**Motivation**

The BRENDA database is the major information system for enzyme- and reaction-related biochemical research. The aim of the BRENDA project is to provide a continuous integration of new enzyme data and detailed information on enzyme occurrence and function. The sophisticated and flexible query system provides an easy access to complex data structures (numerical data, text, images, ontologies, hierarchical structures) and a variety of applications in life science.

**Challenges & Highlights**

A major challenge in life sciences is to cope with the rapidly growing amount of published literature references and to manually and automatically extract data from the mainly unstructured information in the literature. The data need to be interconnected with other repositories and databases to create an exhaustive view on all the enzymes and to provide an efficient access via elaborated query systems and visual presentation of the data.

Each single value in BRENDA is connected to the literature reference, the enzyme source, the tissue, the subcellular localization, and to a protein sequence.

The portal aims to provide an exhaustive collection of indexed literature references containing organism-specific enzyme information to complete the manually annotated 3 Mill. Data, by integration of text mining results and further automatic analysed data. BRENDA provides disease-related information on on impaired enzymes which have a major influence on the metabolism, regulation, and immunity etc. may cause severe diseases. The enzyme-disease relations are evaluated and classified using machine learning methods via Support Vector Machines.

190,000 small molecules or other ligands interacting with the enzymes as substrates, cofactors, inhibitors etc. can be searched and displayed performing a sophisticated substructure search.

The BRENDA developers and curators are also involved in international boards such as the IUBMB Enzyme Task Force and the IUBMB Biochemical Nomenclature Committee. The activities in the development of the BRENDA Tissue Ontology (BTO) is part of the leading international activities in the creation of ontologies and data semantics. The BTO is an encyclopedia of organs, tissues, and cell types.

**Potential Applications & Future Issues**

BRENDA is the major source for enzyme- and reaction-related biochemical research in life sciences. The comprehensive database is an essential repository in basic research of biochemistry, molecular biology, and systems biology as well as in medical research and biotechnology. Intensive interactions and discussions with network users during scientific congresses assure that BRENDA at all times is responsive to their demands. The continuous development ensures that BRENDA is remaining one of the world's most important biochemical information systems.

**Project abstract:**

The Comprehensive Enzyme Information System is the main collection of enzyme functional data and information in the world wide web.

BRENDA, BRaunschweig ENzyme DAtabase: a Database for Metabolic Research, Enzyme Technology and Systems Biology. The BRENDA enzyme database represents the largest repository of functional biochemical and molecular enzyme data, worldwide. BRENDA contains information on all characterized enzymes classified by the IUBMB (International Union of Biochemistry and Molecular Biology). More than 3 Mill. enzyme-specific
data from more than 130,000 literature references have been manually annotated and structured by experts from biochemistry, biology, and chemistry. These data encompass information on the catalyzed reaction, enzyme specificity, occurrence, stability, inhibitors, substrate, products, kinetic data, application etc. Furthermore BRENDA includes data from interconnected databases containing results from text mining methods and bioinformatic approaches. Each single value is connected to the literature reference and the source organism. BRENDA is freely available to the scientific community. More than 80,000 users visit the BRENDA website each month, mainly from North America, Asia, and Europe.

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