ASSESSING CHEMICAL RISK IN RESEARCH ENVIRONMENTS

Introduction

Best practice for managing chemical risk in research is to:

- 1. Identify all hazards associated with the chemical using WHMIS hazard classes, hazard statements, and precautionary statements
- 2. Analyze the risks of the hazards
- 3. Implement controls to reduce risk

Identifying Hazards Associated with a Chemical

Review SDS for the chemical(s) in question. Begin by reviewing Section 2 of the SDS and summarizing the information found there. Specifically consider:

- 1. **Pictograms:** WHMIS pictograms are designed to clearly indicate the hazard, even to those unfamiliar with the labels. The CCOHS provides an <u>explanation of each pictogram</u>.
- 2. **Hazard classification:** WHMIS 2015 applies two major groups of hazards, Health and Physical. Health hazards present dangers to human health (e.g., breathing or vision) while physical hazards cause damage to the body (e.g., skin corrosion). There are 16 physical hazards and 10 health hazards. Each hazard is then further divided according to different severity levels. This CCOHS provides more detail on the hazard classifications.
- 3. **Hazard statements:** a hazard statement describes the nature of the hazard posed by the hazardous product. The purpose is to further simplify the identification of hazards. See the <u>GHS Hazard Statement List</u> for more information. Some potential hazard statements include:
 - a. Causes serious eye damage
 - b. Skin irritation
 - c. Acute toxicity
 - d. Extremely flammable gas
 - e. May cause cancer
- 4. **Precautionary statements:** a precautionary statement pulls from a list of standardized phrases. It describes measures to minimize or prevent adverse effects from exposure to the hazardous product. The precautionary statement can also be applied to warn about improper handling or storage of the hazardous product. Review the GHS Precautionary Statement and P Codes for more details. Examples of precautionary statements include:
 - a. Keep container tightly closed
 - b. Wear protective gloves
 - c. If exposed, get medical attention

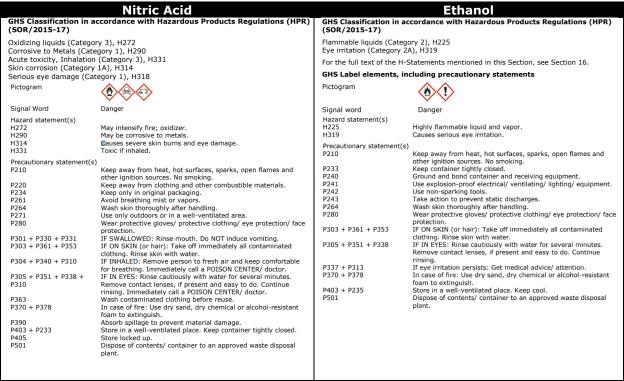


d. Protect from sunlight

As an example, consider the following chemicals:

- Nitric Acid SDS
- Ethanol SDS

Pulling out the pictograms, hazard classifications, hazard statements and precautionary statements yields the following information:



Information was taken from current SDS's published by Sigma Aldrich

Assessing Hazards

Reviewing the WHMIS classification for nitric acid, we can see that it is an oxidizing substance that corrodes metals is hazardous to the skin (Cat 1A), eyes (Cat 1), and acutely toxic (Cat 3). This means the substance will substantially damage skin and eyes and may not kill you upon ingestion/inhalation/contact, but will cause harm relatively quickly.

From this information, one can very quickly determine that skin protection, eye protection, and ventilation should be used when working with nitric acid. Avoiding all contact is also important. Since it has also been indicated that the material is corrosive to metals, and it's an oxidizer, one should be cognizant to not mix with organic or combustible materials and should ensure that the construction of any equipment being used is compatible with this information.

Reviewing the WHMIS classification for ethanol, it is evident that this substance is very flammable and will cause eye irritation upon exposure. Again, this information allows one to understand the main hazard potential of the chemical. It means that ethanol should be handled under ventilation, with eye protection, and the substance should be kept away from ignition sources.

The precautionary statements for nitric acid and ethanol provide even more detail on what controls could be used to mitigate against known hazards. For example, reviewing the P-statements for ethanol, in particular P210, P238, P240, P241, and P242, it becomes evident that fire protection may also involve controlling static electrical discharges from various sources. It makes one aware of just how flammable the substance is.

With this knowledge, the user can make better judgements on how to handle, store, use, and dispose of the chemical with decreased risk.

Implementing Controls

The above risk analysis is used to identify general hazards and risks associated with a chemical. To really understand chemical risk, one must examine these hazards and precautions in the context of how the chemical is being used in an actual research setting, project, or process.

At the University, the easiest method to do this is by using the <u>Laboratory Risk</u> <u>Assessment Template</u>. This form combines the hazards associated with the chemical itself and examines what additional hazards exist with the equipment being used, the process conditions, and how worker exposure may occur.

As a reference, review the following resources found on the <u>Safety Office's Risk Assessment and Standard Operating Procedure page</u>:

- Example 1: Using a Parr Reaction Vessel for hydrothermal reactions
- Example 2: <u>Using hydrochloric acid to etch metal</u>