Incidents Highlight Need for Vigilance in the Laboratory

A Chemical Splash

What Happened?
A researcher was working with ZymoPURE™ Plasmid Maxiprep Kit to purify plasmid DNA. This kit contains liquid chemical components that are irritating to the skin and eyes and flammable; it is a proprietary mixture, so the exact components are not known, however, the hazards are detailed in the manufacturer’s Safety Data Sheets (SDS). The process utilizes a spin column assembly, which failed during use, splashing both the user and a colleague in an “adjacent area.” Adjacent area is defined in the Laboratory Hazard Assessment Tool (LHAT) as, “The distance from a non-hazardous area to a hazardous activity. The distance depends on the material hazards, the lab activity and the lab configuration. For example, splashes may occur within 2 meters, flash fires may be hazardous within 5 meters and explosions may send projectiles 10 meters or more.” Upon further inspection, it was noted that the new column assembly contained in the kit was cracked.

Both the researcher and colleague were wearing closed-toed/closed-heeled shoes and long pants (minimum attire), but neither one was wearing any Personal Protective Equipment (PPE). The researcher received a splash in both eyes and was helped to the eyewash station by another person in the lab. The colleague in the adjacent area was splashed with a drop in one eye and also went immediately to an additional eyewash station located within the lab. Both lab members rinsed their eyes for approximately 15 minutes. The researcher notified the PI and then went to a damaged autoclave glove can result in injuries.

A Serious Burn

It was a normal day at the laboratory, working with postharvest fruit pathogen identification. Using the autoclave was part of the daily routine, until something changed. That day, the researcher set a 4-liter container (Erlenmeyer) of growing media in its secondary container into a laminar flow hood. The researcher then left this container to cool for approximately five minutes, and proceeded to move it outside of the secondary container. As doing this was routine, the researcher completely forgot to check the integrity of the autoclave gloves and in an instant, realized that the gloves had a hole, and by then it was too late.

The researcher did not drop the container (it could have been worse), but immediately after contact suffered a third-degree burn on his/her thumb. It was a small but really painful injury, as the burn immediately extended to all the skin layers. Due to the extreme concentrated heat, there was no evidence of a blister, as the layers of skin had burst open.

Not making a big deal about it, the researcher cleaned the wound, covered it, and proceeded to

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Laboratory safety visits conducted by campus safety professionals often reveal the presence of toxic, corrosive, air sensitive and peroxide-forming chemicals which are either expired, corroded or abandoned. Often, chemicals are left over from a past project or stored with the intention of being useful for a future project. Inspectors are often told by the researchers, “Oh, that was here when I got here,” or “I inherited that.” The opportunity to dispose of unwanted hazardous chemicals and radioactive material with no EH&S recharge will continue through this academic year so don’t hesitate to take advantage of this and dispose of old chemicals that are not likely to be used.

Refer to SafetyNet #8 for information on how to fill out an online chemical pick-up request form, or contact Hazardous Waste Management for more information.

The HMRP program was a wonderful opportunity for our campus to rid ourselves of unwanted chemicals; however, a pro-active approach is to periodically review the conditions of chemicals in storage areas and dispose of old or degrading chemicals. Ask yourself critically, “Will I ever use this chemical?” and “If I do, would I trust the purity and integrity of the particular material?” If the answer is NO, then dispose of the chemical as a hazardous waste.

In addition to maintaining an accurate chemical inventory and performing regular inspections of your chemicals, you can also reduce risks (and costs) by following some of the helpful strategies and procedures below:

1. Label every chemical container with the date received and the date opened. It is very helpful to know exactly how long a particular chemical has been in the laboratory.
2. Regularly clean storage areas and inspect your inventory frequently. If containers are losing their labels, reattach or replace them. If the cap on a container is degrading or if you see signs of a chemical change (turbidity, discoloration, cloudiness and precipitation) in the contents, you should dispose of the chemical.
3. Many chemicals have a limited shelf life due to decomposition reactions. You should be aware of these chemicals and dispose of any which are expired. Chemicals in refrigerators are often kept there due to instability and should be reviewed more often. If you see signs of bulging in any containers contact EH&S immediately.
4. It is required that laboratory-synthesized molecules/chemicals have a label identifying the contents in the container or flask. Students come and go and often leave a legacy, so replace deteriorating labels before information is obscured or lost. This will help to ensure proper traceability for the correct storage and disposal of the chemicals. Unlabeled containers picked up by EH&S staff must be tested or treated as unknowns and have a very high disposal cost.
5. Purchase the minimum quantity of highly toxic, reactive, corrosive or smelly compounds needed for a particular project to reduce the amount stored in the laboratory and the associated risk.

Please feel free to contact EH&S or Fire Prevention staff if you would like assistance in evaluating your chemicals or any further information.
Keep Yourself Safe When Handling Sharps

Recently, a UC Davis researcher was disassembling a glass capillary microinjection needle when they experienced a potential biological sharps exposure. While removing a contaminated glass needle from an injection apparatus the researcher accidentally pointed the tip of the contaminated needle toward their hand. Once the needle became unseated from the apparatus it punctured a finger of the non-holding hand. This “line of fire” occupational exposure was ultimately due to the presence of the non-working hand being in the wrong place at the wrong time. This incident highlights the importance of safe sharps work practices in the research lab.

Approximately once a week there is a claim filed by a UC Davis employee due to a sharps related occupational incident. The majority of occupational exposures to biological materials in the laboratory are caused by contaminated sharps cutting or piercing the employee.

In developing your lab-specific standard operating procedures (SOPs) and defining sharps operations you should look to eliminate or substitute sharps wherever possible. Substitution can include switching from glass to plastic products, using disposable sharps, or utilization of a safer sharp alternative. If sharps are required for your research, you can reduce the experimental sharps risk by taking your hands out of the equation (e.g. utilization of forceps to hold sample), keeping the sharp pointed away from your body at all times (avoid “line of fire”), or reducing the amount of time that the sharp risk is present, especially once it is contaminated.

Before using disposable sharps remember to place an appropriately-sized sharps waste container within arm’s reach of the experiment so the sharp can be immediately discarded once it is contaminated. Also, it is very important to watch each sharp go into the waste container, as exposures often occur when workers miss the waste container opening because they took their eyes away from the sharp.

If the experiment requires the use of reusable sharps, please develop safe work practices for handling the sharp once it is contaminated with a potentially infectious material. Safer, reusable sharps work practices may include decontamination of the sharp device prior to handling, pointing the sharp away from your body while disassembling, or the use of forceps or tongs to place the sharp in a disinfectant bath prior to disassembly.

Finally, when using a significant number of sharps, working for long periods of time, or performing repetitive sharps operations, it is critical to take short, frequent breaks in order to stay focused and avoid hurried or complacent behaviors. To reduce the risk of a sharps exposure in your laboratory, please take the time to evaluate your sharps operations and look to implement safer work practices wherever possible.
HMRP Removes 440,000 Pounds of Hazardous Waste

Environmental Health & Safety recently wrapped up its Hazardous Materials Removal Program (HMRP), disposing of more than 440,000 pounds of hazardous materials in a two-year period.

This included more than 2,500 shipping containers, 260 cylinders, 700 pounds of reactive lithium compounds and 240 high hazard/potentially explosive compounds.

All totaled, this was about 110,000 pounds more waste than in a typical two year period.

“The event was absolutely a success,” said Andrew Majewski, Health and Safety/Hazardous Materials Manager. “Reducing the quantity of chemicals in storage always increases safety.”

The HMRP began in July 2014 and ended June 30, 2016. It provided the opportunity to dispose of unwanted hazardous chemicals and radioactive material with no EH&S recharge. It included several collection events throughout the campus.

The team at the Environmental Services Facility, which found themselves working particularly hard in the final weeks of HMRP, is to be commended, Majewski said. He also thanked the Department Safety Coordinators and HMRP Collection Events Project Manager Moira Heilmann for their contributions to the success of the program.

Some HRMP facts:

- The waste was enough to fill seven tractor trailers.
- Forty-seven departments located in 41 buildings participated in collection events.
- The oldest material collected was sodium sulfate from 1952.

New Faculty Outreach Program – First Impressions Count

The New Faculty Outreach program began in July 2013. An email is sent to all new hired faculty by the laboratory safety review program manager, Becky Grunewald, containing a greeting and useful information regarding safety resources and responsibilities at UC Davis. If the faculty will be conducting laboratory research, an additional offer is made for an in-person meeting and a small welcome gift.

Depending on the nature of the research, Becky may bring in someone from the Environmental Health and Safety biosafety team, the Institutional Animal Care and Use Committee (IACUC), or various other Safety Services resources to meet with the new faculty. She also brings along the assigned embedded lab safety professional (LSP). The meetings are friendly, informal, and often fun. The intention is to encourage faculty to make safety an everyday part of life in the lab, and to put them in touch with the resources they need to help them conduct their research safely.

If desired, Becky or the LSP will walk the faculty member through various online tools in the UC Safety Suite, such as the setup of the Laboratory Hazard Assessment Tool (LHAT). The annual comprehensive lab safety review program is also discussed. Follow-up visits are offered for help with topics such as generating Standard Operating Procedures and appropriate safety training for personnel.

Over 100 faculty have been contacted to date in 2016, with over 30 in-person meetings conducted. Becky is actively seeking to improve this program, and is soliciting feedback from new faculty who have participated. Contact her at bgrunewald@ucdavis.edu.
Occupational Health Services for evaluation. The SDS recommended PPE for working with the chemicals in the kit is gloves and tight-fitting goggles. However, the minimum PPE for working with hazardous chemicals on campus is a lab coat, chemical-resistant gloves and safety eyewear, and as mandated by the LHAT, the same PPE is to be worn by researchers in adjacent areas.

**What Was Done Correctly?**

Both lab members went immediately to the eyewash station to rinse their eyes for 15 minutes. The lab member using the kit also went to Occupational Health Services. The incident was reported to the PI, who is the supervisor. S/he completed the online Employer’s First Report (EFR). Both lab members were wearing closed-toed/closed-heeled shoes and long pants, as per campus policy. Lab personnel had performed a monthly activation of the eyewash station to flush the line and verify a flow of water.

**What Lessons Can You Learn From This Incident?**

Always be aware of your surroundings and consider the activities of others around you. Be informed about the hazards of the chemicals used in your area. Read the hazard warning signs posted when you enter a lab space. When working with hazardous chemicals, be mindful of the people in the area adjacent to where you are doing the work. Be familiar with the content of your hazard assessment and understand the PPE required for the task that you are performing. Make sure that you and lab personnel in the adjacent area are wearing the appropriate PPE.

In shared lab spaces, communicate the hazards and PPE requirements to others in your lab space. If someone is injured in the lab, provide assistance. Understand your lab’s procedure for working alone. If your lab does not have a [Standard Operating Procedure (SOP) for working alone](https://safety.ucdavis.edu/policies-and-procedures), one can be downloaded from the Safety Services website. If you receive a splash to the eyes, go immediately to the eyewash station and rinse your eyes for 15 minutes or as required by the SDS. Always report injuries to your supervisor. While not explicitly required, it is strongly recommended that all personnel don safety eyewear when entering areas that contain hazardous materials, even if active work with these materials is not planned.

**Lab Safety Manual Update**

The Campus Laboratory Safety Committee has completed the review of the 2016 revisions to the UC Davis Laboratory Safety Manual. The updated manual is expected to be released in November or December.

**Thoughts on the Newsletter?**

The CLSC Solutions newsletter is published quarterly by the UC Davis Chemical and Laboratory Safety Committee. Planned publication dates for the upcoming academic year are: Jan. 23, April 24 and July 24. If you have questions, comments or article suggestions, please contact [researchcommunity coordinator@ucdavis.edu](mailto:researchcommunity coordinator@ucdavis.edu) or 752-1493.
to continue working. Believe it or not, less than 24 hours later, the researcher was in the emergency room. By the next morning, the researcher had developed a significant infection. The finger was extremely tender, pus was draining from it, and the researcher had a red streak of spreading wound toward his/her chest. This is known as lymphangitis. The doctor said that this was unavoidable. Immediately when the burn happened, a common pathogenic bacteria (streptococcus) entered the researcher’s blood stream, creating a very bad infection. To cure this, it was necessary to get a set of five IVs over the next day, at a concentration of 6 grams of a mix of antibiotics (very high). The doctor said the researcher was very fortunate, and that things would have been different if this wasn’t treated, if the researcher was elderly or a young kid, or had been immunosuppressed in any way.

If the gloves would have been properly screened and replaced, this would have never happened. Since then, the researcher checks every autoclave glove before putting them on. You should do the same!

CLSC Establishes Subcommittee to Discuss Safety Culture

The CLSC has established a 10-member subcommittee to review and discuss a number of recommendations to improve safety culture in academic institutions from several national publications. These sources include the Association of Public and Land-grant Universities (APLU), National Safety Council (NSC), American Chemical Society (ACS), Stanford University Task Force, Battelle and the UC Center for Laboratory Safety. The subcommittee will provide recommendations and guidance on actions that can be taken at UC Davis to continuously improve our safety culture.

University of Hawaii Fined for March Lab Explosion

The University of Hawaii (UH) has been fined $115,500 for 15 workplace safety violations after a laboratory explosion at its Manoa campus in March resulted in a severe injury to a researcher.

The Hawaii Occupational Safety & Health Division (HIOSH) issued the fine last month after an investigation report issued in July by the University of California Center for Laboratory Safety found that the explosion was most likely caused by an electrostatic discharge.

Read more about the incident and the HIOSH findings in this Chemical & Engineering News story.

University of Hawaii Fined for March Lab Explosion

The explosion at UH Manoa severely injured a researcher and resulted in about $800,000 in damage to the laboratory.

Credit: Honolulu Fire Department