



BRENDA Tutorial

Introduction to the Enzyme Information System

- Classic view
- Fulltext Search
- Advanced Search

- onal Enzyme Parameters
- neDetector
- emical Reactions

Use of this online v

. See terms of use.

Release 2015.1 (January 2015)

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) in 1987
- BRENDA was originally published as a series of book
 - 1st Edition 1990-1997 (Enzyme Handbook)
 - 2nd Edition 2001-... (Handbook of Enzymes)
- BRENDA moved to the University of Cologne
- 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 Department of Bioinformatics & Biochemistry at the 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



EC-Number Enzyme Name Organism Protein Full text Ligand Advanced Search

Search Display 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"> Biochemicals Reactions 	
<ul style="list-style-type: none"> Purification Cloned Expression Renatured Crystallization 		
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 Protein-Specific Search 	<ul style="list-style-type: none"> Disease/ Diagnostics Engineering Application
		References

BRENDA data and information fields „classic view“



BRENDA is the most comprehensive information system on:

- 6671 EC Numbers (January 2015)
- more than 1.9 Mill. different enzymes
- more than 3 Mill. enzyme data, manually annotated from more than 130,000 literature references

Enzyme Commission numbers (EC Numbers) are defined according to the catalyzed reaction

Enzyme nomenclature is defined by the IUBMB
(International Union of Biochemistry and Molecular Biology)

Format: **Four** numbers separated by periods, e.g. 1.2.1.2

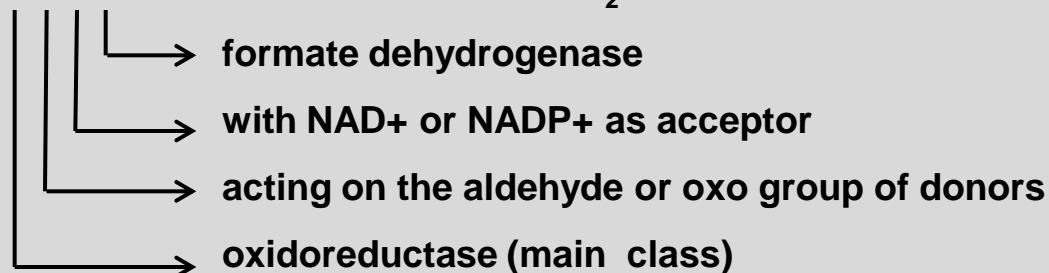
Numbers represent from left to right a progressively finer classification scheme

Main Enzyme Classes:

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

EC 1.2.1.2

Formate + NAD⁺ = CO₂ + NADH





(A)

Enzyme, Ligand contains

add search field delete search field start search

(B)

Classic view	Substructure Search	Sequence Search	Functional Enzyme Parameters
Fulltext Search	TaxTree Explorer	Genome Explorer	ED EnzymeDetector
Advanced Search	EC Explorer	Ontology Explorer	BKM Biochemical Reactions

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Two main search options:

- quick access (A)
- and more specific queries (B)

...further details in the corresponding BRENDA tutorials

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*

Manual annotation



IUBMB enzyme classes



Literature



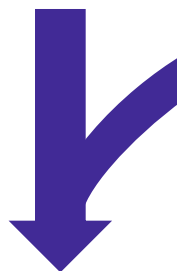
Literature annotation

External databases und ontologies



BRENDA

BTO
Tissue
Ontology



BRENDA