ENVIRONMENTAL HEALTH AND SAFETY

Lab Chatter

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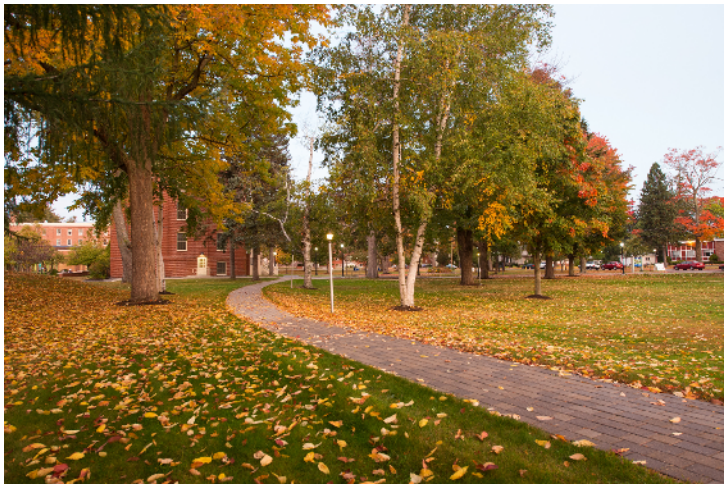
CONTACT EHS

Ronnie Souza
EHS Director
Biological Safety Officer
Radiation Safety Officer
Phone: x2488
Email: rsouza@une.edu

Peter Nagle
EHS Specialist
Phone: x2791
Email: pnagle@une.edu

Jesse Millen-Johnson
EHS Specialist
Phone: x2046
Email: jmillenjohnson@une.edu



SAFETY SPOTLIGHT
LIQUID NITROGEN

By Jesse Millen-Johnson

Liquid nitrogen is inert, colorless, odorless, non-corrosive, nonflammable, and extremely cold. Nitrogen gas actually makes up the major portion of the earth's atmosphere (78% by volume). Extensive tissue damage or burns can result from exposure to liquid nitrogen or cold nitrogen vapors. Asphyxiation from oxygen displacement and explosions are other potential hazards. Liquid nitrogen is stored, shipped, and handled in several types of containers, depending upon the quantity required by the user.

Containers
The types of containers in most university labs are the dewar and the cryogenic liquid cylinder. Dewars are non-pressurized containers. Five to 200 liter dewars are available. Product may be removed from small dewars by pouring, while larger sizes require a transfer tube. Cryogenic liquid cylinders are insulated, vacuum-jacketed pressure vessels. They come equipped with safety relief valves and rupture discs to protect the cylinders from pressure buildup. At UNE, these are commonly 230 liter wheeled vessels that can be moved between rooms.

Hazards
Liquid or low-temperature gas will produce cold contact burns. The extremely low temperature can cause severe frostbite and eye damage. Symptoms of frostbite include change in skin color to white or grayish yellow. Pain may quickly subside. Items in contact with liquid nitrogen become extremely cold. Touching these items may result in torn flesh after it freezes and sticks to surfaces.

Although nitrogen is nontoxic and inert, it can also cause asphyxiation by displacing oxygen to levels below that required to support life. It is important to have adequate ventilation in areas using liquid nitrogen.

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Heat flux into liquid nitrogen from the environment will vaporize the liquid and potentially cause pressure buildup in cryogenic containment vessels and transfer lines. On vaporization, liquid nitrogen expands tremendously by a factor of 696. Adequate pressure relief must be provided to all parts of a system to permit routine out-gassing and prevent explosion.

Liquid nitrogen is able to condense oxygen from the atmosphere. Repeated replenishment of the system can thereby cause oxygen to accumulate as an unwanted contaminant. Chemical explosions may occur if materials which make contact with the oxygen are combustible.

Handling and Moving

Cryogenic containers must be stored, handled, and transported in the upright position. Never tip, slide, or roll containers on their side. Use a suitable hand truck for moving smaller containers. Move larger containers by pushing, not pulling.

Avoid mechanical and thermal shock. Never leave the vessel unattended while transferring liquid nitrogen. Ensure that the delivery of the liquid nitrogen is directly below the mouth of the receiving vessel. Always fill warm dewars slowly to reduce temperature shock effects and to minimize splashing. Do not fill cylinders and dewars to more than 80% of capacity.

If there is any difficulty in operating the container valve or container connections discontinue use and contact the vendor. Do not remove or interchange connections. Use only the properly assigned connections. Do not use adapters. Use only transfer lines and equipment designed for use with cryogenic liquids. Some elastomers and metals, such as carbon steel, may become brittle at extremely low temperatures and may easily fracture.

Storage

Use only manufacturer approved containers. Laboratory personnel must use extreme caution when preserving samples in liquid nitrogen. Storage consists of a liquid and gaseous phase. If cyrovials are immersed in the liquid phase, liquid nitrogen can enter the closed cyrovials during storage. The cryovial may then explode when it is removed from storage due to the vaporization and expansion of the liquid nitrogen.

Do not store cryovials in the liquid phase of liquid nitrogen unless specifically approved by the manufacturer for liquid phase storage. If storage in the liquid nitrogen liquid phase is required, use only manufacturer approved cryovials specifically designed for liquid phase storage. Use gaseous phase approved cyrovials that are then sealed in an outer protective envelope designed for use in liquid nitrogen. The risk of explosion of cryovials stored in the liquid phase can be reduced by moving cryovials to the gaseous phase in the liquid nitrogen container for at least 24 hours prior to removal.

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IF IT BREAKS, FIX IT

By Jesse Millen-Johnson

In a university setting, there can be occasional confusion on what to do if a light breaks, a sink isn't working, or a fume hood alarm keeps going off. This may result in delayed resolution of common problems, which could in turn lead to safety issues.

EHS is responsible for biannual laboratory inspections, hazardous and biohazardous waste pickups, safety trainings, and various other aspects of lab safety. However, UNE Facilities Management should be contacted whenever something breaks or isn't working properly. This can include plumbing, electrical, HVAC, and a host of other potential issues.

In any of those situations, please navigate to the Employees tab on the UNE homepage. Then scroll to Campus Services at https://www.une.edu/employees and click on the Work Order Request link under Facilities Management.

This is the absolute best way to get the right person to your laboratory, classroom, or office as quickly as possible.

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Training

Personnel must be thoroughly familiar with properties and safety considerations before being allowed to handle liquid nitrogen and/or its associated equipment.The PI is responsible for SOPs specific to the use of this chemical in their lab. They must ensure proper site-specific and hands-on training occurs. Initially, researchers should perform the procedures with the PI present to observe the safe handling of this chemical.

Personal Protective Equipment (PPE)

Eye/face protection: A full face shield over safety glasses or chemical splash goggles are recommended during transfer and handling of cryogenic liquids to minimize injuries associated with splash or explosion.

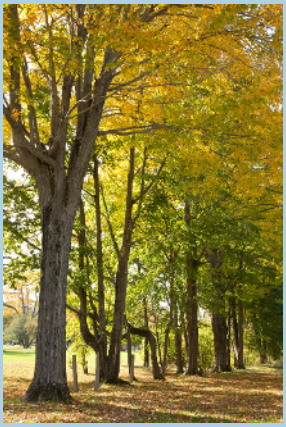
Skin protection: Loose-fitting thermal insulated or leather gloves, long sleeve shirts, and trousers without cuffs should be worn while handling liquid nitrogen. Safety shoes are also recommended while handling containers.

A special note on insulated gloves: Gloves should be loose-fitting so they are able to be quickly removed if cryogenic liquid is spilled on them. Insulated gloves are not made to permit the hands to be put into a cryogenic liquid; they will only provide short-term protection from accidental contact with the liquid.

First Aid

In the event a person is injured by liquid nitrogen, the following first aid treatment should be given pending the care of a physician ONLY if there is no risk to you:

For skin contact with cryogenic liquid nitrogen, remove any clothing that may restrict circulation to the frozen area. Do not rub frozen parts, as tissue damage may result. People with frostbitten feet should not walk on them. As soon as practical, place the affected area in a warm water bath that has a temperature not in excess of 105F (40C). Never use dry heat.



Frozen tissue is painless and appears waxy with a possible yellow color. It will become swollen, painful, and prone to infection when thawed. If the frozen part of the body has been thawed, cover the area with a dry sterile dressing with a large bulky protective covering, pending medical care. In case of massive exposure, remove clothing while showering the victim with warm water. Do not use hot water. Call a physician immediately.

If the eyes are exposed to the extreme cold of liquid nitrogen or its vapors, immediately warm the frostbite area with warm water not exceeding 105F (40C) and seek immediate medical attention. Take a copy of the SDS to the physician.

People suffering from lack of oxygen should be moved to fresh air. If the victim is not breathing, administer CPR. If breathing is difficult, administer oxygen. Obtain immediate medical attention. Do not attempt to rescue an individual that has been overcome due to lack of oxygen; the rescuer often becomes the second victim in this situation.

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OCCUPATIONAL NOISE EXPOSURE

By Ronnie Souza

Under OSHA's Noise Standard, CFR 1910.95, the employer is required to reduce noise exposure through engineering controls, administrative controls, or hearing protection devices.

OSHA standards in section 1910.95 focus on occupational hearing loss and hearing conservation programs. The standards state "The employer shall administer a continuing, effective hearing conservation program…whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level (TWA) of 85 decibels."

UNE has a Hearing Conservation Program for employees exposed to high levels of noise. Most employees in the program are in Facilities Management but other employees are also affected. If you wear hearing protection like earplugs or earmuffs as a UNE employee, you need to notify EHS that hearing protection is being used. EHS will ask you what tasks are being performed, what equipment is being used, and the duration (hours per day). Noise monitoring will then be conducted in your work area.

As part of the Hearing Conservation Program, EHS offers the following services:

Noise monitoring to check sound levels in your work area

Annual audiograms for employees that are above the OSHA limits

Hearing protection for employees, such as ear plugs and ear muffs

Once hearing damage occurs, it is permanent and irreversible (except in the case of an acute, one-time exposure where hearing may gradually recover). It is important to protect your hearing so you can do your job successfully and engage in what you love personally, such as listening to music, spending time with friends and family, and being able to hear important conversations.

If you choose to participate in recreational activities that can cause hearing loss, such as target shooting/hunting, car racing, attending loud concerts, etc., without hearing protection, it would not be considered occupational hearing loss. However, your job could still be significantly affected if you cannot properly communicate with coworkers. It is important to use proper hearing protection for both work and non-work related activities.

To see the entire written Hearing Conservation Plan for UNE, please see the UNE Safety Manual on the EHS portion of the UNE website at http://www.une.edu/campus/ehs.

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PROPER DISPOSAL OF PIPETTE TIPS

By Peter Nagle

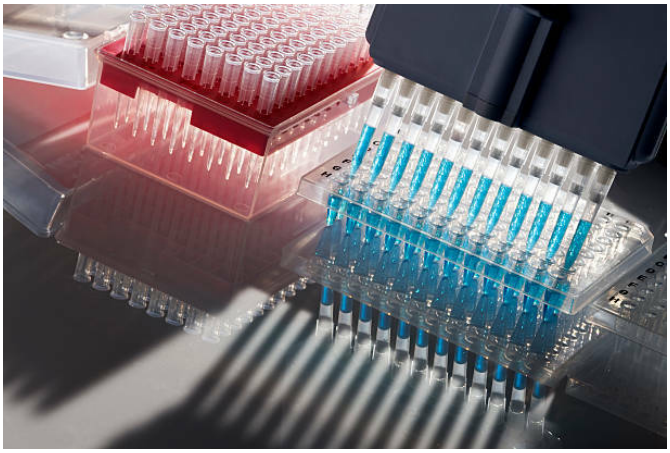
Pipette tips are considered sharps due to their ability to puncture bags and cause injury to those handling the bags. As a safety precaution, they must be placed in rigid containers for disposal. Also, depending on the type of contamination, other considerations must be taken. For instance, is the contamination radiological, biological or chemical?

- Pipette tips contaminated with radiation must be discarded with other radiation waste.
- Biological or infectious contaminated tips must be either autoclaved or chemically sterilized and then discarded in a sharps container.
- Chemically contaminated tips must be evaluated by the lab to determine appropriate disposal.

It's important to focus on chemically contaminated pipette tips because disposal can vary depending on the contamination. If the tip was used to transfer a non-hazardous substance, then it can go directly into a broken glass box or a box specifically used for disposal of plastics. Plastic pipette tips cannot be recycled, so the recycling bins are not an option.

Most of the time pipette tips will be treated as RCRA empty containers, as defined by the EPA and Maine DEP. That is, they have such little residue that they are no longer considered hazardous, even if previously used to transfer a hazardous substance. Be careful with this definition, however. If a substance is a listed waste (having a U or P code) then the tip must be tripled rinsed, with the rinsate being discarded as hazardous waste. In this case it is preferable to consider the pipette tip as hazardous waste and ultimately dispose of it through EHS.

If you have any questions regarding the disposal of pipette tips you can contact EHS directly.



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