
Decision-Making & Communicating Under Uncertainty at EPA: Questions About Probabilistic Risk Assessment

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Definitions: Probabilistic Risk Assessment (PRA)

- n PRA is a systematic and comprehensive methodology to evaluate risks associated with a complex engineered technological entity (such as an airliner or nuclear power plant, Wikipedia)
- n PRA is a risk assessment that yields a probability distribution for risk, generally by assigning a probability distribution to represent variability or uncertainty in one or more inputs to the risk equation (EPA Superfund RAG 2001)

Committee Questions

- n Are there benefits and drawbacks for more PRAs?
- n When would it be beneficial to do a PRA?
- n Examples of decisions communicated well?
 - q Not so well?
- n Recommendations for EPA when making decisions under uncertainty
 - q Communication strategies?

Benefits & Drawbacks: PRAs

n Compared to Deterministic Risk Assessment

- q Data Input
- q Risk estimates
- q Resources
- q Risk Communication
- q Uncertainties
- q Regulatory concern
- q Data analysis
- q Sensitivity analysis

n (Draft Preliminary EPA Report November 10, 2003)

Benefits & Drawbacks-continued

- n EPA OPP staff listed twelve advantages of PRAs (Draft report 2003)
- n Agency policy: tiered risk assessments, from simple to complex
- n More complex= more resources
- n PRA=higher level of sophistication=difficult to communicate to nonPRA-experts=almost everyone

Question about PRAs

- n How many has EPA performed?
 - q OPP? OSWER? ORD?
- n Can the advantages be demonstrated in quantifying uncertainty and indentifying data gaps?
- n With the use of more data and reduced uncertainty, are the risk estimated more robust? Are they higher or lower than if deterministic approaches had been used?

Communication Issues

- n What criteria should be used to determine if a decision was well communicated?
 - q No press frenzy?
 - q No lawsuits?
 - q Apparent acceptance by interested parties?
- n Existing Principles for Communicating about Risk
 - q NAS publications, EPA publications,
 - q Risk in Perspective (Thompson, 2004)



FIGURE 2.2 SOURCE: Drawing by Richter; ©1988 The New Yorker Magazine, Inc.



Toxicity Testing in the 21st Century: A Vision and Strategy

Committee on Toxicity Testing and Assessment of
Environmental Agents


Board on Environmental Studies and Toxicology

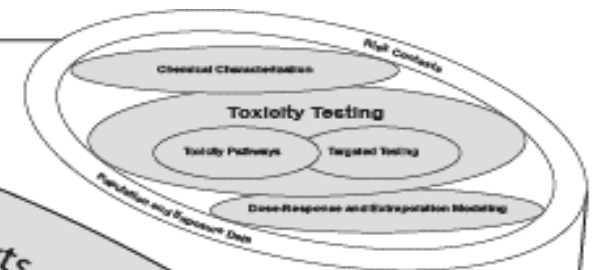
Institute for Laboratory Animal Research

Division on Earth and Life Studies

National Research Council

**A Framework
for
Toxicity Testing in the 21st Century**

 Vision Figure



Risk Contexts

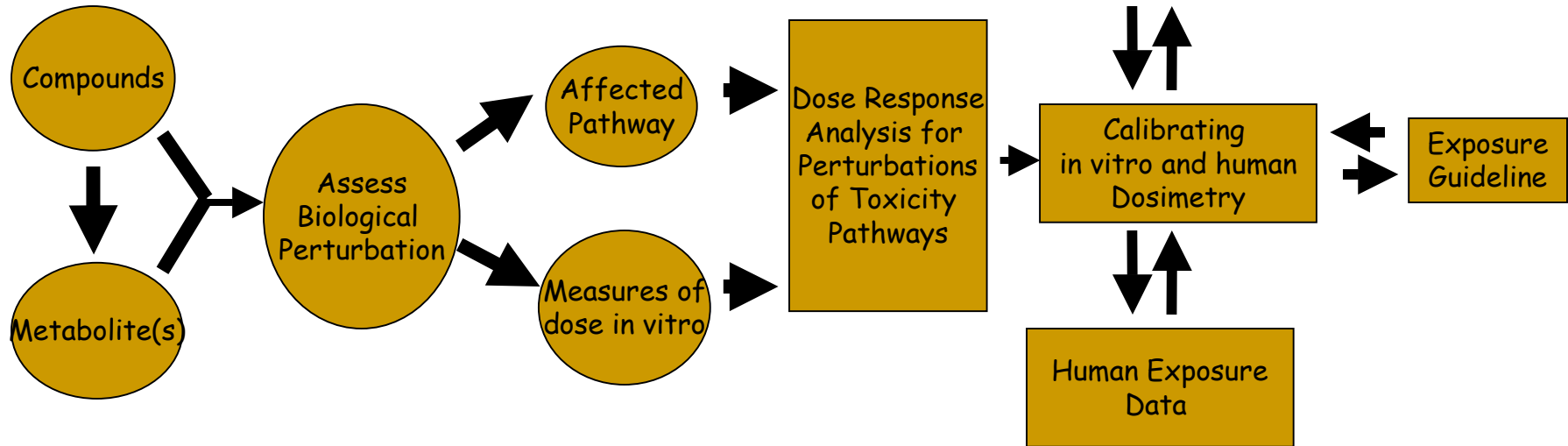
- Evaluation of new environmental agents.
- Evaluation of existing environmental agents.
 - Evaluation of a site.
 - Evaluation of potential environmental contributors to a specific disease.
 - Evaluation of the relative risks associated with environmental agents.

Toxicity Testing and Risk Assessment

Dose Response Assessment


Chemical Characterization

Mode of Action



Hazard Identification

Risk Characterization

- 
- n Paradigm shift away from apical endpoints to perturbation of toxicity pathways
 - n Will provide much broader coverage of the universe of environmental agents that warrant our attention
 - n Substantial commitment of resources will be required to implement the vision
 - n Will require support of the scientific community, regulators, law-makers, industry, and the general public
 - n *Effective communication of the vision is key to its success*