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Exposure Assessment

Introduction to the Collaborative Project

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The Requirements for Risk Assessment

- **Hazards:** The intrinsic toxic properties of the toxicant including differentiation between threshold- and non-threshold effects
- **Dose response of effects:** Identification of NOEL, effect levels (LOEL, MTD)
- **Exposure:** Human and/or environmental
- **Risk assessment:** Evaluation of the risk to human health and/or the environment at a given exposure

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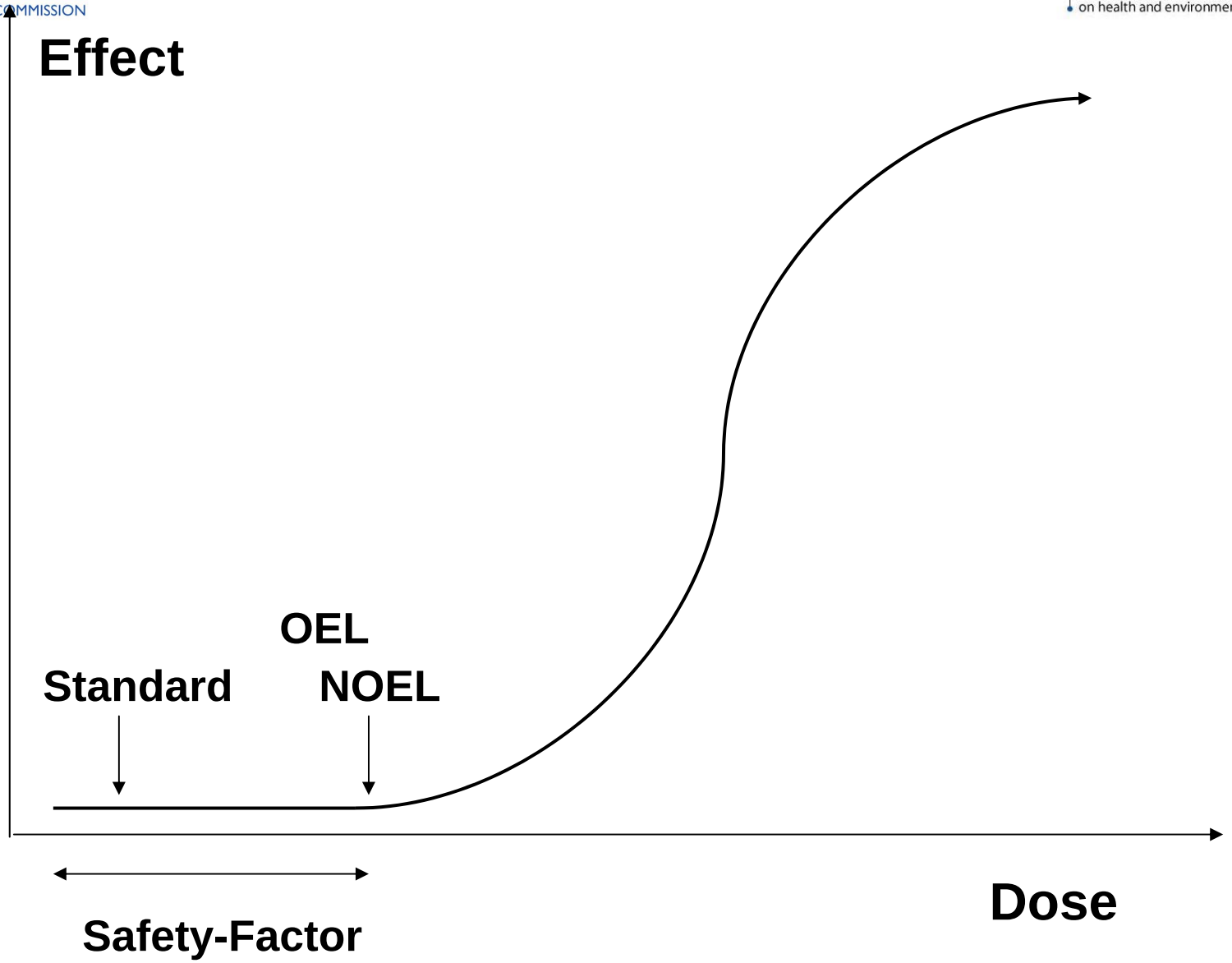

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Practical Implications of Exposure assessment

- **Standard setting:**
- ambient air, food, drinking water, work places
- **Risk assessment of exposure scenarios:**
- Endocrine disrupters, dioxins in food, PCBs at workplaces, heavy metals in toys and jewels, derogation of drinking water standards, indoor air
- **Application of risk assessment concepts:**
- Margin of exposure versus identification of risk for non-threshold carcinogens
- The TTC concept

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Exposure Assessment

- The quantification of exposure, both in individuals and in populations, is a prerequisite for risk assessment.
- Specific procedures to detect exposure include:
- Direct measurement of the chemical in environmental samples such as water, air and soil
- Measurement of the chemical, its metabolites or products of the interaction of the chemical or its biotransformation products with cellular macromolecules (protein and/or DNA) in body fluids and tissues (biomonitoring).

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Biomonitoring

- **Biomonitoring** is the analytical measurement of biomarkers in specified units of tissues or body products (blood, urine, etc.). This includes the measurement of chemicals, or their metabolites and reactants, their interactions with body constituents (proteins, DNA) and any functional changes such as enzyme activities.

- **Biomarkers** are any substances, structures, or processes that indicate an exposure or susceptibility or predict the incidence or outcome of disease. The measurement of biomarkers, in combination with other data, plays an integral role in identifying exposure (sources, trends, etc), potential human health effects, and/or the effectiveness of public health measures introduced to control exposures.

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WHO Guidelines for Nitrogen Dioxide

WHO Regional Office for Europe, 2000 for NO2:

200 ug/m3 for 1-hour, 40 ug/m3 for annual concentration.

WHO: Air Quality Guidelines: Global update 2005:

Since nitrogen dioxide is an important constituent of combustion-generated air pollution and is highly correlated with other primary and secondary combustion products, it is unclear to what extent the health effects observed in epidemiological studies are attributable to nitrogen dioxide itself or to other correlated pollutants.

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The Health Effects Institute, 2010

Traffic-Related Air Pollution: A Critical Review of the Literature on Emissions, Exposure, and Health Effects

The most commonly used traffic-pollutant surrogates include CO, NO2, elemental carbon (EC), black carbon [BC], black smoke [BS], PM, benzene, and ultrafine particles (UFP).

None of the pollutant surrogates considered in the report met all the criteria for an ideal surrogate. Data are not available to assess the ratios of the surrogates to emissions from all sources over time. CO, benzene, and NOx (in this case NO2), found in on-road vehicle emissions, are components of emissions from all sources, making it difficult to disentangle the contributions from motor vehicles from other sources (including some in indoor environments).

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Being aware of these uncertainties the 1. Transatlantic Risk Assessment Dialogue (Brussels, November 2008) concluded:

"Practical experience in the United States, Canada, and European Union has shown that differences in human exposure assessment, due to different approaches, tools, and assumptions, are an important source of uncertainty and divergences in the assessment of risk. A Transatlantic Risk Assessment Dialogue and a related Global Risk Dialogue were initiated "to encourage cooperation at the technical and scientific level" and "to move towards a common international understanding of exposure and risk assessment and risk management approaches."

Subsequently the Exposure Assessment Workgroup (EAWG) has been established.

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The Collaborative Exposure Assessment Project

Step 1: Nov. 2008: 1. International Risk assessment Dialogue: Selection of Exposure Assessment as one of the joint activities between US-EPA, EU, Health Canada

Step 2: Ottawa meeting June 2-4, 2010:
Meeting of Exposure Assessment Workgroup (EAWG)
Identification of 3 tasks:

Product 1: Document on: Assessing human exposures for risk assessment (RA) and risk management (RM)

Product 2: Document on: Incorporating biomonitoring in exposure assessment, RA and RM

Product 3: Future collaborative case studies for harmonization of assessing exposures in the context of RA and RM

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Status at present:

Draft Paper 1: Assessing human exposures for risk assessment and risk management: An international perspective (Project 1)

Draft paper 2: Incorporating biomonitoring in exposure assessment (Project 2)

Next steps:

- Presentation and discussion of draft papers in breakout groups
- Evaluation of case studies
- Discussion of Project 3: collaborative case studies (EU, Health Canada, US-EPA)