A Web-Based Multi-Database System Supporting Distributed Collaborative Management and Sharing of Microarray Experiment Information

Sarah Burgarella, Dario Cattaneo, Marco Masseroli Ph.D.
BioMedical Informatics Laboratory, Bioengineering Department, Politecnico di Milano, Milan - Italy

ABSTRACT
We developed MicroGen, a multi-database Web based system for managing all the information characterizing spotted microarray experiments. It supports information gathering and storing according to the Minimum Information About Microarray Experiments (MIAME) standard. It also allows easy sharing of information and data among all multidisciplinary actors involved in spotted microarray experiments.

INTRODUCTION
Spotted cDNA microarray is one of the most diffuse technologies among biomolecular gene expression techniques. It is based on complex procedures entailing several experimental steps and actors that produce high-throughput experimental data. During an experiment, involved actors need to access and share specific experiment information according to their roles. Furthermore, complete information describing all experimental steps must be orderly collected to allow unambiguous interpretation of data and potential verification of the results. To satisfy such requirements, we developed MicroGen, a MIAME standard compliant information system for managing all data completely characterizing different spotted microarray experiments.

MATERIALS AND METHODS
MicroGen architecture is based on a MS-Access relational multi-database structure. The central database collecting information of each performed experiment has been designed according to the Minimum Information About Microarray Experiments (MIAME) standard, developed by the Microarray Gene Expression Data (MGED) society and illustrated in detail in the MIAME checklist [1]. We created different sets of database tables, reflecting experimental workflow, to store descriptions of experiment design, used samples, preparation extraction and labeling, array design, hybridization procedures and parameters, measurement information and specifications. All data regarding the clones available for spotting (i.e. type, name, identification code, and characteristics) are orderly stored in additional databases customizable according to the used types of microarrays.

MicroGen core system is constituted of Active Server Page scripts, and uses Microsoft ActiveX Data Object technology and Standard Query Language to connect to the database management system. MicroGen graphic user interface, implemented as Web pages using Hyper Text Markup Language and Javascripts, enables connecting user Web browsers to the central Web server core system.

RESULTS AND DISCUSSION
MicroGen enables sharing information among four types of multidisciplinary actors involved in spotted microarray experiments: the researcher, who designs and requests a specific microarray experiment, fills out the initial required MIAME fields describing experiment design, used samples, preparation extraction and labeling, and accesses all information and experiment results; the spotting operator, the hybridization operator and the image processing operator, who receive new experiment requests, perform required tasks, and input in MicroGen system the corresponding MIAME fields (i.e. array design, hybridization procedures and parameters, and measurement information and specifications, respectively). At any time, all users involved in an experiment can verify its processing status and read all compiled MIAME information. Thanks to all implemented control and workflow procedures, our system ensures microarray experiment information management and integrity from the experiment design to its conclusion. MicroGen is freely available at http://www.bioinformatics.polimi.it/MicroGen/.

CONCLUSIONS
MicroGen is a MIAME compliant information system that allows managing information regarding all steps performed in spotted microarray experiments and sharing it among all involved actors and roles.

REFERENCES