

Ministry of the Environment programs and initiatives

Multimedia health risk assessment

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A multimedia health risk assessment is conducted when chemical contaminants are found at levels that raise concern about potential risk in the community. The multimedia approach to health risk assessment examines total exposure to contaminants through a number of possible pathways, such as air, soil, drinking water and food.
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A multimedia health risk assessment is conducted to gather information in order to understand whether or not environmental health risk is present in a community and, if so, how much. The purpose is to predict, as much as scientifically possible, the health implications of exposure to certain contaminants over time. For example, a study might be conducted to assess a community's risk from exposure to lead or arsenic.

The Ministry of the Environment has conducted these studies in Port Hope, Cornwall, Port Colborne, Windsor and Hamilton.

An assessment examines the various means of exposure, as well as the levels of exposure, to a contaminant. It not only predicts the likelihood of a health risk, but also helps identify actions needed to reduce that risk. It does not, however, provide a diagnosis of the present health status of people living in the community.

There is always some uncertainty in health risk assessment. Science cannot explain everything about the effects of every chemical and how it acts in the environment. For many substances there are no known, or established, acceptable exposure limits. Actual risks cannot be precisely determined. Because of the uncertainties, health risk assessments are based on careful assumptions.

The health risk assessment approach

There are four steps in the process of health risk assessment: hazard identification, dose-response assessment, human exposure assessment and risk characterization.

Hazard identification provides a preliminary identification of potential harmful health effects resulting from exposure to a contaminant. Scientific literature is examined to identify any known, undesirable health effects associated with a substance.

In **dose-response assessment**, information is gathered from various agencies to determine the existing acceptable intake or known health guidelines for a substance. These include the World Health Organization, Health Canada, the International Agency for Research on Cancer and the U.S. Environmental Protection Agency. The purpose is to predict the relationship between exposure to a contaminant and the likelihood of negative effects. That is, at what dose (or intake level) are harmful effects likely to occur?

Human exposure assessment involves collection of environmental samples from a particular site or community. Depending on the nature of the study, the human exposure assessment may involve collecting air, water, dust, soil or other samples from the area suspected of contamination. It could also include sampling body fluids (like urine or blood) or tissues. Questionnaires are sometimes included to help assess individual and community exposure factors. That is to determine what activities or behaviours may expose an individual to contamination.

Where conditions do not allow for direct collection of data, scientists will use computer modelling to fill in gaps in available information. Models can be used to estimate the levels of contamination in air or soil or to look at how those levels might change over time under different conditions.

Information gathered in a human exposure assessment identifies the major pathways of exposure (e.g., air, water, food), the levels of exposure from each pathway, and the total exposure from all pathways that contribute to the health risk of concern. That information is then used to predict exposure levels for the typical adult and child, as well as for those involved in activities such as gardening.

Young children are assessed as a special group because they may be more sensitive to the effects of certain contaminants. They may also have more contact with soil and dust than adults do, and so are at greater risk of taking in contaminants. Their level of risk may therefore be higher.

Risk characterization, the final step in the process, assesses the likelihood of health risk based on the information gathered in the first three steps. The risk assessment does not provide the actual risk for a specific person but rather the predicted range of risk to residents in a general area.

Levels of exposure found in a health risk assessment are compared with known acceptable guidelines for contaminants. The comparison helps determine whether the level of exposure is higher or lower than the acceptable limits.

The findings of a health risk assessment also help determine what actions, if any, are needed to reduce health risk in the community and which actions would be the most effective in reducing risks.

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