



DEVELOPMENT OF INTEGRATED DATABASE OF NEURODEGENERATIVE DISEASES (IDND)

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Abstract:

The Integrated Database of Neurodegenerative diseases is a database that documents all the Neurodegenerative diseases information. Neurodegenerative disease are caused due to loss of structure or function of neurons. This database is intended to provide the scientific, clinical, pathological, research communities with a comprehensive and integrated tool or database for browsing and efficiently extracting information about pathways, clinical information, protein information and protein interactions in biological processes. It is an integrated database as it is combination of three separate databases i.e. UniProtKB (protein information), KEGG (pathway), PubMed (disease articles). IDND is developed using WAMP (WAMP means Windows Apache MySQL PHP) is a platform of Web development under Windows. It allows you to develop dynamic Web sites with Apache server, PHP script language and MySQL is open source database.

INTRODUCTION

Neurodegenerative disease is an umbrella term for a range of conditions which primarily affect the neurons in the human brain. Neurons are the building blocks of the nervous system which includes the brain and spinal cord. Neurons normally don't reproduce or replace themselves, so when they become damaged or die they cannot be replaced by the body. Examples of neurodegenerative diseases include Parkinson's, Alzheimer's, and Huntington's disease etc. (we have included 18 diseases in IDND). Neurodegenerative diseases are incurable and debilitating conditions that result in progressive degeneration and / or death of nerve cells. This causes problems with movement (called ataxias), or mental functioning (called dementias). Dementias are responsible for the greatest burden of disease with Alzheimer's representing approximately 60-70% of cases. Degenerative nerve diseases affect many of your body's activities, such as balance, movement, talking, breathing, and heart function.

Many of these diseases are genetic. Sometimes the cause is a medical condition such as alcoholism, a tumor, or a stroke. Other causes may include toxins, chemicals, and viruses. Sometimes the cause is not known. Most of them have no cure. Treatments may help improve symptoms, relieve pain, and increase mobility. Many neurodegenerative diseases are caused by genetic mutations, most of which are located in completely unrelated genes. In many of the different diseases, the mutated gene has a common feature: a repeat of the CAG nucleotide triplet. CAG encodes for the amino acid glutamine. A repeat of CAG results in a polyglutamine (polyQ) tract. Diseases showing this are known as polyglutamine diseases. Polyglutamine: A repeat in this causes dominant pathogenesis. Extra glutamine residues can acquire toxic properties through a variety of ways, including irregular protein folding and degradation pathways, altered subcellular localization, and abnormal interactions with other cellular proteins.

IDND database:

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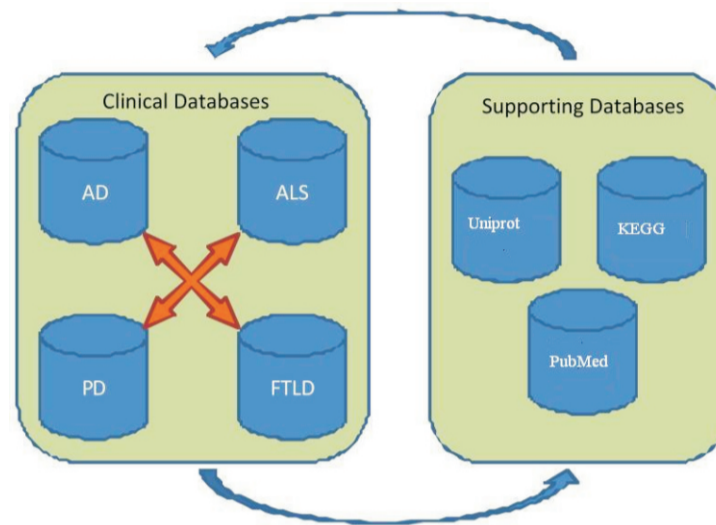


Figure 1: IDND is an integrated database of UniProtKB, KEGG, and PubMed.

PubMed database:

PubMed is a free database accessing primarily the MEDLINE database of references and abstracts on life sciences and biomedical topics. The United States National Library of Medicine (NLM) at the National Institutes of Health maintains the database as part of the Entrez system of information retrieval. PubMed was first released in January 1996.

UniProtKB/Swiss-Prot

UniProtKB/Swiss-Prot is a high-quality, manually annotated, non-redundant protein sequence database. It combines information extracted from scientific literature and bio curator-evaluated computational analysis. It provides information like,

- Protein and gene names
- Function
- Enzyme-specific information such as catalytic activity, cofactors and catalytic residues
- Subcellular location
- Protein-protein interactions
- Pattern of expression
- Locations and roles of significant domains and sites
- Ion-, substrate- and cofactor-binding sites

KEGG (Kyoto Encyclopedia of Genes and Genomes)

KEGG is a collection of online databases dealing with genomes, enzymatic pathways, and biological chemicals. The KEGG, the Kyoto Encyclopedia of Genes and Genomes, was initiated by the Japanese human genome program in 1995.[2] According to the developers they consider KEGG to be a "computer representation" of the biological system.[3] The KEGG database can be utilized for modeling and simulation, browsing and retrieval of data. It is a part of the systems biology approach. KEGG Pathways include Metabolism, Genetic Information Processing, Environmental Information Processing, Cellular Processes, and Human Diseases.

REQUIREMENTS:

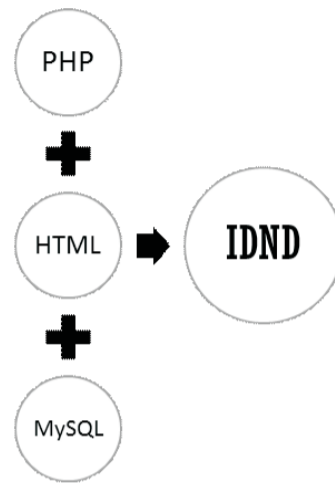


Figure 2: IDND is developed using PHP, MySQL and HTML.

WAMP (WAMP means Windows Apache MySQL PHP) is a platform of Web development under Windows. It allows you to develop dynamic Web sites with Apache server. It also possesses PHPMyAdmin and SQLite manager to manage more easily your databases. WAMP are packages of independently created programs installed on computers that use a Microsoft Windows operating system. WAMP is an acronym formed from the initials of the operating system Microsoft Windows and the principal components of the package: Apache, MySQL and one of PHP, Perl or Python. Apache is a web server. MySQL is an open-source database. PHP, Perl and Python are scripting languages that can manipulate information held in a database and generate web pages dynamically each time content is requested by a browser. Other programs may also be included in a package, such as PHPMyAdmin which provides a graphical user interface for the MySQL database manager. WAMP installs easily and it's very intuitive use allows quickly configuration. MySQL is currently the world's most popular and widely used open source database technology and data storage system.

Here are a few of the types of applications PHP and MySQL can help you create:

1. PRINTS (Protein Motif prediction)
2. ProDom (Protein Domain Identification)
3. Website Blogs
4. Facebook

STRUCTURE OF THE DATABASE

Level-0 DFD or Context Diagram

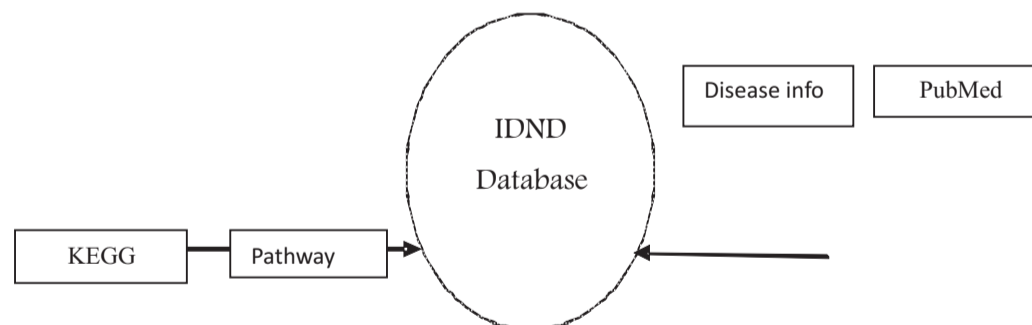


Figure 3: Context Diagram of IDND Database.

The Context Diagram shows the system under consideration as a single high-level process and then shows the relationship that the system has with other external entities (systems, organizational groups, external data stores, etc.).

Homepage of IDND:



Figure 4: Homepage of IDND database.

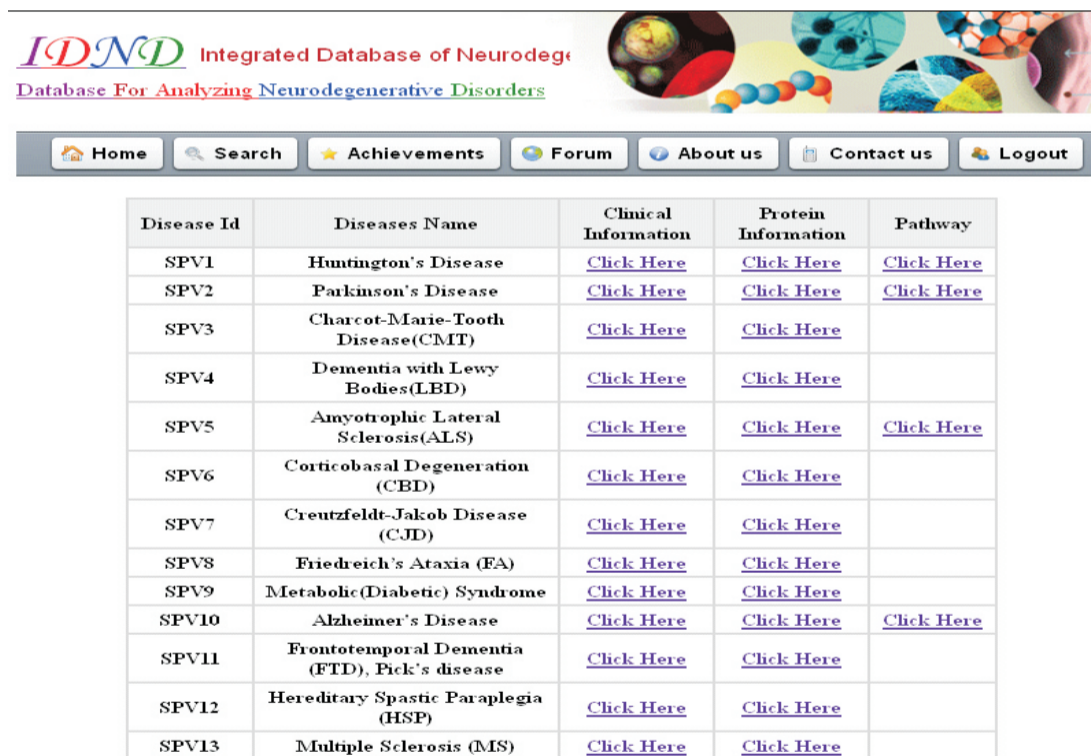


Figure 5: Search page of IDND database.

APPLICATIONS OF IDND DATABASE:

Clinical Applications:

Gene transfer and cell therapy, a Clinical Investigation Centre for biotherapies.
An electrophysiology laboratory.
Cell transplantation in patients with Parkinson's and Huntington's diseases.
In vivo gene therapy trial in Parkinson's disease.
Cortical high frequency stimulation for the treatment of Parkinson's disease and movement disorders.
Coordination of the national network for Huntington's disease

Pathological:

Idiopathic rapid-eye-movement (REM) and sleep behavior disorder (IRBD) represents the prodromal phase of a Lewy body disorder and that, with sufficient follow-up, most cases would eventually be diagnosed with a clinical defined Lewy body disorder, such as Parkinson's disease (PD) or dementia with Lewy bodies (DLB).

Research:

Neurodegenerative disease assays for high throughput drug screening and chemical genetics.
Identification of genetic, epigenetic and environmental risk and protective factors for Neurodegenerative Diseases.

Etiology:

Involvement of environmental mercury and lead in the etiology of neurodegenerative diseases.
Etiology of (CAG) n triplet repeat neurodegenerative diseases such as Huntington's disease is connected to stimulation of glutamate receptors.

Future Aspects:

IDND presently cannot share data on many computers in LAN, so it will be made online using Web services.
More detailed information like protein structure and structure information will be added.
We are planning to build visualization tool for protein structure.
IDND can also be made commercial for researchers and Neurosurgeons.

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