

## New developments in exposure assessment: The impact on the practice of health risk assessment and epidemiological studies

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### Abstract

The field of exposure assessment has matured significantly over the past 10–15 years. Dozens of studies have measured the concentrations of numerous chemicals in many media to which humans are exposed. Others have catalogued the various exposure pathways and identified typical values which can be used in the exposure calculations for the general population such as amount of water or soil ingested per day or the percent of a chemical than can pass through the skin. In addition, studies of the duration of exposure for many tasks (e.g. showering, jogging, working in the office) have been conducted which allow for more general descriptions of the likely range of exposures. All of this information, as well as the development of new and better models (e.g. air dispersion or groundwater models), allow for better estimates of exposure. In addition to identifying better exposure factors, and better mathematical models for predicting the aerial distribution of chemicals, the conduct of simulation studies and dose-reconstruction studies can offer extraordinary opportunities for filling in data gaps regarding historical exposures which are critical to improving the power of epidemiology studies. The use of probabilistic techniques such as Monte Carlo analysis and Bayesian statistics have revolutionized the practice of exposure assessment and has greatly enhanced the quality of the risk characterization. Lastly, the field of epidemiology is about to undergo a sea change with respect to the exposure component because each year better environmental and exposure models, statistical techniques and new biological monitoring techniques are being introduced. This paper reviews these techniques and discusses where additional research is likely to pay a significant dividend. Exposure assessment techniques are now available which can significantly improve the quality of epidemiology and health risk assessment studies and vastly improve their usefulness. As more quantitative exposure components can now be incorporated into these studies, they can be better used to identify safe levels of exposure using customary risk assessment methodologies. Examples are drawn from both environmental and occupational studies illustrating how these techniques have been used to better understand exposure to specific chemicals. Some thoughts are also presented on what lessons have been learned about conducting exposure assessment for health risk assessments and epidemiological studies.

*Keywords:* Exposure assessment; Health risk assessment; Epidemiological studies