Understanding Environmental Health Risk Assessment

Risk is the likelihood that something bad might happen. Did you know that one in four Americans live within three miles of a hazardous site? Because of this, we need to know what risks these sites pose to humans. Environmental health risk assessment estimates the possibility that something negative will happen as a result of an exposure to a hazardous pollutant.

Risk Perception
A number of factors affect how we see risk. In general, the risks that harm people are sometimes very different from the risks that worry, concern, and upset people. We may perceive risk to be greater when it is out of our control, when we feel we have no choice about the risk, when the risk seems unfair, and when it may affect our children. Let’s compare the risks in our society, see Figure 1 below.

Things that play a role in environmental risk assessment are:

- **Probability**: Likelihood or chance that a certain result will occur
- **Uncertainty**: Lack of precise knowledge or understanding of the hazardous pollutant
- **Variability**: Difference between individuals, such as age, sex, nutritional status, family traits, life style, and state of health.

Figure 1. Comparing Risk in Our Society

<table>
<thead>
<tr>
<th>Event</th>
<th>Probability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Too much heat exposure</td>
<td>100,000</td>
</tr>
<tr>
<td>Cardiovascular Problems</td>
<td>10,000</td>
</tr>
<tr>
<td>Unintentional Poisoning/Drug Overdose</td>
<td>1,000</td>
</tr>
<tr>
<td>Cigarette Smoking</td>
<td>1</td>
</tr>
</tbody>
</table>

These values show the number of deaths out of the given number of people

REGULATORY STANDARDS are set to keep the public’s risk in this range.

These standards consider health outcomes, costs, and whether we have the technology that can remove the pollutant.

Examples are: Maximum Contaminant Levels for water and National Ambient Air Quality Standards.

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Exposure assessment is when we look at how much of a pollutant is present in the environment and how someone might be exposed. This information is then used to calculate and estimate the exposure. The pollutant has to be in the same place and time as the person or population. We need to be extra careful with sensitive populations such as children, older people, people who are already sick, and pregnant women because they may be harmed more than a regular adult.

The exposure assessment calculation can make two types of numbers: the lifetime average daily dose (LADD, when we know that the pollutant can cause cancer) and average daily dose (ADD, when the pollutant has not been proven to cause cancer). Check out the graphic above to see what goes into an exposure assessment. The numbers used are based on average human activities.

If we are exposed to a hazardous pollutant, we need to know:

- How are we exposed?
- What is the point of contact: drinking water (ingestion), indoor/outdoor air (inhalation), soil (accidental ingestion), or through our skin (absorption)?
- How long?
- What other chemicals are we exposed to?
- What is our age, sex, nutritional status, lifestyle, and state of health?
- What are the risks we may be born with (family traits)?

Risk characterization uses the estimated exposure to determine whether that exposure will cause harm. This activity is different based on whether the pollutant can cause cancer or has non-cancer health effects. For pollutants that do not cause cancer, we look at risk by dividing the ADD (Step 2) to either a oral reference dose, inhalation reference concentration (RfD, RfC, used by the U.S. Environmental Protection Agency) or by a minimal risk level (MRL, used by the Agency for Toxic Substances and Disease Registry). This is called the Hazard Quotient. The RfD, RfC, and MRL are the amount of a chemical that one can have daily for a certain amount of time without developing non-cancer health problems (Step 3).