Exposure as a principle of risk assessment

Paul Jagals
School of Population Health, University of Queensland

More has arguably been written about the concept of human exposure to hazardous environmental substances than about some of the important concepts that it forms part of, such as epidemiology and predictive risk assessment. For instance, a particular approach to Environmental Health impact assessment (EHIA) would seek to combine risk assessment and causality tracking, thus placing exposure assessment central within an EHIA. Exposure is and critical to the assessment of the likelihood (risk) of a health outcome (predictive by nature) and also to track causality of disease (epidemiologic in nature). This presentation focuses on exposure assessment, paying particular attention to children’s environmental health risks. With rapid population growth placing increasing pressure on country level health budgets, predicting health outcomes in child populations has become important for predicting future economic and social burdens of adverse environmental health conditions. Such prediction depends almost entirely on an individual’s response to a contaminant dose (i.e. dose response) the ultimate product of exposure assessment. Response (i.e. disease) assessment (within the process of risk assessment) remains problematic even in these days of advanced technology and knowledge. Many of the dose-response values available in guidelines and standards are based on animal and human volunteer studies as well as other inferences, and are often not useful for accurate risk assessment. The responses of children to environmental exposures need particular attention. This meeting will have shown that children, for a variety of reasons, respond very differently to environmental exposures compared to adults. Accurate and plausible measurement of children’s exposures and responses will therefore go a long way to help build our knowledge of reliable dose-response assessment. Exposure is often defined as the state of being laid open or bare, i.e. an openness to danger. This definition may be taken further, i.e. the accessibility to anything that may detrimentally affect a child. These definitions are somewhat open to exploitation since they imply that being in the direct or indirect vicinity of a hazardous substance constitutes exposure and therefore a risk. While an external exposure pathway can exist under such a condition, other information is required to demonstrate that exposure is likely. Otherwise it is an incomplete exposure pathway and exposure should not be expected to occur. A final critical part of assessing exposure is to incorporate information on the internal exposure pathway i.e. how a contaminant would fare after entering the human body. It is only when these exposure pathways are integrated and assessed as a whole, that we can finally predict the health risk of people exposed to hazardous environmental conditions.