

Overview of Risk Assessment:
Questions, challenges, limitations...
and implications for nutrient-related risks

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February 28, 2007

THE PRINCIPAL QUESTIONS FOR RISK ASSESSMENT

- 1) What is the probability that adverse health effects will occur in individuals exposed to an agent or activity?
- 2) Under what conditions of exposure to an agent or activity are individuals unlikely to incur adverse health effects?

Agent \approx chemical, biological, or physical

TYPES OF QUESTIONS NOT APPROPRIATE FOR RISK ASSESSMENT

- 1) **When do risks become excessive or intolerable?**
- 2) **What factors should be considered in decisions to reduce risks?**
 - **Public health protection only?**
 - **Costs?**
 - **Technical feasibility?**
 - **Offsetting benefits?**
- 3) **What means should be used to reduce or manage risks considered excessive or intolerable?**
 - **Enforceable limits on exposure**
 - **Warnings, other types of information**
 - **Education, public health guidance**
 - **Enforceable technical controls**

RISK ASSESSMENT DOES NOT PRODUCE NEW KNOWLEDGE

**RATHER... IT IS A SYSTEMATIC PROCESS
USED TO ORGANIZE AND EVALUATE EXISTING
KNOWLEDGE AND ITS LIMITATIONS.**



LESSONS FROM 25 YEARS OF EXPERT STUDIES OF RISK ASSESSMENT

PROCESS

- 1) **Begin with careful delineation of the problem to be addressed, the decision that needs to be made.**
- 2) **Establish mechanisms to ensure interactive dialogues among all parties involved**
- 3) **Establish the questions to be addressed by risk assessment**
- 4) **Ensure the availability of the necessary technical resources**
- 5) **Ensure that risk assessment activities are not subject to inappropriate influences from decision-makers and others not conducting the assessments**

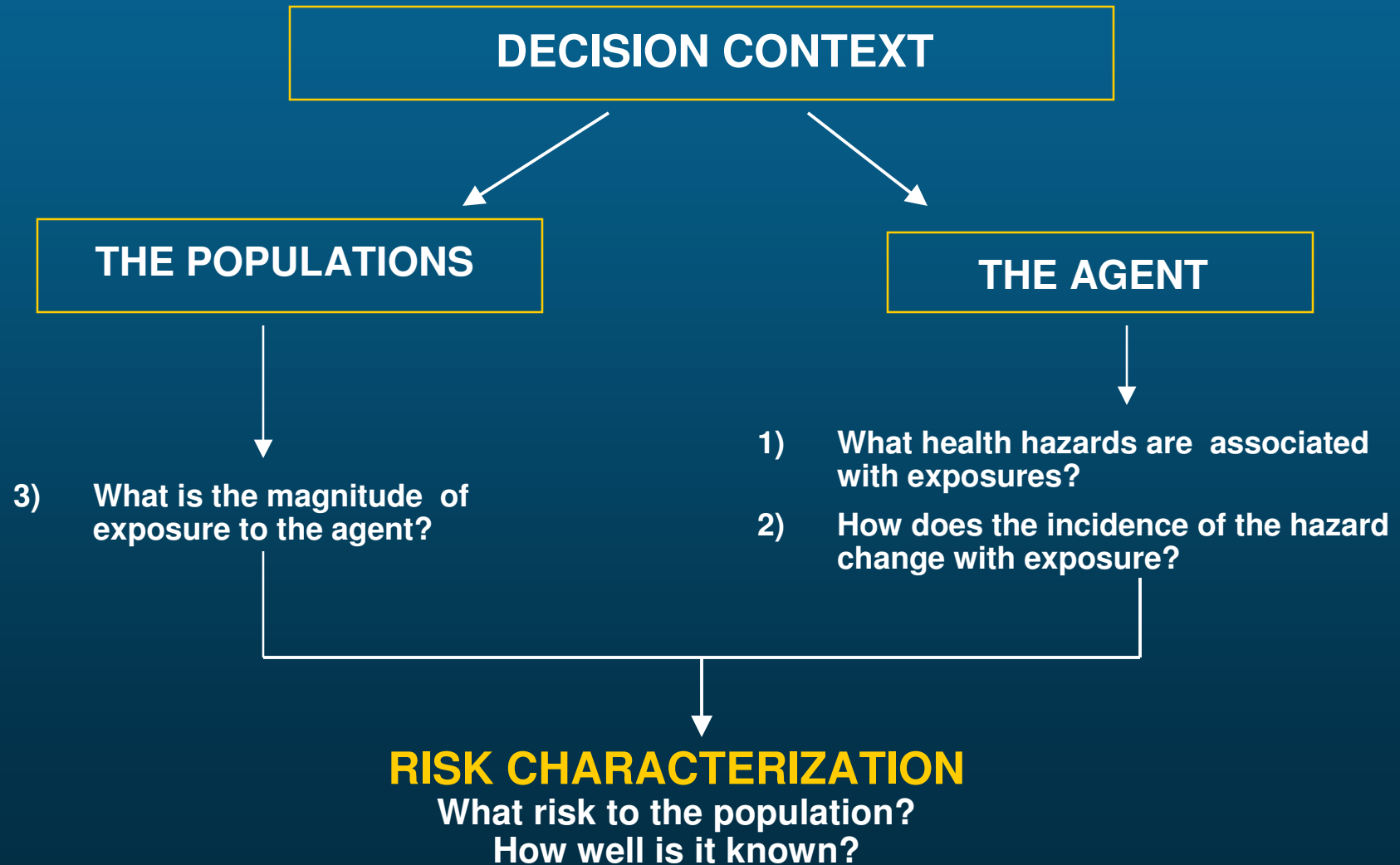
LESSONS FROM 25 YEARS OF EXPERT STUDIES OF RISK ASSESSMENT

PROCESS

- 6) **Require that risk assessment results include careful descriptions of uncertainties**
- 7) **Ensure that the risk questions have been fully addressed**
- 8) **Ensure adequate scientific peer review**
- 9) **Ensure that risk assessment results are understood by decision-makers and other involved parties**

LESSONS (II)

THE STEPS OF RISK ASSESSMENT



THE BIG QUESTIONS (I)

- I. For hazard and dose-response data derived from human studies:
 - A. Is there an observed threshold dose?
 - B. Is there a biological basis for a threshold?
 - C. What is the probable threshold dose in the population that is the subject of risk assessment?

PART C CONCERNS THE PROBLEM OF
INTER-INDIVIDUAL *VARIABILITY*.

THE BIG QUESTIONS (II)

- II. For hazard and dose-response data derived from experimental (animal) studies:
 - A. Are the observed hazards relevant to humans?
 - B. Is there an observed threshold dose?
 - C. What is the probable threshold dose in the population that is the subject of risk assessment?

THESE ARE THE PROBLEMS OF CROSS-SPECIES
AND INTER-INDIVIDUAL *VARIABILITY*.

THE BIG QUESTIONS (III)

III. What is to be done if the exposure (dose) incurred by the population that is the subject of risk assessment is below the doses for which hazard data are available?

**THIS IS THE PROBLEM OF
LOW DOSE EXTRAPOLATION.**

THE BIG QUESTIONS (IV)

IV. What is to be done if there are several studies available for hazard and dose-response information, and it is necessary to select among them for assessing risk?

THE NRC – RISK ASSESSMENT IN THE FEDERAL GOVERNMENT (1983)

- 1) Many options may be available for making these types of extrapolations or choices. (“inference options”)
- 2) Scientific knowledge is generally insufficient to allow selection of the most well-supported option
- 3) An element of policy is introduced to permit selection of the options that will be used



“DEFAULTS”

THE NRC – RISK ASSESSMENT IN THE FEDERAL GOVERNMENT (1983)

- 4) Selection of defaults ensures consistency and minimizes the possibility of inappropriate manipulations of risk assessments**
- 5) Departures from defaults should be allowed if supportable in individual cases**

THE IMPLICATIONS FOR NUTRIENT RISK ASSESSMENT

- 1) Risk assessment can not compensate for lack of data and knowledge. But it can guide research.
- 2) Experimental models for studying excessive intakes sorely needed.
- 3) **CURRENT THINKING:**
 - A. Threshold for excessive intakes (UL)
 - B. Threshold for inadequate intakes (RDA)
 - C. Condition of homeostasis: region between RDA and UL.

THE IMPLICATIONS FOR NUTRIENT RISK ASSESSMENT (continued)

- 4) **Understanding distributions of nutrient intakes in populations of interest:**
 - **The extent to which the tails of these distributions fall outside the range of homeostasis provides a description of nutrient health risks.**
- 5) **The development of consensus guidelines for the extrapolations and assumptions needed to complete nutrient risk assessments (“generic defaults”), would be of major benefit.**

SOME BROAD QUESTIONS IN NEED OF EXPLORATION

- § How certain is the evidence supporting homeostasis?
- § How does the range of homeostasis *vary* among individuals?
And also among individuals differing in:
 - Life stage
 - Nutritional status
 - Health status?
- § Given these variabilities, what are the most useful ways to describe individual and population risks?
- § How can the scientific *uncertainties* be most usefully described?