Risk Assessment for Hazardous Chemicals

The following outline provides a summary of the steps that laboratory workers should use to assess the risks of handling toxic chemicals. Note that if a Laboratory Chemical Safety Summary is not already available, then following the protocol outlined here should enable a worker to prepare his or her own LCSS.

Identify chemicals to be used and circumstances of use

Identify the chemical involved in the proposed experiment and determine the amounts that will be used. Is the experiment to be done once, or will the chemical be handled repeatedly? Will the experiment be conducted in an open laboratory, in an enclosed apparatus, or in a fume hood? Is it possible that new or unknown substances will be generated in the experiment? Are any of the workers involved in the experiment pregnant or likely to become pregnant? Do they have any known sensitivity to specific chemicals?

Consult sources of information

Consult an up-to-date LCSS for each chemical involved in the planned experiment. Examine an up-to-date MSDS if an LCSS is not available. In cases where substances with significant or unusual potential hazards are involved, it may also be advisable to consult more detailed references such as Makinson et al. (U.S. DHHS, 1981), Patnik (1992), Patty’s (Clayton and Clayton, 1993). It may also be necessary to obtain the assistance of lab supervisors or Risk Management staff (x3353) before proceeding with risk assessment.

Evaluate type of toxicity

Use the above sources of information to determine the type of toxicity associated with each chemical involved in the proposed experiment. Are any of the chemicals to be used acutely toxic or corrosive? Are any of the chemicals to be used irritants or sensitizers? Will any select carcinogens or possibly carcinogenic substances be encountered? For many substances, it will be necessary to consult the listings of carcinogens (see Tables A and Table B) to identify chemical similarities to known carcinogens. Are any chemicals involved on the proposed experiment suspected to be a reproductive or developmental toxins or neurotoxins?

Consider possible routes of exposure
Determine the potential routes of exposure for each chemical. Are the chemicals gases, or are they volatile enough to present a significant risk of exposure through inhalation? If liquid, can the substance be absorbed through the skin? Is it possible the dusts or aerosols will be formed in the experiment? Does the experiment involve a significant risk of inadvertent ingestion or injection of chemicals?

Evaluate quantitative information on toxicity

Consult the information sources to determine the LD50 for each chemical via the relevant routes of exposure. Determine the acute toxicity hazard level for each substance, classifying each chemical as highly toxic, moderately toxic, slightly toxic, and so forth. For substances that pose inhalation hazards, take note of the threshold limit value time-weighted average (TLV-TWA), short-term exposure limit (STEL), and permissible exposure limit (PEL) values.

Select appropriate procedures to minimize exposure
Use the "basic prudent practices for handling chemicals" for all work with chemicals in the laboratory. In addition, determine whether any of the chemicals to be handled in the planned experiment meet the definition of a particularly hazardous substance due to high acute toxicity. If so, consider the total amount of the substance that will be used, the expected frequency of use, the chemical's routes of exposure, and the circumstances of its use in the proposed experiment. Use this information to determine whether it is appropriate to apply the procedures for work with highly toxic substances.

Prepare for contingencies

Note the signs and symptoms of exposure to the chemicals to be used in the proposed experiment. Note appropriate measures to be taken in the event of exposure or accidental release of any of the chemicals.