U.S. EPA National Center for Computational Toxicology
Publication Background Statement December 15, 2008
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The Toxicity Data Landscape for Environmental Chemicals

This paper, published in Environmental Health Perspectives, is authored by staff of the EPA Offices of Research and Development, Pesticide Programs, Pollution Prevention and Toxics, Water, Science Coordination and Policy and the Great Lakes National Program Office. We surveyed the major types of chemicals regulated by the EPA and compiled a non-redundant list of these chemicals to provide candidates for the ToxCast screening and prioritization program (http://www.epa.gov/ncct/toxcast). The chemicals considered are high- and medium production volume chemicals (HPVs and MPVs), pesticide and antimicrobial active compounds, pesticidal inerts, candidate air and water pollutants, potential persistent or bioaccumulative chemicals, chemicals proposed for testing in assays of the EPA Endocrine Disruptor Screening Program (EDSP), chemicals tracked by the Toxics Release Inventory (TRI) Program, and chemicals evaluated as part of the Integrated Risk Screening System (IRIS). The final list contained 9,912 unique chemicals.

This paper also evaluated how much data were available to help evaluate the toxicity of these chemicals. Data were compiled from over 200 public sources into a central database called ACToR (Aggregated Computational Toxicology Resource, http://actor.epa.gov/actor). Sources of data included the EPA, FDA, NIH, other state and federal governmental agencies in the U.S., Canada, Europe and Japan, WHO, academic groups, industry and non-governmental organizations. Types of data collected included chemical identity and structure, physical-chemical properties, *in vivo* toxicology, chemical use levels, and regulatory information.

The conclusions of this paper are:

1. Of the 9,912 chemicals on this list, at least limited acute hazard data was publicly available on 66%. Conversely, no toxicology data was available on 34%.
2. Data on specific disease endpoints was more limited: Carcinogenicity: 26%; Developmental Toxicity: 29%; Reproductive Toxicity: 11%; Genotoxicity: 28%
3. This analysis helps define the set of chemicals that can be used to train and validate models linking in vitro assays with in vivo animal toxicity, as part of the ToxCast program.

While toxicity data on many existing chemicals is insufficient, there is a growing realization that the traditional means of comprehensive laboratory animal testing is not practical and cannot keep pace with the demand. This is driving the need for faster, cheaper, and scientifically-superior methods for screening, prioritizing and testing large inventories of chemicals. In some cases, the Agency uses existing information such as exposure, predictive computer models (e.g., SAR/QSAR), acute or in vitro data to prioritize chemicals for level of concern and perhaps further evaluation. The EPA ToxCast program is developing systematic approaches for screening and prioritization using in vitro testing methods developed largely by the pharmaceutical industry.

For more information on this paper, ACToR, or the EPA ToxCast program, contact: Richard Judson (judson.richard@epa.gov, 919-541-3085) or David Dix (dix.david@epa.gov, 919-541-2701).