UNIVERSITY OF AKRON
LABORATORY REFRIGERATOR/FREEZER
SAFETY PROTOCOLS
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Introduction

Use of refrigerators and freezers in science and engineering laboratories is potentially dangerous. Biological contamination, exposure to bio-toxins, and bacteria in the food supply are one problem. The other problem relates to chemical hazards involving fire, explosions, and chemical toxins. During inspections, usually unannounced, Occupational Safety and Health Administration (OSHA) and United States Environmental Protection Agency (U.S. EPA) (or Ohio EPA) safety and environmental regulatory compliance officers often look for and find unsafe laboratory refrigerator practices.

Three Types of Refrigerators/Freezers

There are basically three different types of refrigerators/freezers that can be considered, depending on the use and/or need.

1. Household (Domestic): Refrigerators and freezers that can be used in school science laboratories for storage of aqueous solutions and non-flammable/non-explosive materials.

2. Lab-Safe (or Explosion-Safe or Flammable): Refrigerators and freezers which are used for storage of flammable or explosive materials. This type of cooling technology has no internal switching devices that can arc or spark as a source of ignition. The compressor and other circuits usually are located at the top of the unit to reduce the potential for ignition of floor-level flammable vapors. These refrigerators also incorporate design features such as thresholds, self-closing doors, and magnetic door gaskets. Special inner shell materials control or limit damage should an exothermic reaction occur within the storage compartment.

3. Explosion-Proof: Refrigerators that are designed to be operational in areas where the air outside the refrigerator might be explosive. This often includes liquids, gases, or solids with flashpoints of less than 100 ^{O}F. Explosion-proof refrigerators feature enclosed motors to eliminate sparking and bear a FM® (Factory Mutual) or UL® (Underwriters Laboratory) explosion-proof label. Such refrigerators must meet the requirements for Class 1, Division 1 Electrical Safety Code (NPFA 45 and 70) and require direct wiring to the power source via a metal conduit.

Storage requirements also apply to any solution or specimen that may release flammable fumes. For example, ether-impregnated of laboratory animal fur has been known to cause explosions in refrigerators.

All types of refrigerators/freezers should be frost-free to prevent water drainage or damage. The refrigerator/freezer must meet all applicable codes (i.e., National Electric Code- C11; NFPA 45, 56C, and70; and, OSHA 29 CFR 1910.30).

Proper Signage

Prudent Practices for Research Laboratories, the National Academy of Sciences, and OSHA note that storage of food and beverages in refrigerators containing chemicals violate good laboratory practice. This results from the potential for contamination of food and subsequent ingestion. There also are fire and explosion factors. Therefore, refrigerator/freezers must have appropriate signage. Examples of such signage include:

1. Lab-Safe or Flammable Refrigerator/Freezer Signage: "Flammable Materials Refrigerator" and “No Food"

2. Domestic Refrigerator/Freezer Signage: "Edible Food and Drink Only" or "Non-Flammable/ Non-Explosive Solutions Only"

3. Explosion-Proof Refrigerator/Freezer Signage: "Approved for Use in Hazardous Locations"

4. Radioactive Material-Containing Refrigerators/Freezer Signage: "Caution, Radioactive Material. No Food or Beverages May Be Stored in this Unit"

Refrigerators used to store flammable materials should be approved for storing those types of materials by Factory Mutual or Underwriters Laboratory.

Safe Laboratory Refrigerator/Freezer Operating Procedures

There are a number of standard operating procedures which must be utilized by all researchers. The primary researcher (or laboratory supervisor or professor-in-charge [PIC]) should have the responsibility of oversight of the refrigerator. Although not necessarily exhaustive, the following is a list of common laboratory refrigerator/freezer operational safety considerations:

1. Never store food in any refrigerator or freezer used to store chemicals.

2. Refrigerators and freezers should be cleaned-out and defrosted on a regular basis **(note: only defrost as necessary, consistent with the primary researcher’s chemical hygiene plan, and in coordination with the primary researcher, laboratory supervisor, PIC, and EOHS)**. (See the decontamination procedures described below.)

3. Containers placed in a refrigerator or freezer should be completely sealed or capped and safely positioned/securely placed. Avoid capping materials with

aluminum foil, corks, and glass stoppers.

4. All liquid chemicals should be stored in plastic trays.

5. Appropriate drip/leak/spill containment pans should be placed under all laboratory refrigerators.

6. All items stored are to be appropriately labeled.

7. Review inventory on refrigerator/freezer contents to insure compatibility of the contents.

8. Store only chemicals in amounts needed over a reasonable amount of time. Each chemical has a shelf life and decomposition products which could be hazardous.

9. Remember that power outages and technology failure can have impact on stored contents. Be aware of unusual odors, vapors, etc.

10. Refrigerators/freezers should be periodically inspected (i.e., at least monthly).

11. Post an up-to-date inventory on the refrigerator door.

12. The refrigerator/freezer must be properly grounded and a permanent installation (i.e., no extension cords).

13. The refrigerator/freezer must be located away from laboratory exits.

Spill Contingency and Decontamination

The following procedures should be utilized in the event of a broken container, leak, or spill:

1. In the Event of a Spill—Clear the lab and then contact The University of Akron Department of Environmental and Occupational Health and Safety (EOHS) at x-6866) for non-emergencies (i.e., not immediately dangerous to human health and the environment). Otherwise and always during non-business hours, call 911.

2. For Non-Hazardous Items—Refrigerators/freezers not used for the storage of chemicals, biological agents, or radioactive materials can be emptied and defrosted by the users. Any spillage or leakage of non-hazardous material can be cleaned with soap and water.

3. For Chemicals Only—Remove all items and defrost. If chemicals have spilled or leaked, clean with the appropriate solvent (e.g., isopropyl alcohol or soap and water). Follow directions from the material safety data sheet (SDS) for each chemical and dispose of waste properly (contact EOHS if unsure).

4. For Biological Agents Only—Remove all items and defrost. If biological agents have spilled or leaked, clean with a 10% bleach solution (1 part bleach to 9 parts water). Dispose of waste properly.

5. For Combinations of Chemicals and Biological Agents—Remove all items and defrost. If any chemicals and/or biological agents have spilled or leaked, follow the aforementioned protocols. Be careful not to combine incompatible substances such as bleach and ammonia. Dispose of waste properly.

6. For Radioactive Material and Any Combination of Radioactive Material with Chemicals, or Biological Agents—Contact The University's Radiation Safety Officer (or EOHS) at x-7766, immediately.

Long-Term Cooling and Freezing of Laboratory Materials

Finally, researchers must know the need for and effects of long-term cooling and freezing of laboratory materials. SDSs are an excellent source of information relative to the need for cooling or freezing chemicals for storage or extended life. Equally important is information provided on hazardous decomposition products produced over time. Additional information can be secured from manufacturers.

Questions

If there are any laboratory refrigerator health and safety concerns or questions, please contact EOHS at x-6866.