

## **Minimizing Exposure to Chemicals**

Precautions should be taken to avoid exposure by the principal routes, that is, contact with skin and eyes, inhalation, and ingestion.

1. Avoiding Eye Injury
  - a. Safety glasses with side shields provide the minimum protection acceptable for regular use. Safety glasses must meet the American National Standards Institute (ANSI) standard Z87.1-1989, Standard for Occupational and Educational Eye and Face Protection.
  - b. Safety splash goggles or face shields should be worn when carrying out operations in which there is any danger from splashing chemicals or flying particles.
  - c. Goggles are preferred over regular safety glasses to protect against hazards such as projectiles, as well as when working with glassware under reduced or elevated pressures (e.g., sealed tube reactions), when handling potentially explosive compounds (particularly during distillations), and when employing glassware in high-temperature operations.
  - d. Because goggles offer little protection to the face and neck, full-face shields should be worn when conducting particularly hazardous laboratory operations.
  - e. The use of laser or ultraviolet light sources require special glasses or goggles. Contact the Office of Regulatory Compliance.
  - f. Ordinary prescription glasses do not provide adequate protection against injury. Prescription safety glasses and goggles can be obtained.
  - g. Contact lenses offer no protection against eye injury and cannot be substituted for safety glasses and goggles. It is best not to wear contact lenses when carrying out operations where chemical vapors are present or a chemical splash to the eyes or chemical dust is possible because contact lenses can increase the degree of harm and can interfere with first aid and eye-flushing procedures. If an individual must wear contact lenses for medical reasons, then safety glasses with side shields or tight-fitting safety goggles must be worn over the contact lenses.
  
2. Avoiding Ingestion of Hazardous Chemicals
  - a. Eating, drinking, smoking, gum chewing, applying cosmetics, and taking medicine in laboratories where hazardous chemicals are used is strictly prohibited.
  - b. Food, beverages, cups, and other drinking and eating utensils will not be stored in areas where hazardous chemicals are handled or stored.

- c. Glassware used for laboratory operations shall not be used to prepare or consume food or beverages.
- d. Laboratory refrigerators, ice chests, cold rooms, ovens, and so forth will not be used for food storage or preparation.
- e. Laboratory water sources and deionized laboratory water will not be used for drinking water.
- f. Laboratory chemicals should never be tasted.
- g. A pipet bulb or aspirator should be used to pipet chemicals or to start a siphon; pipetting should never be done by mouth.
- h. Hands should be washed with soap and water immediately after working with any laboratory chemicals, even if gloves have been worn.

### 3. Avoiding Inhalation of Hazardous Chemicals

- a. Toxic chemicals or compounds of unknown toxicity should never be smelled. Procedures involving volatile toxic substances and operations involving solid or liquid toxic substances that may result in the generation of aerosols should be conducted in a laboratory hood.
- b. Dusts should be recognized as potentially contaminated and hazardous.
- c. Hoods should not be used for disposal of hazardous volatile materials by evaporation. Such materials should be treated as chemical waste and disposed of in appropriate waste containers.
- d. The following general rules should be followed when using laboratory hoods:
  - i. For work involving hazardous substances, use only hoods that have been evaluated for adequate face velocity and proper operation. Check for current (within the year) certificate posted on the hood.
  - ii. Keep reactions and hazardous chemicals at least 6 inches behind the plane of the hood sash.
  - iii. Never put your head inside an operating laboratory hood to check an experiment. The plane of the sash is the barrier between contaminated and uncontaminated air.
  - iv. On hoods where sashes open vertically, work with the hood sash in the lowest possible position. On hoods where sashes open horizontally, position one of the doors to act as a shield in the event of an accident in the hood. When the hood is not in use, keep the sash closed to maintain laboratory airflow.
  - v. Keep hoods clean and clear; do not clutter with bottles or equipment. If there is a grill along the bottom slot or a baffle in the back of the hood, clean them regularly so they do not become clogged with papers and dirt. Allow only materials actively in use to remain in the hood. Following this rule will provide optimal containment and reduce the risk of extraneous chemicals being involved in any fire or explosion. Support any equipment that needs to remain in hoods on racks or feet to provide airflow under the equipment.

- vi. Report suspected hood malfunctions promptly to the appropriate office, and make sure they are corrected. Clean hoods before maintenance personnel work on them.
4. Avoiding Injection of Hazardous Chemicals
- a. Solutions of chemicals are often transferred in syringes, which for many uses are fitted with sharp needles. The risk of inadvertent injection is significant, and vigilance is required to avoid that accident. Needles must be properly disposed of in "sharps" containers. Use special care when handling solutions of chemicals in hypodermic syringes.
5. Minimizing Skin Contact
- a. Wear gloves whenever handling hazardous chemicals, sharp-edged objects, very hot or very cold materials, toxic chemicals, and substances of unknown toxicity. The following general guidelines apply to the selection and use of protective gloves:
    - i. Wear gloves of a material known to be resistant to permeation by the substances in use. Wearing the wrong type of glove can be more hazardous than wearing no gloves at all, because if a chemical seeps through, the glove can hold it in prolonged contact with the wearer's hand.
    - ii. Inspect gloves for small holes or tears before use.
    - iii. In order to prevent the unintentional spread of hazardous substances, remove gloves before handling objects such as doorknobs, telephones, pens, and computer keyboards.
    - iv. Replace gloves periodically, depending on the frequency of use and their permeation and degradation characteristics relative to the substances handled.