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Environmental Health & Safety

SafetyMatters

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ENVIRONMENTAL HEALTH & SAFETY

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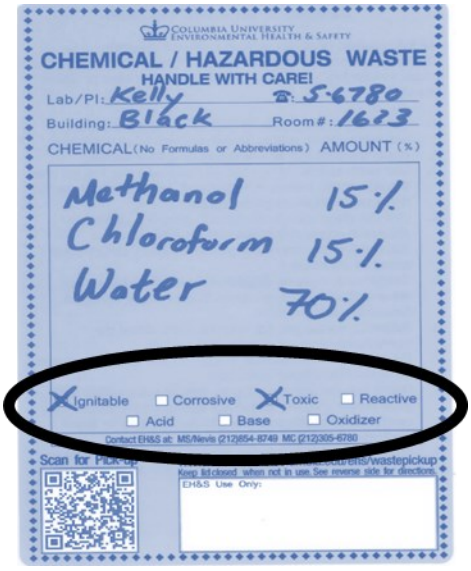
Hazardous Waste Labeling Update

by Justin Tsui, Safety Advisor

This summer, EH&S performed a cycle of laboratory safety surveys focused on comprehensive assessment of hazardous chemical waste collection practices in Satellite Accumulation Areas (SAAs). A Satellite Accumulation Area is defined as a location at or near any point where hazardous waste is initially generated and accumulated in containers before being removed by EH&S. The beginning of the survey cycle was timed in coordination with the announcement of important new compliance requirements for labeling hazardous wastes under modified Environmental Protection Agency (EPA) regulations. An excerpt of EH&S' announcement is below:

> *"EPA's Hazardous Waste Generator Improvements Rule requires that generators of hazardous waste must identify all chemical hazard(s) of the hazardous waste collected in containers at the point of generation, referring to the Satellite Accumulation Area inside the laboratory."*



Members of the research community can readily meet this new requirement by simply marking the hazard check boxes already present on the orange hazardous waste labels distributed by EH&S. What does a properly completed hazardous waste label look like? The example illustrated here includes all necessary components for compliance.

Effectively immediately, laboratories are asked to identify every characteristic that applies to the waste being prepared for pick up. Please note, waste labels that are not fully and properly completed may be ineligible for pick up. Please keep this detail in mind when requesting a chemical waste pickup online at http://vesta.cumc.columbia.edu/ehs/wastepickup/

As a reminder, "Labeling" is part of the Five L's of Hazardous Waste Management (see https://research.columbia.edu/sites/default/files/content/EHS/Waste_Hazmat/5Ls.pdf):

- Label the container as soon as you start collecting waste by affixing a completed Chemical/Hazardous Waste label.
- List all of the Waste components on the Label.
- DO NOT use chemical formulae or abbreviations on Hazardous Waste Labels.

For questions about this new regulation or for assistance on how to label hazardous waste appropriately, contact labsafety@columbia.edu.

Pyrophoric Safety

by Sebastian Flynn-Roach, Safety Advisor

This December will mark 10 years since the tragic laboratory accident at UCLA when a graduate researcher, Sheri Sangji, suffered extensive, ultimately fatal burns due to the accidental ignition of a pyrophoric compound, tert-butyllithium, that she was handling. It is important to remember and reflect on accidents and to share current information with the research community to avoid future tragedies.

Pyrophoric chemicals are extremely reactive and can ignite spontaneously upon exposure to air and/or moisture. In the case of the fatal accident at UCLA, Ms. Sangji was transferring the chemical via syringe inside of a fume hood when the plunger came out, causing the chemical to spray and ignite. Other solvents in the hood were also knocked over, and the resulting fire inflicted severe burns over much of her body. Ms. Sangji was treated at a specialized burn center, however succumbed to her injuries 18 days later. Her death launched a nationwide re-examination of academic research safety practices, particularly with pyrophoric and flammable chemicals, and other materials that pose physical hazards.

Many volumes have been written about the accident, but the primary lessons-learned to emerge from its investigation are related to personal protective equipment, training and hazard identification and control. Researchers can take measures to prevent accidents and protect themselves by using the necessary hazard control methods and wearing appropriate clothing and personal protective equipment (PPE) for the chemicals they are handling. Knowledge and emergency preparedness in the laboratory are crucial, especially in case of a pyrophoric chemical spill or fire.

Environmental Health & Safety (EH&S) is assisting with these efforts through a Fire Safety Team-led survey to identify laboratories that use pyrophoric materials and assess whether they have appropriate emergency extinguishing media in the event of a fire. The recommended media for many pyrophoric reagents is Met-L-Kyl, a sodium bicarbonate-based chemical designed to suppress most metal alkyl fires. Other reagents may be safely extinguished by sand or other inert absorbents; please contact fire-life@columbia.edu or labsafety@columbia.edu for more information.

Before work is conducted with a pyrophoric material, laboratory users should carefully review the chemical's safety data sheet (SDS) and must have completed the TC1850 pyrophoric materials Rascal training. An annual refresher requirement has also been newly added for this training, which is applicable to anyone who is part of a laboratory that uses pyrophoric materials, even if the individual does not actively handle such chemicals themselves. This encourages greater group awareness of the materials and how to control them. The Rascal pyrophoric safety training module provides background on physical properties, hazard awareness and general emergency response procedures, however it is not a substitute for task-specific and chemical-specific training from a laboratory supervisor. All users must complete both the University training and hands-on training for each protocol before beginning work. For high hazard materials such as these, always apply the buddy system and never conduct pyrophoric experiments alone.

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When working in the laboratory: eating, drinking or applying cosmetics is prohibited.

Proper work attire (e.g., long pants, closed toe shoes) and PPE (e.g., laboratory coat, gloves and eye protection) must be worn when working in the laboratory.

Remember to periodically flush your laboratory cup sinks and floor drains with water to prevent odors from migrating into your laboratory.

For Lab Fire Safety Prevention tips, check out FDN(wh)Y Me https://research.columbia.edu/content/fdnwhy-me

Pyrophorics continued from page 2

During active work and handling of pyrophoric chemicals, appropriate body protection and PPE are required at all times. At a minimum, a lab coat, gloves, and either safety goggles or a face shield should be worn; be mindful that a flame-resistant or fire proof lab coat may be appropriate. Leftover reaction material may need to be quenched for safe disposal. Quenching involves the use of solvents to neutralize the pyrophoric material so that it will no longer ignite. Stock quantities of pyrophoric chemicals should never be quenched prior to disposal, however. EH&S will provide waste pick-up service for any stock pyrophoric chemicals that require disposal. Proper quenching techniques can be found at https://www.chemistry.ucla.edu/sites/default/files/safety/sop/SOP_Pyrophoric.pdf

It is essential for the research community to learn from laboratory accidents. EH&S' series of *Santayana Report* bulletins (available at https://research.columbia.edu/lessons-learned-santayana-report) aims to share information from real-world accidents and incidents so that researchers can avoid the same conditions in their own laboratories and the spills, fires, accidents and other near misses that may occur. EH&S is available to assist with safely managing laboratory protocols of all types to help limit their frequency and impact.

Read more about the Safe Use of Pyrophoric Reagent Reagents at https://research.columbia.edu/sites/default/files/content/EHS/Homepage/pyrophorics.pdf

The Electrifying Facts About Fire Safety

by Andrew Patterson, Senior Fire Safety Officer

Electrical Safety is at times an overlooked hazard in a research laboratory. The improper use of energized electrical equipment can damage critical and expensive equipment, may cause a fire, and may also physically harm an individual. Here are a few shocking things Fire Safety observes in laboratories:

- Extension Cords: When using an extension cord, the FDNY Fire Code requires that extension cords not be used as a substitute for permanent wiring and are for temporary use (defined as less than 90 days). Extension cords should **never** be stretched across the middle of the floor.

- Power Strips: Power strips should only be used for small portable devices, such as computer equipment and accessories. Refrigerators, freezers, and other large equipment should not be connected to a power strip.

- GFCI Outlets: A ground-fault circuit interrupter (GFCI) outlet is designed to protect people against electric shock from an electrical system. If any equipment in the laboratory is near a water source, a GFCI outlet should be installed.

A Fire Safety Officer can provide laboratories more information on proper use of electrical equipment and other electrical safety tips. Contact fire-life@columbia.edu.

Fire Prevention Week: October 7-13, 2018

November 4, 2018

A Mercurial Device

by Stavros Fanourakis, Safety Advisor II

Thermometers are essential instruments in almost every research environment. So ubiquitous, that often it is forgotten how many there are in the laboratory. There might be one in the water bath, or in the old incubator; perhaps there is a thermometer hanging on the wall, and a couple hidden away in a desk drawer.

The science behind thermometers is simple: they contain a thermometric material and operate based on the physical properties of their contents. The thermometer is under constant pressure inside, but when heated or cooled, the thermometric material undergoes a change in its volume. The magnitude of expansion or contraction is directly proportional to the temperature change, and produces a reading indicative of the absolute temperature measurement.

Mercury, being the only metal that remains liquid at room temperature, exhibits properties that historically made it an ideal material for use in a thermometer. However, inorganic mercury also possesses significant toxicological properties. It is extremely neurotoxic and can damage the respiratory system and a number of different organs including the eyes, skin, and kidneys. Mercury is also a notorious environmental pollutant. Its organic species tend to bio-accumulate in marine organisms and can end up in the food chain and water supplies.

In an accidental break of a thermometer or other mercury containing device, personnel exposure can occur through inhalation of elemental mercury vapors. It is vital that certain precautions are in place during cleanup procedures. EH&S should be contacted immediately in the event of any mercury spill, large or small.

Laboratories that require use of mercury containing devices, including thermometers, should have appropriate cleanup supplies readily available, to minimize the risk of exposure or release to the environment in the event of a spill. Specialized mercury spill kits typically include a zinc amalgamation powder; once applied on the spill, zinc reacts with liquid mercury producing a non-fluid amalgam, rendering containment of the spill and cleanup much easier. In addition, kits should include gloves, droppers/pipettes for suction of mercury beads, and a bag or jar to contain contaminated debris. Principal Investigators, laboratory managers, researchers and students are urged to check their labs for mercury containing devices. Other instruments that may contain mercury include manometers and some microscopy lamps.

Alternatively, a majority of laboratories truly do not require a mercury containing thermometer. EH&S recommends employing "substitution" as an effective method of controlling mercury environmental and occupational hazards, via the mercury thermometer exchange program. Through this program EH&S replaces mercury containing thermometers with alcohol-containing thermometers, at no cost. This free service may cause a slight loss in precision and accuracy, but has significantly reduced the risk of an accident. Since 2002, researchers across all Columbia campuses have exchanged over 500 thermometers for alcohol-based replacements. No mercury in the laboratory means no need to purchase mercury-specific spill supplies or worry about accidental exposure to this toxic metal.

To arrange a free exchange of a mercury thermometer with an alcohol model, please contact the Safety Advisor team at labsafety@columbia.edu.

New ALARA Notification Levels

by Joshua Young, Health Physicist

As of the July 1, 2018 wear date, Radiation Safety has updated the ALARA Notification Levels for radiation monitoring badges in order to more efficiently monitor the radiation doses received by radiation workers (in particular Clinical Radiation employees) at Columbia University.

ALARA is an acronym that stands for "As Low As Reasonably Achievable," and it is the guiding philosophy of radiation protection. It means that even without exceeding regulatory limits, Radiation Safety will make all reasonable efforts to reduce radiation doses without inhibiting employees from performing their work. To support this effort, notification levels have been established to prompt workers to check if their work practices are actually ALARA. The ALARA levels work by triggering increasing levels of notice and review upon observation of pre-determined radiation dose levels. At the first trigger (ALARA Level I), a notice is sent to the employee to ask them to review their work practice and determine if there are any reasonable steps that could be taken to reduce their radiation dose. At the second trigger (ALARA Level II), this review is performed with the employee by a Radiation Safety staff member. A formal counseling session with the Radiation Safety Officer may be triggered at doses that threaten to exceed regulatory limits, and a stop-work order will be issued to those that record a dose within 10% of any annual limit.

After a thorough review of historic dosimetry reports, Radiation Safety has updated these notification levels to better account for normal work practices in clinical areas and to more closely align with industry standards. By increasing the notification review frequency to monthly, the Radiation Safety Officer can efficiently distinguish between normal work activities and improper behaviors that need correction.

Dose monitoring will now be assessed on a monthly basis (or quarterly basis if dosimeters for a particular group are issued quarterly). The following table illustrates the new ALARA Notifications Levels (all units in mrem):

Exposure Type	ALARA Level I Notification Level	ALARA II Investigation Level	Formal RSO Counseling	Annual Regulatory Limit
Whole Body Deep (DDE) Assigned Effective Dose Equivalent (EDE)	100 monthly or 1,250 annual	400 monthly or 2,500 annual	3,750 annual	5,000
Lens of Eye (LDE)	375 monthly or 3,750 annual	750 monthly or 7,500 annual	11,250 annual	15,000
Skin and Extremities (SDE)	1,875 monthly or 12,500 annual	5,625 monthly or 25,000 annual	37,500 annual	50,000
Organ	1,875 monthly or 12,500 annual	5,625 monthly or 25,000 annual	37,500 annual	50,000

Wear your dosimeter when working with radioactive materials or radiation producing equipment and return them to our office on time so we can keep your doses ALARA. For any questions or concerns contact badges@columbia.edu.

Spotlight on Safety — Prepare to Ship

by Cody Cameron, Biological Safety Officer

There are many considerations and compliance requirements that go along with shipping biological materials, whether to a nearby, neighboring institution or across the country. Selecting the proper amount of dry ice to preserve the contents, applying the correct hazard classification, and completing the required documentation such as commercial invoices, airway bills, or packing lists, to name a few, are all critical to ensure that packages arrive safely, in time, and in compliance. International shipments have even more stipulations. Depending on the destination, the package may pass through multiple customs agencies and numerous handlers. If the package is incorrectly classified, improperly packaged, or lacking the requisite documentation, the shipment may be indefinitely held in customs, jeopardizing the integrity of the contents. Furthermore, countries each have their own customs laws, regulations, and import restrictions that determine what can enter the country. International customs violations can result not only in indefinite retention of the shipment, but potentially steep fines.

Recently an investigator from CUMC's Pathology and Cell Biology Department needed to make a shipment of cells to Argentina. Dr. Partha Mukhopadhyay began with emailing hazshipping@columbia.edu with questions on this process. EH&S asked Partha his perspective on the successful shipment process for his cells' journey.

Please share with *SafetyMatters* readers some of the basics about the research you are performing.
Partha: We are studying breast cancer epigenetic regulation in relation to metabolic imbalances along with cancer progression. For this research we use specialized cell lines. Our collaborators in Argentina did not have the cell lines available in the country's repository so we offered to send ours to them.

Was this your first time shipping a package internationally and how would you describe the process?
Partha: I have shipped biological materials before, but I have never shipped anything of this nature internationally. After my meetings with the Biosafety team I felt the process of sending the package was simple. Biosafety informed me of the need of a customs broker to usher the package into Argentina. A customs broker wasn't anything I've ever needed to use. FedEx usually can perform this function but not in my case. Thankfully, the recipient PI was able to connect with a local broker to facilitate the parcel through customs. (**Interviewer note**: Argentina has exceptionally strict customs laws. Argentina's import procedures have changed various times over the years and require either the importer or exporter to be registered with Argentine customs for international transactions. Without a broker to provide clearance through customs, there would be significant impact on the package ever getting to the recipient.)

What were your greatest challenges in sending this package?
Partha: Interestingly enough there was one small hiccup, which caused quite the scare. I used the paper FedEx label instead of the electronic shipping label. This caused a system error and an estimated 9-day delay. I was able to call FedEx and have them remedy the error. It thankfully reached its destination within 4 days.

Could you please describe your experience with EH&S? How helpful was the Rascal training (TC0076: "Shipping with Dry Ice, Exempt Specimens and Excepted Quantities of Dangerous Goods")?
Partha: My experience with EH&S was excellent. I felt that during our meetings I was provided with all of the information that I needed to know, simplifying this complicated process. The Rascal course was exceptionally informative in describing exactly what to do in each situation and when to do it. The training was exactly what I needed and it gave me confidence when packing and filling out the invoice and airway bills. EH&S provided me both the "Exempt Human Specimen" and dry ice labels, and also gave me the recommendation to pack 5 kg of dry ice for every 24 hours the package would be in transit.

Thank you to Partha for sharing his experience! If your laboratory needs help shipping biological materials, whether domestically or internationally, please reach out to hazshipping@columbia.edu.

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