



Carcinogens and Mutagens Fact Sheet

This fact sheet is for general safety awareness. Individual Standard Operating Procedures for all experiments and processes involving carcinogens or mutagens must be developed by the laboratory.

PROPERTIES & HAZARDS

Carcinogens are chemicals that are known or suspected to cause cancer in humans. Cancer is a chronic effect and is typically the result of repeated or long-term exposure. Symptoms may develop many years after exposure. A known human carcinogen means there is sufficient evidence of a cause and effect relationship between exposure to the material and cancer in humans. A substance that has induced cancer in experimental animal studies is referred to as a suspected human carcinogen.

Mutations are defined as causing a permanent change in the amount or structure of the genetic material in a cell. The term mutation applies both to heritable genetic changes that may be manifested at the phenotypic level and to the underlying DNA modifications when known. This hazard class is primarily concerned with chemicals that may cause mutations in the germ cells of humans that can be transmitted to the progeny. However, mutagenicity/genotoxicity tests *in vitro* and in mammalian somatic cells *in vivo* are also considered in classifying substances and mixtures within this hazard class.

There are three categories for carcinogens and mutagens, Category 1A, 1B and 2, that you may see on the safety data sheet (SDS) or chemical bottle. In Section 2 – Hazard Identification of the SDS, a combination of the following hazard classifications, pictograms and hazard statements will be listed indicating a carcinogen or mutagen hazard. More information on material hazards can be found in complete hazard statements listed on an SDS or chemical bottle.

Hazard Classification and Category	Pictogram	Hazard Statement
Carcinogenicity – Category 1A, 1B and 2		May cause cancer Suspected of causing cancer
Germ Cell Mutagenicity – Category 1A, 1B and 2		May cause genetic defects Suspected of causing genetic defects

PARTICULARLY HAZARDOUS SUBSTANCES

The Occupational Safety and Health Administration defines particularly hazardous substances as select carcinogens, reproductive toxins and substances which have a high degree of acute toxicity. Work with particularly hazardous substances requires special provisions for employee protection. The following is required when working with chemicals having these designations:

1. Prior approval required from PI before use.
2. Establishment of a designated area
3. Use of containment devices
4. Procedures for safe removal of waste

These items should be addressed in your laboratory’s procedure-specific standard operating procedures that require use and handling of carcinogens or mutagens.

CONTROLS

Selection of controls should be made using a risk-based approach that considers the degree of hazard, route of exposure and characteristics of the process that may potentially lead to exposure. If you need help selecting controls for a given procedure, contact ESSR for assistance.

Engineering Controls

- Chemical fume hood
- Glovebox

Chemical fume hoods and gloveboxes provide the best protection against exposure in the laboratory. Generally, chemical fume hoods are the preferred ventilation control device in laboratories unless a glovebox is warranted. Handle carcinogenic and mutagenic materials in a fume hood or glovebox.

Personal Protective Equipment

- Double Gloves – Generally nitrile or neoprene provide adequate protection against minor splashes for most chemicals. Consult glove manufacturer’s chemical compatibility guides for best glove selection, or alternative glove types if needed for specific chemicals that penetrate nitrile or neoprene. SDS recommendations on glove type should be reviewed.
- Splash goggles
- Lab Coat
- Clothing that leaves no exposed skin on legs or feet
- Closed-toe shoes that fully cover the top of the foot
- Chemical Resistant Apron*
- Face Shield*

**For work with large volumes of materials, and/or when pouring.*

Training

- Laboratory Specific Training must cover all processes carcinogenic or mutagenic materials and include information on safe use and emergency response.

STORAGE

- Carcinogens and mutagens should be stored in a secure, designated area. This designated area must be approved by the principal investigator.
- Carcinogenic chemicals should be stored in containers with a screw-top lid.
- Storage location must be consistent with storage recommendations on the chemical’s Safety Data Sheet.
- Laboratories that use or store carcinogens or suspect carcinogens must have a sticker indicating either “Cancer Hazard” or “Cancer Suspect Agent” on the laboratory hazard signs at the entrances of the laboratory.

USE

- The principal investigator must approve any purchase or procedure involving carcinogens or mutagens.
- If possible, substitute a chemical without carcinogenic or mutagenic hazards.
- When possible, minimize the quantity of carcinogenic or mutagenic chemical used.
- Only use carcinogens or mutagens in a designated area approved by the principal investigator. For example, tape off designated area where used and label tape with material hazard. All lab workers should be aware of where the designated area is and that they are used for work with carcinogens or mutagens.
- Keep containers closed as much as possible
- When weighing out solid carcinogenic or mutagenic chemicals, use the tare method. In this method, the chemical is added to a pre-weighed container in a chemical fume hood. The container is then sealed and re-weighed outside of the hood. If chemical needs to be added or removed, this manipulation is carried out in the hood.
- Change gloves immediately if they have suspected contact with the carcinogenic or mutagenic chemical.
- Do not work alone when working with carcinogens or mutagens.
- Everyone working with carcinogens or mutagens must be aware of any applicable signs and symptoms of exposure, if they exist.
- The work area should be thoroughly cleaned and decontaminated after work is complete. Decontamination procedures will vary by chemical and should be included in laboratory SOPs.
- Thoroughly wash hands after handling any amount of a carcinogen or mutagen.
- Any spills of carcinogenic chemicals must be cleaned immediately and the area decontaminated. Decontamination procedures will vary by chemical and should be included in laboratory SOPs.

Waste

- Waste should be managed so that incompatible materials are not mixed.

- Waste containers should be compatible with their contents and should be segregated by hazard class into separate secondary containers.
- For questions regarding waste management contact ESSR, Environmental Affairs at envaffairs@umd.edu.

SPILL CLEANUP

- Spill cleanup must follow the items specified in the Emergency Response Guide posted in the laboratory.
- If the laboratory is equipped and personnel are trained, minor spills can be handled by laboratory personnel.
- If a spill is beyond the capacity of the laboratory to address, call (301) 405-3333 from a safe location.

REFERENCES AND ADDITIONAL RESOURCES

1. OSHA [A Guide to the Globally Harmonized System of Classification and Labeling of Chemicals \(GHS\)](#)
2. OSHA [Occupational Exposure to Hazardous Chemicals in Laboratories](#)
3. US Dept. of Health and Human Services (HHS) [National Toxicology Program \(NTP\)](#)
4. World Health Organization (WHO) [International Agency for Research on Cancer \(IARC\)](#)
5. [Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards](#), National Academy Press, Washington, DC, 2011.