Development of a server centre for the management and protection of worker health - REGETOX 2000

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Introduction

Occupational physicians and industrial hygienists concerned about toxicological health problems afflicting workers in chemical plants and waste industries are facing the challenge of mastering the vast amount of information currently available on toxic products, multiple and complex exposures, and their consequences on health. This information is available from multiple sources, notably international databases such as those of the Environmental Protection Agency (EPA, USA) or the Agency for Toxic Substances and Disease Registry (ATSDR). The advent of telematics enhances the phenomenon but also offers new prospects for improving the protection of workers at risk.

REGETOX 2000 is a multidisciplinary project involving university experts in occupational medicine, toxicology, and molecular biology, as well as industrial partners (occupational physicians and safety officers). In terms of medical informatics, the goals of the project are (i) to develop a local network between university and industrial partners; (ii) to set up a database of toxicological information; (iii) to establish links with other toxicological databases available on the Internet; (iv) to develop a server prototype for accessing specific databases and a working environment risk assessment package and (v) to set up new bioanalytical approaches to evaluating and quantifying the biological effects produced by toxic compounds and to evaluate individual susceptibility to these compounds.

Materials and methods

To reach these objectives, given the rapidly changing informatics environment, a detailed analysis of the needs was carried out and decisions were made about the hardware and software to be used.

Connecting the partners. The first task was to create a discussion forum by telematics, allowing university and industrial partners to know each other, communicate, and exchange information in full security.

Need analysis. The needs related to setting up a server of toxicological information were carefully analysed. It was necessary to check whether the industrial partners had the adequate equipment to join the network and the required training to use it.

Database selection. Current toxicological databases were analysed in detail with the other partners in the project. The most important toxicological databases available on the Internet or on CD-ROM were selected.

Hardware and software. A choice was made about the server and operating system. Likewise, access to the server and its databases by industrial partners was analysed and determined. The risk assessment package was carefully tested.

Education and Training. Partners' needs with respect to education and training in health informatics were assessed. Training sessions were prepared for using the system, accessing databases on the Internet, and using the risk assessment package.

Biomarkers. As biomarkers of effect, DNA and haemoglobin adducts were determined. DNA adducts were measured by post-labelling. Adducts to haemoglobin were detected and quantified by specific GC-MS and LC-MS methods.
To evaluate individual susceptibility, genotyping experiments focusing on expression of drug-metabolising enzymes were performed.

Evaluation. At each step of the project, evaluation sessions took place among university and industrial partners to assess the situation, analyse difficulties, and improve the system.

Results

The diagram representing the telematics network of toxicological information is displayed in Figure 1.

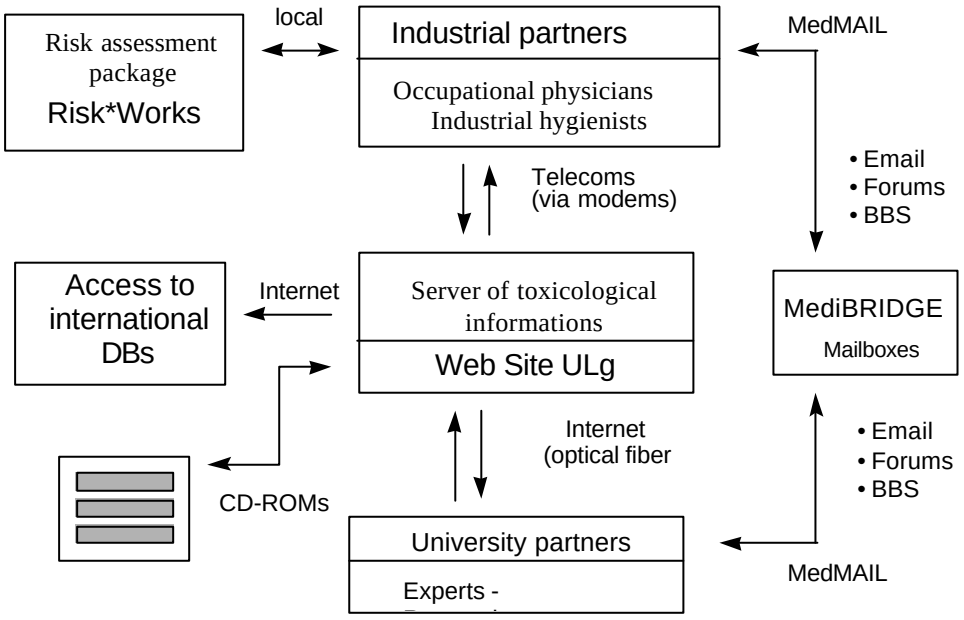

Figure 1. Project REGETOX 2000. Telematics network of toxicological information.

MedMAIL. University and industrial partners used the MedMAIL package (MediBRIDGE, S.A., Belgium) as electronic mailing and discussion forum. Access to MedMAIL is by modem and with a unique telephone number preregistered in MedMAIL.

Web site REGETOX. From the start of the project, a web site was created at the University of Liège. It is accessible at the following address: http://www.regetox.med.ulg.ac.be. It provides information on the REGETOX project (both in French and English), its partners, objectives, and achievements. It is connected to the SSTC web site. It provides direct access to a series of toxicological databases selected by university experts for their relevance (e.g., AIHA, EPA, ICIC, NIOSH, TOXNET), thus avoiding long searching sessions on the Web.

Server of toxicological information. The system is based on a COMPAQ Pro 180 MHz server, with a hard disk of 9GB, 80MB RAM, and a battery of 4 CD-ROMs (12x), under a Windows NT 4.0 server. Partners can access the server by modem and a password, to consult two costly databases on CD-ROMs (network version), acquired for their relevance, i.e., the MSDS and ChemInfo databases of the CCOHS (Canadian Center for Occupational Health and Safety). The group license of these DBs has led to substantial cost reductions.

Risk assessment program. The Risk*Works package, developed by the Hampshire Research Institute (USA), runs on a PC under Windows 3.11. A demo version of the program can be downloaded from the server for training purposes.

Remote access to server. To access the server from a partner's PC, a REGETOX menu under Windows 95 has been designed, grouping all services offered. This simple approach makes it possible to use MedMAIL, consult the REGETOX web page, use the Risk*Work package, and consult the MSDS and ChemInfo databases, once the connection has been established.

Biomarkers. Sensitive and specific methods were developed successfully. They were applied to a few dozen blood samples collected from workers exposed to hazardous substances.

Education and Training. The server has become an ideal tool for teaching university students and training industrial physicians and hygienists involved in protecting the health of exposed workers.

Conclusion

A prototype server has been developed in the context of the REGETOX 2000 project. It entails a web site, multiple links to internationally recognised toxicological databases, and email and discussion forum facilities. It also allows access via a modem and a special password to two specific and particularly relevant databases, ChemInfo and MSDS. A demo version of the risk assessment package can be downloaded for testing. The system is fully operational 24 hours a day and should evolve in the future to a single access via the Internet.