

SAFE SCIENCE: BE PROTECTED

Laboratory Refrigerators/Freezers: Knowing How To Cool It!

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The icing on the cake!

Doing inspections in science laboratories is often interesting and sometimes exciting. In some cases, Biology teachers had the practice of storing pints of ice cream and pieces of birthday cake in the freezer with the frozen specimens of rats and mice. In domestic (household type) refrigerators juice drinks, milk, sandwiches for lunch were placed with bacteria plates and other assorted biological solutions and specimens. What's wrong with this scenario? The problem which quickly comes to mind is biological contamination, exposure to toxins, and bacteria in the food supply, to name a few. The other problem is one of a chemical hazard such as fire, explosion and poisoning. Improper storage of flammable or explosive chemicals. OSHA Compliance Officers go for this type of scenario in a big way as unsafe practice.

Cool it the safe way!

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

- *Household-type refrigerators and freezers* can be used in school science laboratories for storage of aqueous solutions, and nonflammable/ materials.
- *Lab-Safe (explosion-safe)* or flammable storage refrigerators and freezers 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 mag-

netic door gaskets. Special inner shell materials control or limit damage should an exothermic reaction occur within the storage compartment.

- *Explosion-Proof* refrigerators are designed to be operational in areas where the air outside the refrigerator might be explosive. This often includes liquids, gases or solids with flash points of less than 100 degrees F. Explosion-proof refrigerators feature enclosed motors to eliminate sparking and bear a FMÆ (Factory Mutual) or ULÆ (Underwriters Laboratory) explosion-proof label. Such refrigerators must meet the requirements for Class 1 Division 1 Electrical Safety Code (NFPA 45 and NFPA 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, an ether-impregnated fur of a dead mouse or rat has been known to cause an explosion in a refrigerator).

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 Standard #45 and #56C; NFPA Standard #70, Article 250; and OSHA 29 CFR 1910.30.

Cooling can be dangerous if you don't know your signs !

Prudent Practices for Research Laboratories, the National Academy of Sciences and the Occupational Safety and Health Administration (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 explosion factors. Therefore, refrigerator/freezers must

WHAT'S YOUR SIGN?

have appropriate signage.

Flammable or Lab Safe refrigerator/freezer signage:

CAUTION

**Flammable Materials
Refrigerator
No Food to Be Stored Here**

Domestic Refrigerator/Freezer signage:

NOTICE

**Edible Food and Drink Only or
Non-flammable/
Non-explosive Solutions Only**

Explosion-Proof Refrigerator/Freezer signage:

**NOTICE
Refrigerator**

**Approved for Use In
Hazardous Locations**

Refrigerators/freezers storing radioactive materials must be clearly labeled:

RADIOACTIVE

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 FMÆ (Factory

Mutual) or ULÆ (Underwriters Laboratory).

Guiding the ship through the glacier!

There are some standard operating procedures which should be put into place for all users. However, one employee should have the responsibility of oversight of the refrigerator.

The following is only a suggested brief list for consideration:

- Never store food in any refrigerator or freezer used to store chemicals.
- Refrigerators and freezers should be cleaned out on a regular basis.
- Containers placed in a refrigerator or freezer should be completely sealed or capped, securely placed, and labeled. Avoid capping materials with aluminum foil, corks, and glass stoppers.
- All liquid chemicals should be stored in plastic trays
- All items stored are to be appropriately labeled.
- Review inventory on refrigerator/freezer contents to insure compatibility of the contents.
- 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.
- Remember that power outages and technology failure can have impact on stored contents. Be aware of unusual odors, vapors, etc.
- Refrigerators/freezers should be periodically inspected (i.e., at least monthly).
- Post an up-to-date inventory on the refrigerator door.
- The refrigerator/freezer must be properly grounded and a permanent installation (i.e., no extension cords).
- The refrigerator/freezer must be

located away from lab exits.

The need to melt the glacier!

A protocol should be established for decontamination of the Refrigerator/freezer should there be evidence of a spill or break.

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.

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 MSDS for each chemical and dispose of properly.

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 properly.

Combination 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 properly.

Radioactive material and any combination of radioactive material with chemicals, or biological agents: Contact your local or state radiation officer immediately.

Knowing what and how long to cool it

Material Safety Data Sheets (MSDS) 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.

LIVE LONG AND PROSPER SAFELY!

RESOURCES:

American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc.: HYPERLINK "<http://www.ashrae.com>" <http://www.ashrae.com>
Occupational Safety and Health Administration: HYPERLINK "<http://www.osha.gov>" <http://www.osha.gov>

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