RAMEDIS: A WEB-BASED SYSTEM LINKING GENOTYPE AND PHENOTYPE OF RARE METABOLIC DISEASES

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Introduction

The defects of the DNA sequence of an organism in the form of different mutations are the cause of most different defects that represent themselves in the course of the development as observable or also not observable phenotypes. A starting point of supporting diagnosis and therapy are genotype phenotype-correlations based on clinical and genetic data of a patient.

The RAMEDIS system is a platform independent, web-based information system for genetic diseases on the basis of separate case reports. It was developed in close cooperation with clinical partners and collects information on rare metabolic diseases with extensive details, e.g. about occurring symptoms, laboratory findings, therapy and molecular data. By using largely standardized medical terms and conditions, the contents of the database is easy to compare and to analyze. In addition, a convenient graphical user interface is provided to the user by every common web browser. The system is available by the WWW portal **www.ramedis.de**. RAMEDIS supports an extendable number of different genetic diseases and enables co-operative studies. Additionally, by using RAMEDIS we expect advances in epidemiology, combination of molecular and clinical facts, generation of rules for therapeutic intervention and identification of new diseases.

RAMEDIS is used intensively by clinical partners, which proves the applicability of the system. So far our information system for mutations and its corresponding phenotypes contains more than 720 case reports that are characterized by altogether 4100 symptoms, 23000 laboratory values and further characteristics. This work was supported by the German Ministry of Education and Research in the German Human Genome Project by the grants 01KW9912 and 01KW0202.

System at a glance

General features

This information system is usable via **www.ramedis.de** with every common web browser (e.g. Internet Explorer or Mozilla Firefox) and needs no special software or hardware resources. RAMEDIS stores genotype-phenotype data in separate case reports with different levels of information (e.g. main data, molecular genetics, symptoms, treatment, references). Data security and protection are ensured by graduated access rights (guest, user, author, adminstrator) to the system. Consequently, only authors own full rights of access to their case reports and are allowed to edit the data. RAMEDIS bases on a relational data model with more than 50 tables and is realized by an Oracle database management system.

Applications

RAMEDIS was implemented to support research in epidemiology, genotype-phenotype correlation and to generate rules for therapeutic intervention. The system is also used for follow up of metabolic patients who need special dietary or medical treatment. A typical application is dietary treatment of patients with Phenylketonuria and blood phenylalanine monitoring. This enables correlation of genotype with blood phenylalanine concentration and/or phenylalanine tolerance.

Descriptive statistics

Controlled vocabulary

Diagnoses	:	366
Symptoms	:	635
Lab findings	:	1355

Amount of stored data

Authors	:	58
Case reports	:	723
Symptoms	:	4096
Lab findings	:	22785
Molecular genetics	:	325

Graphical user interface
Search and browse case reports

Using case reports

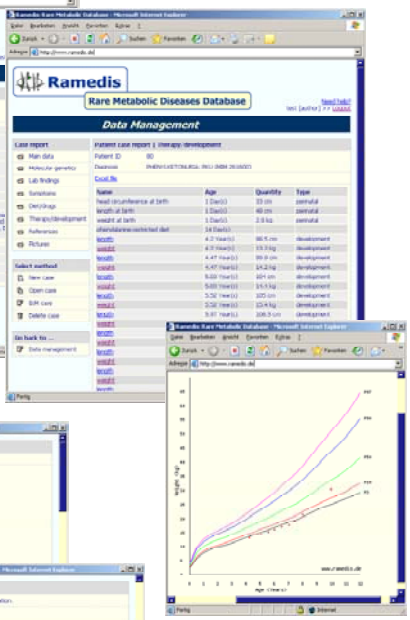
Case report coverage

- Main data
- Molecular genetics
- Laboratory values, symptoms, growth parameters, treatment
- References, Pictures

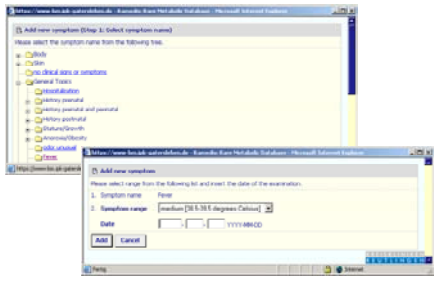
Data management

The graphical user interface of RAMEDIS supports search and exploration of case reports by elementary or combined parameters (e.g. diagnosis, laboratory values and symptoms). Authors can edit their case reports using controlled vocabulary and free-text data fields supported by software assistants. For better understanding the course of laboratory values and growth parameters is visualized by graphical illustrations. Clinical data can be exported to Excel files for further use.

Case report representation
Explore case report data



Data management assistant
Add data to your case reports



Graphical illustration
Visualize laboratory and growth parameters

Summary and outlook

We developed an information system with the name RAMEDIS to support the collection and retrieval of valuable patient data with rare metabolic diseases to link genotype and phenotype information. As only standardised data are allowed, the information will be usable for studies and statistical evaluation. This system can also be used to perform case-based reasoning queries. Other existing approaches covers only one single inborn error of metabolism. RAMEDIS offers the possibility to collect and retrieve data of different rare metabolic diseases world-wide via WWW with every common web browser. Using latest software architectures the provided applications are platform independent and easy to use. By this way new knowledge concerning the diseases could be gained and rules for therapeutic intervention could be developed.

Future development will include a cooperation with NCBIs phenotype database to increase the audience of our data. In addition, we research in the field of mining text for relevant information of mutations and its corresponding phenotypes from different sources (e.g. PubMed, OMIM) and their analysis using a medical case-based reasoning component.

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