

In this issue of the Environmental Health and Safety (EHS) Listserv, November 1, 2011:

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1. Pre-planning = Laboratory Safety

Could any of these happen in your laboratory?

- In **early 2010**, a graduate student at Texas Tech lost three fingers and suffered other serious injuries after the chemical he was working with detonated.
- In **June 1997**, a Principal Investigator at Dartmouth died from exposure to a very small amount of a highly toxic chemical, Dimethylmercury.
- In **January 2009**, a graduate student at UCLA died after her clothing caught fire while working with a pyrophoric chemical.
- In **April 2011**, a Yale student died from strangulation when her hair became entangled in a chemistry shop lathe. She was working alone.
- In **June 2011**, a Boston College chemistry student was injured when a small amount of thionyl chloride, a substance commonly used in organic chemistry experiments, exploded while the student was working alone in the lab.
- In **July 2011**, two University of West Florida students were burned in a chemistry lab explosion involving nitric acid.
- In **September 2011**, two University of Maryland students suffered first and second degree burns on their faces, arms, and the front part of their bodies due to an explosion and fire as they worked with sulfuric acid and nitric acid. Another student in the vicinity suffered extensive cuts from flying glass shards.
- In **October 2011**, a University of Florida student was treated for cuts when a vial of chemical exploded. The student was transferring approximately 4 grams of a chemical from a scale to a vial. The chemical in this case has the potential for violent reaction when it becomes unstable or shocked.

While most of these examples involve chemicals, ANY physical hazard, as evidenced by the Yale incident, can lead to serious injury or death.

Have you ever heard the expression, “An ounce of prevention is worth a pound of cure?” For our purposes, this means that the best way to avoid injuries in the laboratory is by pre-planning. What does “pre-planning” mean? It means that possible hazards associated with the work are anticipated, the magnitude of the risk is evaluated, and mitigation strategies are put into place BEFORE the laboratory work/research begins.

Following are steps that should be part of your pre-planning to optimize laboratory safety:

- Perform a HAZARD DETERMINATION. Analyze hazards with respect to normally expected operations/conditions as well as hazards that may present in the event of a process or equipment failure or that may occur if workers do not adhere to established procedures ask the question: “What If?”
- Examine the potential effects of the identified hazards. Think about possible effects to persons, structures, and the environment.
- When performing a RISK ASSESSMENT, consider the likelihood of an adverse event and the magnitude of adverse effects if the event does occur. Knowledge and experience of those conducting the work may increase or decrease the risk of an adverse event. When evaluating hazards and risks, it often is best for more than one person to participate in the process for a more thorough evaluation.
- Consider options for eliminating or reducing the hazard or risk. Common strategies include product substitution, process modification, engineering controls (such as fume hoods for controlling airborne chemical exposures, blast shields for energetic material, glove boxes, etc.), administrative controls (such as product synthesis limitations, written work procedures, job briefings, training and supervision of workers, etc.), Personal Protective Equipment (such as lab coats, specific gloves, eye protection, etc.), and emergency equipment/alarms. PPE and administrative controls are a supplement to and not a substitute for engineering controls.
- Verify appropriateness of the work space, with consideration given to available engineering controls and emergency equipment, as well as the seriousness of an adverse event and the population potentially affected.
- Develop WRITTEN laboratory procedures and instructions to mitigate hazards. Mitigation means eliminate or reduce the frequency of a risk, the potential consequences of a risk, or both.
- In order to ensure effective COMMUNICATION of hazards, mitigation strategies, and safety practices for a particular research project, there should be a formal documentation system to ensure everyone on the project receives project-specific TRAINING before they engage in work. Training should include instruction on deviations from established procedures/protocols that must be reviewed and approved by a competent authority (e.g., Principal Investigator) prior to implementation.
- Incidents and near misses should be documented, tracked, and communicated as a means of identifying methods for enhancing safety. Consider sharing with colleagues who may conduct similar work. The American Industrial Hygiene Association (AIHA) maintains a list of laboratory safety incidents. This list may be helpful in conducting hazard assessments and raising awareness of laboratory safety. It is available at:
<http://www.aiha.org/insideaiha/volunteergroups/labHandScommittee/Pages/LaboratorySafetyIncidents.aspx>

The pre-planning process applies to ANY type of work, not just work involving chemicals. A number of tools exist to assist the campus community in hazard identification, risk assessment, and hazard mitigation strategy development. Here are a few:

- The **EHS Virtual Manual** is an online tool that asks a few questions of the user and then aggregates safety resources such as Safe Operating Procedures and outside links relevant to the type of work being conducted.
- **EHS Safe Operating Procedures (SOPs)** exist for a wide variety of tasks. Note: A SOP may be listed under one heading, for example, “Landscape” but also be of relevance to those in an agricultural setting, or performing research in the field.
- **EHS web-based training**, including Chemical Safety, General Electrical Safety Awareness, Ladder Safety and others, may be applicable to the research being conducted and serve as a valuable resource toward the “training” component essential to successful hazard mitigation.
- Previous **Laboratory Safety Colloquia** presentations sponsored by EHS and the Office of Research and Economic Development are available online. In most cases a video of the actual presentation is available for review as applicable to research being proposed/conducted. Examples of topics include Pyrophorics Chemical Safety, Cryogen Safety, Laser Safety, and others.
- The National Research Council (NRC) publication, ***Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards in the Laboratory, Revised Edition*** includes steps which can be used to assess laboratory hazards.
- The Occupational Safety and Health Administration (OSHA) **Occupational Exposure to Hazardous Chemicals in Laboratories Standard** (29 CFR 1910.1450) provides guidance on mitigating HEALTH hazards related to chemical used/stored in the laboratory. Note: This standard does not include a hazard evaluation requirement to identify/mitigate PHYSICAL hazards.
- OSHA has developed a publication, **Laboratory Safety Guidance**, which provides a general overview of laboratory safety and contains safety recommendations, in addition to descriptions of mandatory safety and health standards. While not regulatory in nature, this document is a valuable resource.
- The American Chemical Society (ACS) is an organization which provides guidance on health and safety as it relates to chemistry. The ACS has published several widely used documents, for example, ***Safety in the Academic Chemical Laboratory*** (2003).
- The US **Chemical Safety Board** (CSB) undertook an investigation after the Texas Tech incident in 2010. They have released their case study report, a related webinar, and a video, all of which discuss safety in research laboratories. These materials are available on their website at <http://www.csb.gov/investigations/detail.aspx?SID=90>.

Resources:

- EHS Virtual Manual <https://scsapps.unl.edu/VirtualManual/>
- EHS Safe Operating Procedures <http://ehs.unl.edu/sop/>
- EHS web-based **Chemical Safety** and other training <http://ehs.unl.edu/onlinetraining/>
- Laboratory Safety Colloquia <http://ehs.unl.edu/training/Colloquium/>

- The National Academies Press - Prudent Practices in the Laboratory, Handling and Disposal of Chemicals (an NRC resource)
http://www.nap.edu/openbook.php?record_id=4911
- OSHA Laboratory Safety Guidance
<http://www.osha.gov/Publications/laboratory/OSHA3404laboratory-safety-guidance.pdf>
- CSB Video, Experimenting with Danger:
http://www.csb.gov/videoroom/videos.aspx?cid=1&F_All=y
- CSB Case Study, Texas Tech University Laboratory Explosion
http://www.csb.gov/assets/document/CSB_Study_TTU_FINAL.pdf
- CSB Webinar:
http://www.csb.gov/assets/document/TTU_Webinar_Presentation.pdf
- ACS Publications
http://portal.acs.org/portal/acs/corg/content? nfpb=true& pageLabel=PP_SUPE_RARTICLE&node_id=2230&use_sec=false&sec_url_var=region1& uuid=3c3b8cf8-d3c3-46be-b203-87fc068d6b40

2. Rack It Up

As the number of bicycles on campus has increased over the years, so has the incidence of bicycles being parked/chained in locations other than bicycle racks designated for that purpose. More bicycle racks are continually being added to help meet the demand for parking. But where are you NOT supposed to park your bicycle?

Definitely do NOT park your bicycle in building halls or stairwells, chain to railings of handicap ramps, or park anywhere the bicycle will interfere with building exit routes, which must be kept free of obstruction. Also do NOT park/store your bicycle in building tornado or shelter-in-place locations.

A recent issue of the Facilities Management and Planning newsletter offers more information on bicycle counts at UNL, the UNL Bicycle Policy and efforts toward becoming a Bike Friendly University.

Resources:

- UNL Bicycle Policy <http://parking.unl.edu/regulations/bicycle.shtml>
- Bike UNL <http://bike.unl.edu/home>
- Facilities Management and Planning (scroll down to Staff section-FMP Newsletter) <http://fmp.unl.edu/>

3. It Could Happen to YOU!

Don't become a statistic in the quarterly UNL Injury Incident report! Falls have been one of the major types of injury incident at UNL for some time. Statistics associated with six "fall" incidents that occurred between April 1 – June 30, 2011, are highlighted

below. These “falls” were NOT directly related to a work task. Rather, they involved walking to meetings or other campus locations during the workday and into and out of the work area at the end of the day/for a break.

- Causal factors were equally divided between Environment (e.g. wet or uneven surface, muddy/slick area) and Personal (indoors tripped on their own shoes/feet, inattention)
- Ages were equally divided among ages <18, 26-40, 56-65 and 65+. (Note: university employee demographics are not factored into evaluations.)
- Three of the incidents resulted in bruising. Two resulted in fractures. One resulted in a cut lip.
- All six were OSHA Recordable. That means, at a minimum, visit to medical professional with treatment beyond first aid. In two cases, the employees had days away from work as a result of the accident.
- Four of the six were OFFICE workers, one worked in Food Service and one was a Laboratory worker.

What are some general recommendations to avoid injury from falls related to walking? Here are a few:

- Pay attention to your surroundings—people who might be/get in your way, walking surface condition, any anomalies in walking surface (like moving from pavement walk to a brick walk), curbs, etc.
- Make sure footwear fits well and is appropriate for the walking surface. Be sure to lift your feet and don’t shuffle.
- Use handrails when ascending/descending stairs.
- Focus on walking rather than visiting with others, iPod music, or other distractions.
- Keep your arms free to assist with balance, especially on slippery surfaces.

4. Revised Safe Operating Procedure

- Hand and Portable Power Tool Safety http://ehs.unl.edu/sop/s-hand_portable_power_tool_safety.pdf
- Spill Prevention Control and Countermeasures (SPCC) & Storm Water BMPs (Best Management Practices) - Hazards of Oil http://ehs.unl.edu/sop/s-SPCC_hazards_oil.pdf
- Spill Prevention Control and Countermeasures (SPCC) & Storm Water BMPs - Spill/Release Preparation & Response (MEPGED) http://ehs.unl.edu/sop/s-SPCC_spill-release_prep_response.pdf
- UST – Automatic Tank Gauging http://ehs.unl.edu/sop/s-UST_automatic_tank_gauging.pdf
- UST – Closure Requirement http://ehs.unl.edu/sop/s-UST_closure_requirements.pdf
- UST – Installation Requirements and Summary Recommended Design Features http://ehs.unl.edu/sop/s-UST_installation_summary_recommended_design_features.pdf

- UST – Petroleum Release Requirements [http://ehs.unl.edu/sop/s-
UST_release_requirements.pdf](http://ehs.unl.edu/sop/s-UST_release_requirements.pdf)
- UST – Registrations, Permits, Notifications and Fees [http://ehs.unl.edu/sop/s-
UST_registrations_permits_fees.pdf](http://ehs.unl.edu/sop/s-UST_registrations_permits_fees.pdf)
- UST – Summary of Recordkeeping Requirements [http://ehs.unl.edu/sop/s-
UST_summary_recordkeeping_requirements.pdf](http://ehs.unl.edu/sop/s-UST_summary_recordkeeping_requirements.pdf)

Remember...SAFETY IS AN ATTITUDE!

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