Volume 6 Issue 1 COLUMBIA UNIVERSITY EH&S Winter 2012

Environmental Health & Safety

SafetyMatters

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Serious Accident at Texas Tech Offers Lessons on Lab Safety

by Christopher Pitoscia

Last month, the US Chemical Safety Board (CSB) released the report of its investigation into an incident at Texas Tech University (TTU). The laboratory explosion, in which a graduate chemistry researcher lost 3 fingers and sustained serious eye injuries, was the first academic research accident ever to be investigated by the CSB. The findings of the report – full text and video linked below – questioned the "culture of safety" in academia, and the way in which chemical hazards are assessed, communicated and controlled in the research environment.

The CSB report should prompt the entire academic research community to review their own systems and practices, with an eye toward identifying opportunities for improvement. For laboratories, this means examining existing Standard Operating Procedures (SOPs), particularly those that involve hazardous substances, such as energetic reactive compounds or toxic materials. Where laboratory SOPs are not formally defined, they should be developed, implemented and clearly communicated; if they have not been recently reviewed, a documented revision should be performed. Laboratories needing guidance in developing SOPs can contact EH&S.

The commitment to safety in research begins in the laboratory and is reinforced by safe practice at the bench. Safety must be integral to all research operations and be supported throughout the laboratory, department and institution. TTU was found to have a culture in which PIs failed to adopt and support basic personal protective equipment standards, leading to a similarly lax approach from students. Additionally, most students in the department where this incident occurred had not taken the general laboratory safety training class offered by EH&S and there was no formal system for ensuring that PIs and/or senior laboratory personnel effectively communicated laboratory or process specific hazard information to students and/or that students understood such information, which are both essential components of a strong safety and hazard communication program. This unfortunate incident should serve as a reminder that we all have an obligation to educate ourselves and one another in proper safety practices and support a safety culture that seeks to ensure that hazards are identified, assessed, communicated and controlled. PIs, students, and graduate research workers must embrace not only their general training, but an overall awareness and safety-first attitude toward their work environment.

EH&S encourages the research community to review the CSB's report and video and to initiate or continue discussions about ensuring research safety systems, procedures and practices are incorporated in all research activities. EH&S welcomes the opportunity to participate in these discussions, so please contact us.

CSB Report - http://www.csb.gov/assets/document/CSB_Study_TTU_FINAL.pdf
CSB Video - http://www.csb.gov/videoroom/detail.aspx?VID=61
OSHA Bulletin–http://osha.gov/Publications/laboratory/OSHA3404laboratory-safetyguidance.pdf

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FDNY Familiarization Drill by John LaPerche

On Saturday Sept 24, local New York City Fire Department (FDNY) units, along with their Haz Mat, Rescue and Special Operation Command units, were invited by EH&S, Public Safety and CU Facilities to participate in a familiarization drill of the Morningside Campus Northwest Corner Building. The purpose of the drill was to acquaint FDNY with important elements of the building's layout and operation, including fire alarm locations, building access, and water supply and mechanical systems, should they ever be called to respond to an emergency. The firefighters were also escorted on a tour of the building's "areas of concern," including laboratories, chemical storage areas and mechanical equipment rooms. Being familiar with a building is of great importance to a firefighter; knowing the layout of a building helps them operate more quickly and safely, which in turn protects more lives and prevents property damage. EH&S has been hosting building tours with FDNY for more than a decade and always concludes these events with a "Lessons Learned Lunch," to afford the firefighters an opportunity for additional Q&A with EH&S, as well as other University representatives participating in the tour. As always, FDNY was appreciative of our continued efforts at familiarizing them with University building and operations and look forward more drills in the future.

The FDNY Laboratory Unit performs regular, weekly inspections in all chemical laboratories across Columbia University's New York City campuses, and has the authority to issue Violation Orders or Notices of Violation for non-compliance with code requirements.

All laboratories in NYC require a FDNY permit to operate; these permits are renewed each year after the FDNY annual inspection, and will be withheld until all open violations have been corrected.

Top violations 2011 YTD

- **Certificate of Fitness – (C-14)**
- **Chemical Stored Improperly**
- **Extension Cord Misuse**

Safe Use of Refrigerators in Research Labs by Brian Anderson

Improper storage of flammable laboratory chemicals in regular "household" freezers and refrigerators is a safety concern that can result in physical injury and the loss of research materials. Household freezers and refrigerators, designed primarily for the storage of food, must be used with care in lab applications. While household units are typically lower in price, they are not designed to industrial specifications, and often contain unprotected internal wiring and components that are capable of acting as incidental sources of ignition, thus greatly limiting their capability for safe chemical storage. When flammable materials are stored in a household refrigerator, flammable vapors can accumulate and ignite if an internal mechanism such as an interior light or a fan motor causes a spark; unfortunately, numerous instances of such events are documented in the laboratory safety literature. For this reason, no matter the quantity, concentration or duration of storage, flammable liquids must never be kept in refrigerators or freezers that are not designed and rated as either "explosion proof" or for the storage of "flammable materials." If your lab does not have access to an appropriate refrigerator/freezer, a wet or dry ice bath is recommended for temporarily cooling samples of flammable liquids.

Prior approval from EH&S, issued via the Financial Front End (FFE) system, is required if your lab intends to purchase a household refrigerator or freezer. To notify EH&S of a planned purchase, please submit to your Research Safety Specialist a completed "Memorandum of Understanding and Agreement Prohibiting the Storage of Flammables in a Fridge/Freezer" form, found at http://www.ehs.columbia.edu/Refrigerator.pdf. Upon receipt, EH&S will consult with the lab on the materials that will be stored in the unit, approve the purchase in FFE, and provide the appropriate safety signage for your new unit.

For Lab Fire Safety Prevention tips, check out: FDN(wh)Y Me @ http://www.ehs.columbia.edu/FDNYMe.html

Waste Wise by Rebecca Lonergan and Christopher Pettinato

If you have spent any time working in a laboratory at Columbia University, the emphasis placed on proper waste collection practices is hard to miss. Whether it is information highlighted in training or during one of EH&S's routine laboratory safety surveys, a document posted in your lab or on the EH&S website, or a reminder delivered as an automated response to an online waste pick-up service request, guidance information designed to aid laboratory personnel in making the proper waste determination abounds at Columbia.

The foundation of laboratory waste collection begins with an understanding that each laboratory waste has a designated receptacle and each laboratory should have the appropriate complement of receptacles needed to properly and safely collect and store the specific wastes generated by that laboratory. Columbia University generates more than 300,000 pounds of chemical waste and 500,000 pounds of regulated medical waste each year, not to mention the tons of laboratory plastic, metal and glassware that are sent for recycling each year. As you might imagine, waste that is improperly placed in the wrong container could present serious safety and compliance issues for individuals and the University.

Chemical Inventory audit on the way @ Morningside Campus
Any questions send email to chemtracker@columbia.edu

Recently, numerous uncapped syringes were found by EH&S in a cardboard bin used to collect clean, broken laboratory glassware destined for recycling. This was an egregious error in judgment that placed numerous others at risk for a needle stick injury. Fortunately, and only by chance, EH&S was able to intercept this container before it was collected by the NYC Department of Sanitation for recycling. It is undetermined if this error was due to a lack of knowledge or carelessness, but it has prompted a change in practice for these containers. Effective December 2011, laboratory glass disposal boxes prepared by laboratories for handling and recycling by custodial services at Morningside must be labeled with the new, standardize label depicted below. Labels will be applied at the Chandler Chemical Store Room or the CEPSR Biological Stock Room when boxes are issued to laboratories. If laboratories obtain these boxes from other sources, labels can be obtained from EH&S. Boxes will not be accepted by custodial services unless properly labeled.

EH&S Website: http://www.ehs.columbia.edu

EH&S has developed a Laboratory Disposal Guide for Morningside (http://www.ehs.columbia.edu/LabDisposalGuideMS.pdf) and CUMC (http://www.ehs.columbia.edu/LabDisposalGuideCUMC.pdf) to assist laboratories in making the proper waste disposal decisions. Please review and ensure that your laboratory is set-up to properly and safely collect its waste. Feel free to print and post the guide in your laboratory.

CLEAN BROKEN GLASS

FOR RECYCLING**

INVESTIGATOR:_____

BUILDING:_____

FLOOR/ROOM#:_____

**Attention Custodians:

DO NOT discard this box unless the above information is filled in, and the box has been securely taped closed.

Handy Guidance by Greg Kwolek

The hands are a common target for chemical, biological, radiological and physical exposures. Two recent laboratory incidents demonstrate the importance of protecting the hands, through an evaluation of workplace hazards, implementation of practices to limit exposure and selection and use of proper protective gloves.

In one incident, a laboratory worker sustained a chemical burn to their right hand while cleaning glassware in a potassium hydroxide bath. In the cleaning process, their gloved hand was submerged in the bath and exposed to the corrosive solution when the nitrile glove they were wearing tore. While nitrile gloves typically offer long-lasting chemical protection against potassium hydroxide, it is best to eliminate ("engineer out") the potential exposure from the equation. The use of tongs, for example, to handle the glassware would reduce the potential for hand exposure. If not feasible, consider double gloves or gloves with a greater chemical resistance rating than would be worn during general bench work. In a separate incident, while decanting chloroform through a funnel, the funnel overflowed and chloroform immediately began to dissolve the latex glove the laboratory worker was wearing, resulting in skin irritation. Emphasis must be placed on evaluating work operations, identifying possible hazards and then employing practices and protective equipment to reduce or eliminate hazards.

These are just two incidents that highlight the importance of identifying potential chemical hazards and determining the chemical protection afforded by a particular type of glove material before beginning work at the bench. The ready availability of nitrile, latex or any other glove material in the laboratory must not be interpreted as an indication that any or all gloves will provide adequate or equal protection against all chemical hazards.

How does one go about choosing the proper glove? Referencing a Material Safety Data Sheet (MSDS) may only provide generic advice by recommending "gloves", but not specify the safest material to don. The best resource for help in selecting a protective glove that provides the desired chemical protection is a glove selection guide and most a appropriately a guide published by the manufacturer of the specific glove intended for use. Manufacturers test a variety of chemicals against different glove materials to determine chemical permeation and degradation. Recommendations for a suitably protective glove are then published based on these data and can vary between manufacturers depending on specific formulations of glove materials. The guides can be accessed from the manufacturers' website or requested directly. EH&S's website provides links to some of the more common manufacturers' selection guides.

Can I Remove My Lab Door? by Harry J. Oster

Often overlooked is the important role the door plays in the event of a fire, or smoke. When closed, the door protects the hallway and allows occupants in adjoining labs to safely exit the floor past the room with the incident on their way to the emergency stairwell. Accordingly, the answer to the sometimes asked question "can I remove my lab's door?" is "No."

You may also notice a metal rating tag, oblong in shape attached to the side of the door. This means the door was properly manufactured to design specifications. The tag is made in different colors, which translates into the hourly fire rating for the door, typically 1.5 hours. The tag should never be painted or removed, as this will void the certification of the door.

As always, in the event of a fire, remember the acronym: **R A C E**. **R**escue, **A**larm, **C**onfine and **E**xtinguish/ **E**vacuate, with the focus on the letter "**C**": **C**lose the Door!

Preventative Measures During Cold Weather by Muhammad Akram

When the body is unable to warm itself, cold related stress may result. Four factors contribute to cold stress: cold air temperatures, high velocity air movement, dampness of the air, and contact with cold water or surfaces. A cold environment forces the body to work harder to maintain its temperature. While it is obvious that below freezing conditions combined with inadequate clothing could bring about cold stress, it is also important to understand that wind chill, which is the combination of air temperature and wind speed, can play a significant role in cold-related stress at above freezing temperatures when coupled with moisture and wind.

Planning in advance of work (or play) in cold weather is very important. Avoiding alcohol, certain medications and smoking can also help to minimize risk. Wearing appropriate clothing and being aware of how your body is reacting to the cold are important to preventing cold stress.

Protective clothing is the most important way to avoid cold stress. The type of fabric also makes a difference. The following are recommendations for working (or playing) in cold environments:

- Wear at least three layers of clothing. A form-fitting inner layer of wool, silk or synthetic to wick moisture away from the body. A middle layer of wool or synthetic to provide insulation even when wet. An outer wind and rain protection layer that allows some ventilation to prevent overheating.
- Wear a hat or hood. Up to 40% of body heat can be lost when the head is left exposed.
- Wear insulated boots or other appropriate footwear.
- Keep a change of dry clothing available in case clothes become wet.

Work practices are also important preventative measures. Schedule cold weather work (or play) to take advantage of the warmer parts of the day. Try to work in pairs to keep an eye on each other and watch for signs of cold stress. Take breaks out of the cold. Drink plenty of liquids, avoiding caffeine and alcohol. It is easy to become dehydrated in cold weather. Avoid fatigue since energy is needed to keep muscles warm.

Engineering controls can also be effective in reducing the risk of cold stress. Radiant heaters may be used to warm workers. Shielding work areas from wind will reduce wind chill. Use insulating material on equipment handles, especially metal handles, when temperatures drop below 30° F.

Be mindful of how your body is responding to cold, wet and/or windy conditions and adjust your schedule, equipment and protective clothing accordingly to best avoid cold related stress.

New Employee

Please Welcome Christopher Aston, Ph.D., Sr. Biological Safety Officer

EH&S is pleased to announce the addition of Christopher Aston, Ph.D., to our staff as Senior Biological Safety Officer, effective December 1, 2011. Dr. Aston earned his B.Sc. in Cell and Immunobiology from University College of Wales, holds a Ph.D. in Molecular and Cellular Biology from Oxford University and the Rockefeller University, and has served in various research and biosafety roles in academia and both the private and public sectors over the last 2 decades. Dr. Aston has contributed numerous articles to the literature in the fields of infectious diseases, genomics, microbial pathogenesis and biodefense, and will be responsible for supporting all technical and regulatory biosafety activities across Columbia University.

Radiation is Everywhere! by William O'Connell

The Radiation Safety Program is often asked to explain radiation risk to members of the public or to patients who are having medical procedures involving the application of ionizing radiation. Expressing radiation risk in lay terms can prove challenging. A common tool is correlating the radiation exposure required in a specific medical procedure with a similar everyday radiation exposure. For example, a New York City resident can expect to receive 3 millisieverts from natural background radiation every year. Therefore, if a patient is having a CT scan of the abdomen (6 millisieverts) we could say the effective radiation dose from the scan is the equivalent to the background radiation received from living in New York City for two years. This is referred to as BERT (Background Equivalent Radiation Time).
So where does this background radiation come from? The table below offers insight into the various sources of natural background radiation:

Source	Average Annual Effective Dose
Radon Gas	2.29 millisieverts
Other Internally Deposited Radionuclides	0.31 millisieverts
Terrestrial Radiation	0.29 millisieverts
Cosmic Radiation	0.27 millisieverts
Total	**3.16 millisieverts**

The values cited above are average values. Residents of Denver have higher annual doses from cosmic radiation compared to New Yorkers since the "The Mile High City" has a thinner layer of atmosphere overhead to protect it from cosmic rays. Even the food we eat has naturally occurring radiation. Bananas, potatoes, kidney beans, sunflower seeds and Brazil nuts all contain trace amounts of radioactivity.

Should we be worried about low-level background radiation? The National Research Council's Committee on Biological Effects of Ionizing Radiation (BEIR) has prepared an exhaustive study of the health effects of low levels of ionizing radiation. In their publication, Health Risks from Exposure to Low Levels of Ionizing Radiation, the BEIR committee reviewed current research on the health effects of low-level radiation (doses less than 100 millisieverts.) They concluded that the evaluation of radiation-induced cancer risk at doses below 100 millisieverts is difficult. Furthermore, BEIR concluded there is no evidence of non-cancer diseases at doses below 100 millisieverts.

Individuals working with ionizing radiation are obliged by law to keep their annual dose from radiation below 50 millisieverts. The average annual occupational radiation exposure at Columbia University is more than 10 times less and well below 5 millisieverts. Does 5 millisieverts represent a risk-free dose? The official answer is No – but the probability of an adverse health effect at an annual dose of 5 millisieverts is extremely small.

After hour calls for RAM emergencies

In an effort to properly triage emergency calls received after business hours by the Radiation Safety Program (212-305-0303), EH&S will launch a voice messaging system on Friday, December 2nd that will allow callers to be routed to NYPH Security Office, CUMC Public Safety Office or NYSPI Security Office, respectively, once he/she has chosen the corresponding option within the voice messaging system. After hours the respective Public Safety and Security officers will contact applicable Radiation Safety personnel.

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Do you have a suggestion for a future *Safety Matters* article? Do you have a comment on something you just read? Please share it with us at newsfeedback@columbia.edu