



## LAND RESEARCH PROGRAM

### ASSESSING HUMAN HEALTH RISKS AT CONTAMINATED SITES BY LAND RESEARCH AND HUMAN HEALTH RISK ASSESSMENT PROGRAMS

#### Issue:

The U.S. Environmental Protection Agency's (EPA) Superfund program is called upon to determine a health-based need for cleanup of a contaminated site and to determine the level of cleanup required to protect human health and the environment. One of the primary tools used to evaluate these sites is human health risk assessment. Risk assessment can be used to evaluate the potential of an environmental contaminant to result in adverse human health effects to an exposed population. This evaluation is based on all applicable peer-reviewed scientific information.

The process of developing a risk assessment, as outlined by the National Academy of Sciences, includes four primary steps:

- *Hazard identification*
- *Dose-response assessment*
- *Exposure assessment*
- *Risk characterization*

The questions asked in a risk assessment included the following:

What types of health problems are likely to be caused by substances in the environment (*hazard identification*), how likely is it that people will experience problems when exposed at different levels (*dose-response assessment*), and what is the extent of human exposure to those agents (*exposure assessment*)?

A risk assessment also includes a statement that integrates the information on hazard, dose-response, and exposure and may provide an estimate of the likelihood that exposed populations or individuals will be harmed and to what degree (*risk characterization*). Thus, risk assessments may contain both a detailed narrative (*qualitative risk information*) and numerical estimates of risk (*quantitative risk information*). An important aspect of a risk assessment is discussion of the strengths and weaknesses of the supporting scientific information and, if appropriate, quantitation of the uncertainties in the assessment. Uncertainty occurs because of a lack of knowledge. Uncertainty can often

be reduced by collecting more and better data.

#### Scientific Objective:

EPA's Office of Research and Development (ORD) supports the Superfund program's efforts to address human health risk at contaminated sites by conducting research that addresses significant scientific issues that are common to all risk assessments. Toxicological studies and computer modeling for carcinogenic and other health effects are also conducted. Research in these areas often results in reducing uncertainties in risk assessments.

In addition, the expanding capability for obtaining and interpreting genomic information presents ORD with a major challenge for incorporating genetic data into risk assessments. Genomics is expected to serve as an additional tool for evaluating the exposure to and effects of environmental contaminants. In response to the EPA's Interim Policy on Genomics in 2002, an EPA task force developed a report on the

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implications of genomics for regulatory and risk assessment applications. More information can be found at:

[www.epa.gov/osa/genomics.htm](http://www.epa.gov/osa/genomics.htm)

ORD also recognizes that humans are not typically exposed to a single environmental contaminant but rather to mixtures of chemical contaminants in variable doses and irregular exposure patterns. In 2000, ORD issued guidance for assessing the risk of chemical mixtures and continues to seek ways to enhance the science for making these more difficult assessments. More information can be found at:

[www.epa.gov/hhrp/quick\\_finder/chemical.html](http://www.epa.gov/hhrp/quick_finder/chemical.html) and [www.epa.gov/ncea/cfm/recordisplay.cfm?deid=149983](http://www.epa.gov/ncea/cfm/recordisplay.cfm?deid=149983)

### Application and Impact:

ORD develops key human health risk information which is used in Superfund's risk assessment activities. The most important of these information resources is EPA's Integrated Risk Information System (IRIS) which is used by state, tribal, and federal environmental regulatory programs, as well as the international community.

IRIS is the Agency's primary resource providing human health risk information on over 540

environmental contaminants. IRIS provides *hazard identification* and *dose-response assessment* information but does not provide situational information on individual instances of exposure. Combined with specific exposure information, the data in IRIS can be used to develop a risk assessment that includes the characterization of the public health risks of a given chemical in a given situation. IRIS assessments are subjected to rigorous independent peer review and public review and comment (see [www.epa.gov/iris](http://www.epa.gov/iris)).

In addition, human health risk information on some environmental contaminants of interest to the Superfund program is not found on IRIS. In those cases, Provisional Peer-Reviewed Toxicity Values (PPRTVs) are prepared on an ongoing basis at the request of the Superfund program. PPRTVs are derived after a review of the relevant scientific literature, using the same methods, sources of data, and Agency guidance for value derivation generally used by the IRIS Program. All provisional toxicity values receive independent, external peer review.

### REFERENCES:

EPA's Research on Risk Assessment Web site: [cfpub.epa.gov/ncea/cfm/nceariskassess.cfm?ActType=RiskAssess](http://cfpub.epa.gov/ncea/cfm/nceariskassess.cfm?ActType=RiskAssess)

Human Health Research Program Web site: [www.epa.gov/ord/npd/hhrp/index.html](http://www.epa.gov/ord/npd/hhrp/index.html)

Tools for Human Health Risk Assessment Web site: [www.epa.gov/oswer/riskassessment/toolth.htm](http://www.epa.gov/oswer/riskassessment/toolth.htm)

U.S. Environmental Protection Agency. Risk Assessment Guidance for Superfund: Volume 1. Human Health Evaluation Manual (Part A). EPA/540/1-89/002, Washington, DC, 1989.

U.S. Environmental Protection Agency. Risk Assessment Principles & Practices, EPA/100/B-04/001, Washington, DC, 2004. [www.epa.gov/OSA/pdfs/ratf-final.pdf](http://www.epa.gov/OSA/pdfs/ratf-final.pdf)

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