THE PRACTITIONER'S TOOL KIT

# Risk: We Assess It!

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**Editor's Note: The National Environmental Health Association (NEHA) strives to provide relevant and useful information for environmental health practitioners. In a recent membership survey, we heard your request for information in the *Journal* that is more applicable to your daily work. We listened and are pleased to feature this column from a cadre of environmental health luminaries with over 300 years of combined experience in the environmental health field. This group will share their tricks of the trade to help you create a tool kit of resources for your daily work.**

**The conclusions of this column are those of the authors and do not necessarily represent the official position of NEHA, nor does it imply endorsement of any products, services, or resources mentioned.**

Environmental health professionals—including sanitarians, environmental health specialists, environmental health officers, industrial hygienists, safety professionals, environmental protection specialists, and environmental managers, to name a few—are by their very nature risk assessors and risk communicators. All the actions taken during the conduct of an inspection or investigation develop the information used for a risk assessment whether you realize it or not. Depending on your professional position, you could also be considered a risk manager.

Just so we are all on the same page, we begin by defining some risk terms.

- **Hazard** is any physical, chemical, biological, or other agent present in the human environment than could cause human injury, disease, or death.
- **Exposure** is the pathway through which the hazard could come into contact with the human host, typically through eating, drinking, breathing, or skin absorption.
- **Risk** is the result of the interaction of hazard and exposure. If a substance or condition (due to the amount or potency) does not cause injury, disease, or damage, then there is no risk. Likewise, if there is no possible exposure (due to the absence, containment, or treatment of the substance) there is no risk.

Figure 1 shows the major factors involved in characterizing the risk or threats to the life, health, and safety of human populations.

An example would be an environmental health specialists, we will call them Gerry, who is conducting a routine inspection of a restaurant while working as a food service inspector. During the inspection, Gerry finds a jar of home-canned corn in the stock room, which is a violation of the code. Gerry also notices that the lid on the jar is bulging. Suspecting that this bulging could be the result of the growth of *Clostridium botulinum*, Gerry orders the immediate safe destruction of the jar's contents and decontamination of the jar.

If the bulging lid was caused by the production of botulinum toxin, then the contents of the jar were extremely hazardous. As long as the corn and toxin remain safely in the sealed jar, no one would be exposed and therefore there was no risk at that time. If the jar, however, was opened and people consumed the corn and were then exposed to the toxin, the risk is extreme. By destroying the corn and any toxin, Gerry has removed the hazard and thus eliminated the risk. In this example, Gerry has conducted a risk assessment, risk communication, and risk management through the actions taken!

At its simplest level, the primary task of any environmental health professional is to assess the risk to the public of being exposed to a hazard present in their work, home, recreational, or community environments. Increasingly we need to consider the vulnerability of the population potentially affected. That is, some people or populations are more or less susceptible to hazards than are others due to genetics, physiology, lifestyle, socioeconomics, etc. Figure 2 shows how all of these factors work together to characterize risk.

## Risk Assessment

Risk assessment is the systematic, scientific evaluation of potential adverse health effects resulting from human exposures to hazardous agents or situations. Risk assessment can be qualitative or quantitative depending on the type of information used to evaluate the risk. A set of observations that includes sighting of roaches, hazardous food sitting

FIGURE **1**

**Classic Characterization of Risk in Environmental Public Health**

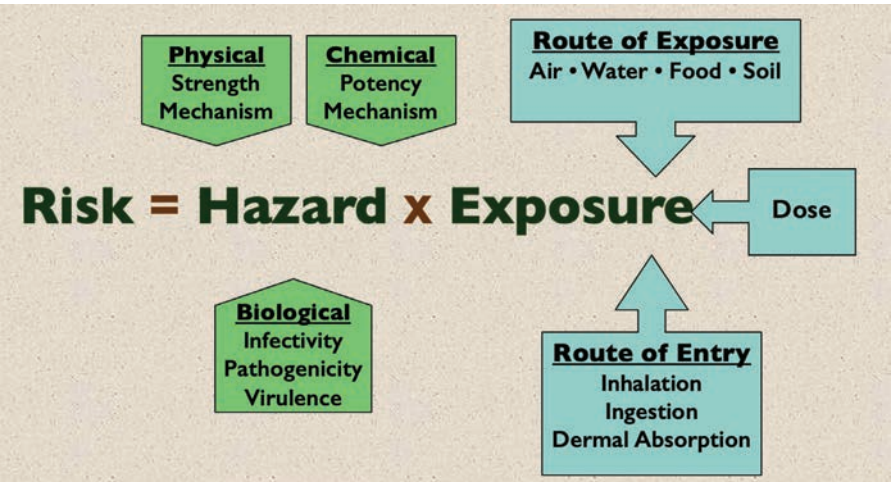
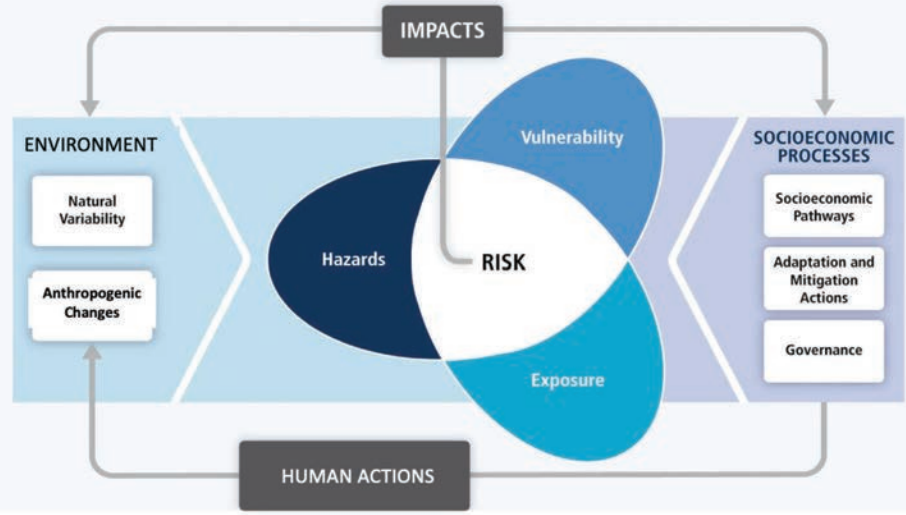



FIGURE **2**

**Risk Framework**




*Note.* Adapted from the risk framework presented at the National Institute of Environmental Health Sciences Disaster Research Response (DR2) Workshop held on August 10, 2022, in Seattle, Washington.

on a counter, or an inoperable dishwasher could be used to qualitatively determine that a food service operation has the potential to present a risk to the public health. If soil and groundwater concentrations are used to calculate the additional lifetime cancer risk associated with contaminants found during environmental media sampling, we are then conducting a quantitative risk assessment. We could be called on to conduct both types of risk assessments.

The observations, measurements, and/or sampling conducted by environmental health professionals are a key part of the risk assessment process. The risk assessment will only be as accurate as the data used to make the assessment. Therefore, it is incumbent on us to make and record high-quality observations, such as adding a temperature estimate to the observation of the hazardous food sitting on the counter or providing documentation of the roaches with a photograph to enhance the validity of the risk assessment. Selection of the appropriate direct measurements (e.g., temperature) and the documentation of how the measurements were conducted, as well as equipment calibration, time, etc., are necessary. Similarly, the selection of samples to be taken (e.g., water, soil, air, food), the selection of sampling locations (e.g., sampling the water from the kitchen tap or the pressure tank tap), and the number of samples to achieve statistical validity become critical in building the data set required to make a good risk assessment.

## Risk Communication

Risk communication is the second imperative in dealing with risk. Environmental health professionals must effectively communicate the risk to the potentially exposed population. Communication is an interactive process of exchanging information and opinions on risk among risk assessors, risk managers, and stakeholders. Risk communication can be with individuals, groups, or both. Notice the words "interactive" and "with." Risk communication involves an exchange of information, answering questions, and being truthful. Proper risk communication messages include the following:

- Uncomplicated language
- Clear statements and recommendations
- Active language
- Cultural sensitivity

Regardless of the risk outcome, it is important to communicate risks to the public. It is also important to communicate what is not known to the public and what is being done about it. Effective risk communication helps to build our professional credibility within the communities we practice.

## Risk Perception

Risk perception is another important consideration. We need to try to understand how risks could be viewed by the various groups involved in a situation. Risk is perceived by individuals and groups differently based on numerous factors, including prior knowledge and experience with the risk

and trust in the risk communicator and the risk assessment process. Someone who has already had cancer may have less tolerance for an increased lifetime cancer risk than someone who has never experienced cancer. Someone who has had food poisoning may be more outraged by the sanitation failures in a school or hospital kitchen than someone who has not.

It is critical for a risk communicator to be aware of these types of issues when preparing risk communication messages to avoid creating or fueling outrage. The COVID-19 pandemic has certainly taught us lessons about the effects of risk perception on compliance with risk mitigations measures, such as masking or getting vaccinated, even when the risk communication is effective.

## Risk Management

Risk management is the process of weighing policy alternatives and selecting the most appropriate action by integrating the results of risk assessment with engineering data in addition to social, economic, and political concerns to reach a decision. In some cases, and in some situations, environmental health professionals might also be risk managers. Risk management involves evaluating data from the risk assessment and determining the best approach to address a hazard or exposure issue, taking into account the physical and societal environment in which the hazard exists.

## Summary

Our job in dealing with any risk to human life, health, or safety comes down to these basic steps:

- Recognize and understand the risk
- Understand who is at risk
- Characterize the risk
- Consider the alternatives
- Consider protective measures
- Communicate the risk
- ACT!

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▸ **INTERNATIONAL PERSPECTIVES / SPECIAL REPORT** *continued from page 23*

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## Get Involved

The EJ Dashboard from CDC can be used in various ways to inform decision making, help with education, support studies, and even help change policy. How will you use the EJ Dashboard to help supplement environmental justice stories in your environmental health work?

Do you work with national-level data sets that would be good to include on the EJ Dashboard? Let the EJ Dashboard team know at trackingsupport@cdc.gov.

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