Abstract for invited oral presentation at ISEA meeting, Durham, NC, October 15-19, 2007

TOXICO-CHEMINFORMATICS: NEW AND EXPANDING PUBLIC RESOURCES TO SUPPORT CHEMICAL TOXICITY ASSESSMENTS

Ann Richard[1*], Maritja Wolf [2], Richard Judson[1]

[1]National Center for Computational Toxicology, US EPA, RTP, NC;
[2]Lockheed Martin, Contractor to the US EPA, RTP, NC;
[3]Bioinformatics Graduate Program, NC State University, Raleigh, NC 27599.
[*]richard.ann@epa.gov

High-throughput screening (HTS) technologies, along with efforts to improve public access to chemical toxicity information resources and to systematize older toxicity studies, have the potential to significantly improve information gathering efforts for chemical assessments and predictive capabilities in toxicology. Important developments include: 1) large and growing public resources that link chemical structures to biological activity and toxicity data in searchable format, and that offer more nuanced and varied representations of activity; 2) standardized relational data models that capture relevant details of chemical treatment and effects of published in vivo experiments; and 3) the generation of large amounts of new data from public efforts that are employing HTS technologies to probe a wide range of bioactivity and cellular processes across large swaths of chemical space. By annotating toxicity data with associated chemical structure information, these efforts link data across diverse study domains (e.g., 'omics', HTS, traditional toxicity studies), toxicity domains (carcinogenicity, developmental toxicity, neurotoxicity, immunotoxicity, etc) and database sources (EPA, FDA, NCI, DSSTox, PubChem, GEO, ArrayExpress, etc.). Public initiatives are developing systematized data models of toxicity study areas and introducing standardized templates, controlled vocabularies, hierarchical organization, and powerful relational searching capability across captured data. Cheminformatics and data models, in turn, are providing the underpinning for the large public HTS efforts of the NIH Molecular Libraries Initiative, as well as new toxicity-targeted HTS programs within the EPA and the NIEHS National Toxicology Program. These initiatives are using chemicals to probe biological space and generating "biological profiles" of chemicals that, along with chemical structure considerations, offer the promise of providing richer, and more relevant and predictive associations to in vivo responses. *This work was reviewed by EPA and approved for publication, but does not necessarily reflect EPA policy.*