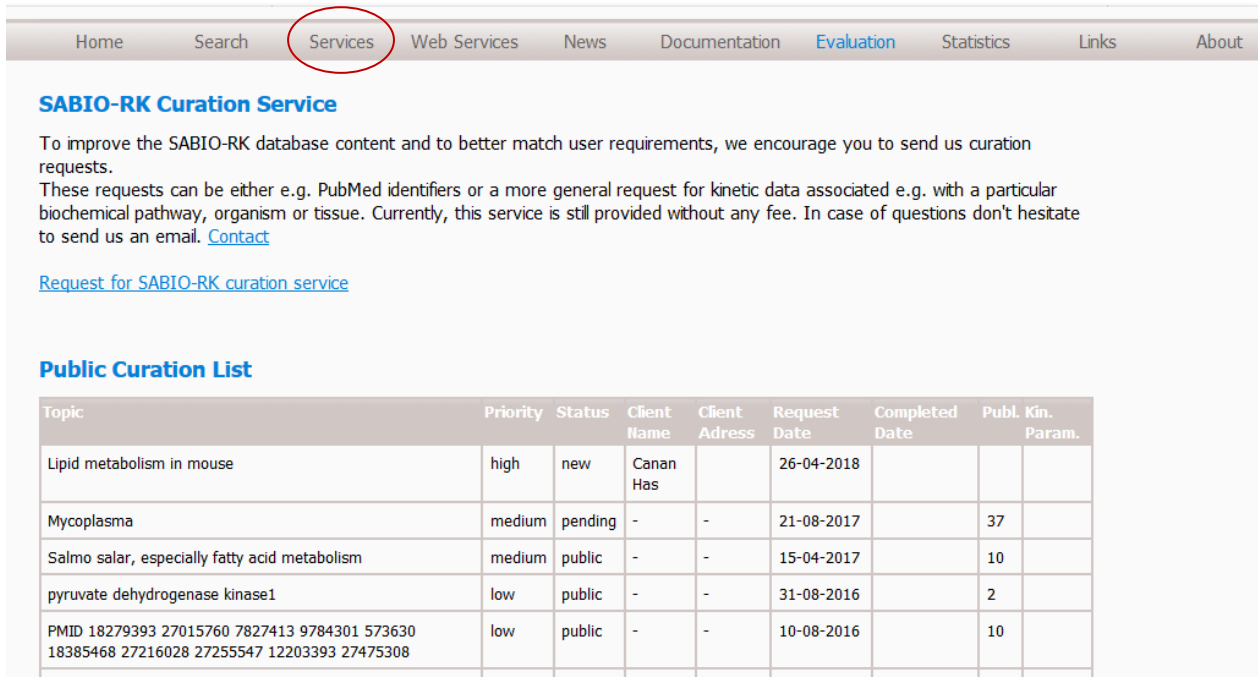
- programmatic search using RESTful web services:

SBML format

TSV (Excel)



Curation requests as service



SABIO-RK Curation Service

To improve the SABIO-RK database content and to better match user requirements, we encourage you to send us curation requests. These requests can be either e.g. PubMed identifiers or a more general request for kinetic data associated e.g. with a particular biochemical pathway, organism or tissue. Currently, this service is still provided without any fee. In case of questions don't hesitate to send us an email. [Contact](#)

[Request for SABIO-RK curation service](#)

Public Curation List

Topic	Priority	Status	Client Name	Client Address	Request Date	Completed Date	Publ. Kin. Param.
Lipid metabolism in mouse	high	new	Canan Has		26-04-2018		
Mycoplasma	medium	pending	-	-	21-08-2017		37
Salmo salar, especially fatty acid metabolism	medium	public	-	-	15-04-2017		10
pyruvate dehydrogenase kinase1	low	public	-	-	31-08-2016		2
PMID 18279393 27015760 7827413 9784301 573630 18385468 27216028 27255547 12203393 27475308	low	public	-	-	10-08-2016		10

- Users may request for retrieval and storage of kinetic data in SABIO-RK (from literature and exp. data)
- Service as part of the de.NBI initiative (German Network for Bioinformatics Infrastructure)
- Service is currently free of charge

Curation requests as service

sabiork.h-its.org/newSearch/index

Biochemical Reaction Kinetics Database

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Search

1.1.1.4

Advanced 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

Entry View Reaction View Visual Search

Sorry, we found no results for your query... - but you may send a request to add the corresponding data: [request](#)

Curation requests as service

[Home](#) [Search](#) [Services](#) [Web Services](#) [News](#) [Documentation](#) [Evaluation](#)

User Request

Your name

Your email

Subject

curation request ▾

Your message

Query

[ontologySearch:false, ipAddress2:127.0.0.1, biomodel:true, transportReaction:false, entryDate:14/10/2008, date:false, remoteHost:127.0.0.1, pHValues:0 - 14, journal:true, q:1.1.1.4 , wildtype:true, kineticData:false, directSubmission:true,

Details Hidden**

false ▾

**

You may choose one of the following options:

- your curation request is completely hidden to the public (anonymous, but visible to SABIO-RK curators)
- only your name and adress are hidden to the public but not the requested task

SABIO-RK hands on

➤ Task: Search for 'author: Pritchard'

The screenshot shows the SABIO-RK website interface. At the top, the logo features two stylized eyes and the text "SABIO-RK Biochemical Reaction Kinetics Database". Navigation links include Home, Search, Services, Web Services, News, Documentation, Evaluation, Statistics, Links, and About. A "Login" link is also present.

The "Search" section contains a main search bar and an "Advanced Search" dropdown. Below the main search bar, there are three input fields: "ANC" (set to "ANC"), "Author" (set to "Pritch"), and a third field containing "pritchard l1, kell db. (19)". A blue "Add & Search" button is located to the right of these fields. A "Reset" button and a help icon (?) are also visible.

The "Filter Options" panel on the right includes the following sections:

- 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

Task: Search for 'author: Pritchard'

- select 'add to export cart'
- select 'entries to export'

The screenshot shows the KEGG database search interface. The search bar contains 'Author:"pritchard" if, kegg db.' and the results show 19 entries. A red circle highlights the 'Entries to Export: 19' button in the top right. A red arrow points to the 'Add to export cart?' checkbox in the first row of the results table.


Search Results Summary:

- Search: Author:"pritchard" if, kegg db.
- Advanced Search: OR Author
- Filter Options: Enzyme (Wildtype, Mutant, Recombinant), Kinetic Data (Rate Equation, Transport Reaction), Environmental Conditions (pH: 0 - 14, Temperature: -10 C° - 115 C°), Source (Direct Submission, Publication, BioModel).
- Total number of kinetic law entries found: 19
- display 25 entries per page

Kinetic data	Reaction	Enzyme			Tissue	Organism	Parameter (besides concentration)	Cond.		Add to export cart?
		ECNumber	Protein	Variant				°C	pH	
▶	Glucose = Glucose	-		wildtype	-	Saccharomyces cerevisiae	Ki Km Vmax			<input checked="" type="checkbox"/>
▶	ATP + alpha-D-Glucose = ADP + alpha-D-Glucose 6-phosphate	2.7.1.1		wildtype	-	Saccharomyces cerevisiae	Keq Km Vmax			<input checked="" type="checkbox"/>
▶	alpha-D-Glucose 6-phosphate = beta-D-Fructose 6-phosphate	5.3.1.9		wildtype	-	Saccharomyces cerevisiae	Keq Km Vmax			<input checked="" type="checkbox"/>
▶	ATP + beta-D-Fructose 6-phosphate = beta-D-Fructose 1,6-bisphosphate + ADP	2.7.1.11		wildtype	-	Saccharomyces cerevisiae	Ki Km Vmax			<input checked="" type="checkbox"/>
▶	beta-D-Fructose 1,6-bisphosphate = D-Glyceraldehyde 3-phosphate + Glycerone phosphate	4.1.2.13		wildtype	-	Saccharomyces cerevisiae	Keq Ki Km Vmax			<input checked="" type="checkbox"/>
▶	D-Glyceraldehyde 3-phosphate = Glycerone phosphate	5.3.1.1		wildtype	-	Saccharomyces cerevisiae				<input checked="" type="checkbox"/>
▶	NAD + D-Glyceraldehyde 3-phosphate + Phosphate = NADH + H+ + 3-Phospho-D-glyceroyl phosphate	1.2.1.12		wildtype	-	Saccharomyces cerevisiae	Km Vmax			<input checked="" type="checkbox"/>
▶	ATP + 3-Phospho-D-glycerate = ADP + 3-Phospho-D-glyceroyl phosphate	2.7.2.3		wildtype	-	Saccharomyces cerevisiae	Keq Km Vmax			<input checked="" type="checkbox"/>
▶	3-Phospho-D-glycerate = 2-Phospho-D-glycerate	5.4.2.11		wildtype	-	Saccharomyces cerevisiae	Keq Km Vmax			<input checked="" type="checkbox"/>

Task: Search for 'author: Pritchard'

➤ select 'write spreadsheet'

 **SABIO-RK**
Biochemical Reaction Kinetics Database

Login | Contact

Entries to Export: 19

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Selected kinetics data

Entry ID	Selected Reaction	Organism	Tissue	Kinetic law type	View details	Remove entry Select all:
56847	Glucose <-> Glucose	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56848	ATP + alpha-D-Glucose <-> alpha-D-Glucose 6-phosphate + ADP	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56849	alpha-D-Glucose 6-phosphate <-> beta-D-Fructose 6-phosphate	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56850	beta-D-Fructose 6-phosphate + ATP <-> beta-D-Fructose 1,6-bisphosphate + ADP	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56851	beta-D-Fructose 1,6-bisphosphate <-> D-Glyceraldehyde 3-phosphate + Glycerone phosphate	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56852	D-Glyceraldehyde 3-phosphate <-> Glycerone phosphate	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56853	D-Glyceraldehyde 3-phosphate + Phosphate + NAD+ <-> NADH + H+ + 3-Phospho-D-glyceroyl phosphate	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56854	ATP + 3-Phospho-D-glycerate <-> ADP + 3-Phospho-D-glyceroyl phosphate	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56855	3-Phospho-D-glycerate <-> 2-Phospho-D-glycerate	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56856	2-Phospho-D-glycerate <-> Phosphoenolpyruvate + H2O	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56857	Pyruvate + ATP <-> Phosphoenolpyruvate + ADP	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56858	Pyruvate <-> CO2 + Acetaldehyde	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56859	NAD+ + Ethanol <-> NADH + H+ + Acetaldehyde	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56860	ATP + H2O <-> ADP + Phosphate	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56861	ATP + AMP <-> 2 ADP	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56862	Glycerone phosphate + NADH <-> NAD+ + Glycerol	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56863	alpha-D-Glucose 6-phosphate + ATP <-> ADP + Glycogen	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56864	2 alpha-D-Glucose 6-phosphate + ATP <-> ADP + alpha,alpha-Trehalose	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>
56865	4 ATP + 3 NAD+ + 2 Acetaldehyde <-> 4 ADP + 3 NADH + H+ + Succinate	Saccharomyces cerevisiae	-	unknown	View	<input type="checkbox"/>


[remove selected Reactions](#)

[write spreadsheet](#) [write SBML](#) [more export formats](#)

[Back to Results](#)

Task: Search for 'author: Pritchard'

- select columns to export:
 - include 'rate equation' and 'parameter'
- export xls and save file

 **SABIO-RK**
Biochemical Reaction Kinetics Database

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Entries to Export: **19**

[Save Excelsheet](#)

Select Columns to Export

[Add all](#) 7 items selected [Remove all](#)

KineticMechanism	EntryID
Other Modifier	Reaction
Pathway	ECNumber
Product	Organism
PubMedID	Parameter
Publication	pH
SabioReactionID	Rate Equation
Substrate	





☐ Export Distinct Rows Only

[Export xls](#) [Export tsv](#) [Reset](#) [Back to Results](#)

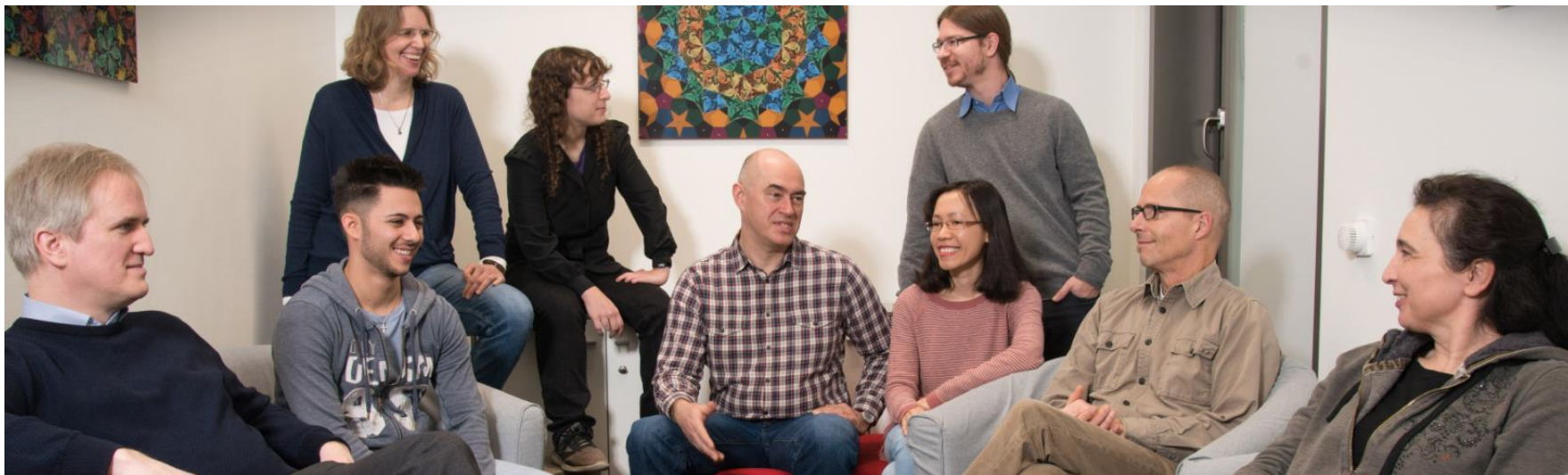
Preview of the first 5 entries

EntryID	Reaction	ECNumber	Organism	parameter.type	parameter.associ.	parameter.sts
56847	Glucose = Glucose -		Saccharomyces ...	Vmax		97.24
56847	Glucose = Glucose -		Saccharomyces ...	concentration	Glucose	0.002
56847	Glucose = Glucose -		Saccharomyces ...	concentration	Glucose	9.765223106
56847	Glucose = Glucose -		Saccharomyces ...	Km	Glucose	0.0011918
56847	Glucose = Glucose -		Saccharomyces ...	Ki	Glucose	9.1E-4
56848	ATP + alpha-D-Gl... 2.7.1.1		Saccharomyces ...	Km	ADP	2.3E-4
56848	ATP + alpha-D-Gl... 2.7.1.1		Saccharomyces ...	concentration	alpha-D-Glucose...	0.002675040
56848	ATP + alpha-D-Gl... 2.7.1.1		Saccharomyces ...	concentration	ATP	0.002525127
56848	ATP + alpha-D-Gl... 2.7.1.1		Saccharomyces ...	concentration	alpha-D-Glucose	9.765223106
56848	ATP + alpha-D-Gl... 2.7.1.1		Saccharomyces ...	volume		
56848	ATP + alpha-D-Gl... 2.7.1.1		Saccharomyces ...	Keq		2000.0
56848	ATP + alpha-D-Gl... 2.7.1.1		Saccharomyces ...	Vmax		236.7
56848	ATP + alpha-D-Gl... 2.7.1.1		Saccharomyces ...	Km	ATP	1.5E-4
56848	ATP + alpha-D-Gl... 2.7.1.1		Saccharomyces ...	concentration	ADP	0.001281967
56848	ATP + alpha-D-Gl... 2.7.1.1		Saccharomyces ...	Km	alpha-D-Glucose...	0.03
56848	ATP + alpha-D-Gl... 2.7.1.1		Saccharomyces ...	Km	alpha-D-Glucose	8.0E-5
56849	alpha-D-Glucose... 5.3.1.9		Saccharomyces ...	Vmax		1056.0
56849	alpha-D-Glucose... 5.3.1.9		Saccharomyces ...	concentration	beta-D-Fructose ...	6.249764055

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Thanks for your attention!

