

PPE, Safety Equipment & Hygiene

Routes of Exposure

The four ways chemicals can enter the body are:

- Inhalation
- Ingestion
- Absorption
- Injection*

*For our purposes, the injection route of entry includes not only an actual injury to the skin caused by a sharp, but also through a pre-existing injury to the skin or through a cut injury (injection) that breaks the skin during a procedure.

The type of Personal Protective Equipment and Safety Equipment needed will need depend on the potential routes of exposure for the chemicals used.

Eye & Face protection

There are a number of PPE that can be used to protect the eyes and face from contamination and/or damage. Some examples of these PPEs are goggles, safety glasses, and face shields.

- Goggles are used to prevent contamination of the eyes.
- Safety glasses also prevent contamination or damage of the eyes, however since it does not provide a seal around the eyes contamination is possible.
- Face shields are used to protect the entire face from splashes, damage, and contamination.

It is important to select the eye/face protection appropriate and rated for the work to be carried out.

Skin protection

In addition to the clothes and shoes worn all the time, additional protective clothing such as lab coats, lab aprons or chemical resistant protective suits and chemically resistant gloves are required to prevent skin contamination. Since protective suits are not worn in most labs appropriate clothing is required. Appropriate laboratory attire consists of pants, close toed shoes, etc. Clothes that leave large areas of skin bare, such as shorts, short skirts and sandals, should not be worn in the lab.

The hands are the most likely part of the body to become contaminated. When selecting gloves for use in the lab remember:

1. Not all gloves protect from all chemicals. Check to make sure the chemicals used will not degrade integrity of the gloves selected. Glove manufacturers can provide assistance in determining which gloves will work for different chemicals. **Never wear latex gloves when handling solvents.**
2. Disposable gloves should be changed frequently. They should not be washed and reused.
3. Sometimes it may be necessary to wear more than one pair of gloves. For example, heavy gloves over Nitrile gloves when using large quantities of hazardous chemicals such as halogenated solvents.

For assistance in determining the best PPE to wear for the chemicals please consult the National Institute for Occupational Safety and Health (NIOSH) Guide to Chemical Protective Clothing (<http://www.cdc.gov/niosh/ncpc/>). To reduce the likelihood of skin contamination, please keep the laboratory clean. Do not leave behind chemical residues that will allow other people to become contaminated.

Ingestion Protection

To prevent accidental ingestion of chemicals:

- Wear gloves during all experimental procedures
- Wash hands after all procedures
- Never store food or beverages in the laboratory
- Never eat or drink in the laboratory

Inhalation Protection

To prevent inhalation of chemical gases, vapors, dusts or aerosols:

- Work in a fume hood. Make sure the fume hood is working properly before use and work at least six inches in from the edge of the hood to maximize the capture efficiency of the fume hood.
- Glove boxes are another way to prevent hazardous chemicals exposure.
- Wearing a respirator is the very last option to consider when providing inhalation protection.
 - a. Before anyone can be approved to wear a respirator, they must satisfy two OSHA requirements:
 - i. A medical evaluation to determine whether or not a person is physically capable of wearing a respirator
 - ii. OSHA requires a fit-test evaluation to ensure that the respirator seals properly around the face and does not allow unfiltered air to leak in.

- b. Respirator filters are chemical specific. Care must be taken when selecting the cartridges for the respirator. The cartridges must be able to absorb the chemicals the user will be working with.

Emergency Showers & Eye Wash Stations

If there is an accident, two of the most important pieces of safety equipment found in a laboratory are the emergency shower and the eye wash station. If contamination should occur over a large area of the body immediately go to the emergency shower, strip off any contaminated clothing, and stay under the water for at least 15 minutes.

An eye wash station is used to flush the eyes if they should become contaminated. Eyes should be flushed immediately after a contamination has occurred. The general rule is to flush the eyes with water for 15 minutes.