



Please enter a search term

Enzyme, Ligand contains

add search field delete search field **start search**

Text-based queries

- Full-text Search
- Advanced Search
- Enzyme & Disease

Structure-based queries

- Ligand Substructure
- Metabolic Pathways
- Enzyme Structures

Explorer

- Enzyme Classification
- TaxTree
- Protein folding:

BRENDA Tutorial

Introduction to the Enzyme Information System

Visualization

- Word Map
- Genomes
- Functional Statistics
- Metabolic

ogy Reactions

Facts about BRENDA

- BRENDA (**BR**aunschweig **EN**zyme **DA**tabase)
- one of the most comprehensive enzyme information repositories
- all enzymes, classified by the Enzyme Nomenclature (IUBMB)
- data of molecular biology, biochemistry, medical research, and biotechnology
- furthermore BRENDA includes data from interconnected databases containing results from text mining methods and bioinformatic approaches
- BRENDA is freely available to the scientific community
- more than 80,000 visits of the BRENDA website each month
- major updates of the data in BRENDA are performed twice a year

History and major developments of BRENDA

- BRENDA was created at the former German National Research Center for Biotechnology (GBF, now HZI, Helmholtz Zentrum für Infektionsforschung, Braunschweig, Germany) in 1987
- BRENDA was originally published as a series of book
 - 1st Edition 1990-1997 (Enzyme Handbook)
 - 2nd Edition 2001-2013 (Handbook of Enzymes)
- BRENDA moved to the University of Cologne, Germany
- First online version in 1998 via the SRS system at the EBI
- First website of BRENDA in Cologne
- Transfer of BRENDA into a fully relational database system
- BRENDA moved back to Braunschweig in 2007
- BRENDA is now maintained and further developed at the BRICS - TU Braunschweig

Facts about BRENDA

The main categories are based on the **Enzymes** and the **Metabolites / Ligands**

Enzyme-related data encompasses information on:

- Enzyme and ligand nomenclature
- Organism
- Reaction and specificity
- Kinetic properties
- Structure and role of the ligands
- Stability information
- Ligand-enzyme information
- Enzyme sequence and structure
- Mutants and disease
- Occurrence, isolation, and properties



BRENDA is the most comprehensive information system on:

- 7270 EC Numbers (July 2017)
- more than 1.9 Mill. different enzymes
- more than 3 Mill. enzyme data, manually annotated from more than 145,000 literature references

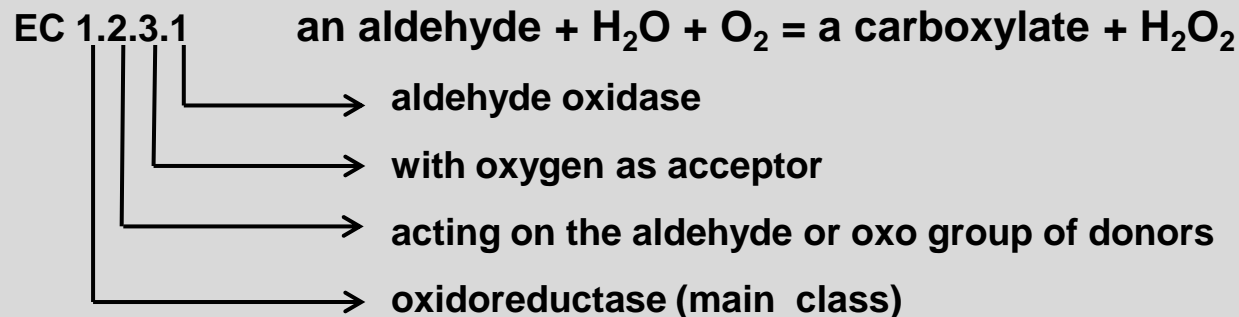
Enzyme Commission numbers (EC Numbers) are defined according to the catalyzed reaction by the IUBMB (International Union of Biochemistry and Molecular Biology)

Format: **Four** numbers separated by periods, e.g. 1.2.3.1

Numbers represent from left to right a progressively finer classification scheme

Main Enzyme Classes:

- 1 Oxidoreductases
- 2 Transferases
- 3 Hydrolases
- 4 Lyases
- 5 Isomerases
- 6 Ligases



(A)

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(B)

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Explorer

- Enzyme Classification
- TaxTree
- Protein folding: CATH / SCOPe
- Ontologies

Visualization

- Word Maps

Prediction

- Membrane Helices

Supporting

- BRENDA

The main search options:

- Quick access (A)
- and more specific queries (B)
- Classic View (C)
- ...

...further details in the corresponding BRENDA tutorials



EC-Number	Enzyme Name	Organism	Protein	Full text	Ligand	Advanced Search
<input type="text"/> Search Display <input type="text" value="10"/> entries						
Nomenclature		Reaction & Specificity			Functional Parameters	
<ul style="list-style-type: none"> Enzyme Names EC-Number 		<ul style="list-style-type: none"> Pathway Catalysed Reaction Reaction Type Natural Substrates & Products Substrates & Products Inhibitors Cofactors Metals/Ions Activating Compounds Ligands 			<ul style="list-style-type: none"> K_M Value k_{cat}/K_M Value K_i Value IC_{50} Value pI Value Turnover Number Specific Activity pH Optimum pH Range Temperature Optimum Temperature Range Kinetic ENzyme DATA 	
Organism-related information						
<ul style="list-style-type: none"> Organism Source Tissue Localization 						
Isolation & Preparation						
<ul style="list-style-type: none"> Purification Cloned Expression Renatured Crystallization 		<ul style="list-style-type: none"> Biochemicals Reactions 				
Stability		Enzyme Structure		Disease, Engineering & Application		
<ul style="list-style-type: none"> pH Stability Temperature Stability General Stability Organic Solvent Stability Oxidation Stability Storage Stability 		<ul style="list-style-type: none"> Sequence 3D-Structure Molecular Weight Subunits Posttranslational Modification 		<ul style="list-style-type: none"> Disease/ Diagnostics Engineering Application 		
				References		

BRENDA data and information fields „classic view“

Data sources & updates: Merge and process of data

Text mining data

FRENDA

Enzyme name + organism

AMENDA

Enzyme name + organism + occurrence

DRENDA

Disease-related enzyme data

KENDA Kinetic data

BRENDA

BTO
Tissue
Ontology

Manual annotation



IUBMB enzyme classes



Literature



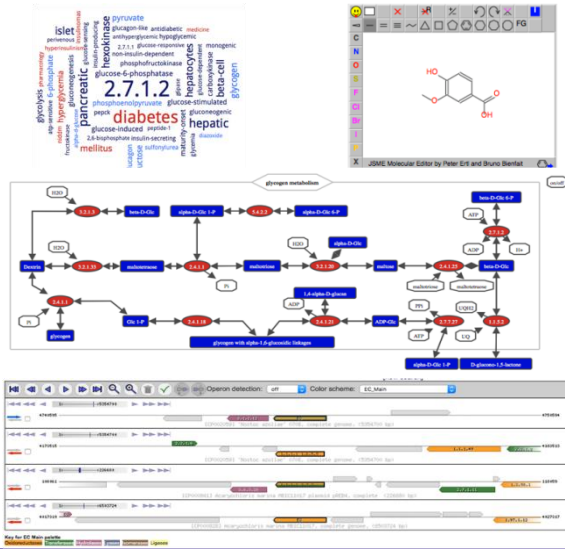
Literature annotation

BRENDA

The Comprehensive Enzyme
Information System



Visualization



External databases and ontologies

