Chemistry Safety Notes

Volume 6, Issue 4 **June/July 2018**

"Chemistry Safety Notes" is published by the Chemistry Dept. Safety Committee, written & edited by Debbie Decker, Safety Mgr.

Incident Report/Lesson Learned

On June 26th at approximately 2:30 in the afternoon, a waste bottle over-pressurized and failed catastrophically. The boom was heard across the floor and on the floor below. An acrid smell filled the hall—described as acetic acid smell. Several people in the area came to the scene to see if someone remained in the lab or had been injured. They entered the lab to find no one. The local safety person was contacted who then contacted the Environmental Health and Safety On-Call Specialist. EH&S contacted the on-call Fire Captain, Fire Marshal's office, hazardous waste group, and environmental management. Department leadership was also contacted.

Shards of broken glass and corrosive liquid was strewn about the lab. The largest shard of glass observed was about 3 cm square. Half of the bottle cap was observed about 15 feet from site of failure. Because of the extent and unknown nature of the contamination, an outside contractor was engaged to effect clean up. The contractor arrived on scene for an initial assessment on June 27th and clean up and decontamination occurred on June 28. The space was returned to Department control on the afternoon of June 28.

A hazardous waste label recovered at the scene described the material as 50% nitric acid, 25% sulfuric acid, and 25% hydrochloric acid. Known as aqua regia, it is used to clean glassware contaminated with organic materials. Aqua regia is also a pressure-generating waste stream. Like piranha, it should be stored in a container with a pressure-relieving cap.

If aqua regia is contaminated with organic materials from cleaning activities or if someone inadvertently adds organic waste to the container, over-pressurization can occur –with the coincident container failure.

Corrective actions are as follows:

- Assure users of aqua regia or acid-piranha have a Standard Operating Procedure in place and all lab personnel are trained on its contents. More than any other SOP, it's important that everyone in the lab have training to avoid unintentional contamination with organics.
- Vented caps are now available from EH&S. Karen Gagnon (EH&S Liaison) has a bag of caps outside her office door (3471 Annex) for your use. Take as many as you need!
- Call 911 or Fire Department non-emergency number when an incident occurs, such as a large boom. It's important to call, even if you think others have called. Dispatch will know if a response has been initiated.
- Be sure everyone is properly attired.
- If a bottle is re-used, assure it's completely cleaned and rinsed thoroughly with water and left to air dry. If inadvertent contamination of a waste stream could result in dire consequences, training of lab personnel on proper management of this waste stream is critical.
- A flowchart will be developed for spill response, based on Safety Net 13, for when lab personnel can clean up vs. needing outside agency support.

Aqua Regia and Acid-Piranha Management

If you use either of these two materials, you must have an SOP—templates available at ehs.ucdavis.edu. From the Hazard Overview for Aqua Regia:

> Aqua Regia is a highly corrosive and strongly oxidizing solution that is best known for its ability to dissolve gold and platinum. It is commonly used to remove a wide variety of inorganic or trace organic contaminants from laboratory glassware. The most common Aqua Regia is a 1:3 (v/v) mixture of concentrated nitric acid (HNO_3, ≤70%) and hydrochloric acid (HCl, ≤37%). Aqua Regia will self-heat when freshly mixed which may lead to severe chemical or thermal burns on contact, and can undergo violent exothermic reactions with organic compounds and other flammable materials. Aqua Regia must be handled with extreme caution, and safe use requires the consideration of several different types of hazards.

From the Hazard Overview for Acid-Piranha:

> "Piranha" is a highly corrosive and strongly oxidizing solution that is typically used to remove organic residues from glassware and to etch metals. It is extremely energetic and may result in an explosion or injury from chemical and thermal burns if not handled with caution. Acid Piranha is a ≥3:1 mixture of concentrated sulfuric acid (H_2SO_4) with 30% hydrogen peroxide (H_2O_2). When combined, H_2SO_4 and H_2O_2 will self-heat to a boil, causing the solution to become active.

You must also use a vented cap to store these pressure-generating waste streams. Karen Gagnon, EH&S Liaison, has a bag full outside her office (3471 Annex). Rose also has them for distribution in the Storeroom. Take as many as you need—they're free!

ChemTag Project

Inventory Conversion Schedule

The ChemTag Project, to RFID/barcode your chemical inventory and convert to the new Chemical application, is moving quickly through the lab groups which have already volunteered.

Please let me know when you would like to schedule your inventory conversion. Appointments available, starting in mid-July. If you would prefer an appointment be scheduled for you, please let me know that as well.

The joys of summer!

Making Safety an Inseparable Part of All Lab Activities

By providing guidance, suggestions, and recommendations specific to laboratory safety here, our goal is to help like-minded managers strengthen the safety culture in their labs.

By Vince McLeod (Excerpted from Lab Manager Magazine, Vol. 13, Issue 5, June 2018)

According to a recent OSHA publication, there are more than 500,000 workers employed in laboratories in the United States.[2] As lab managers, we know that lab workers are potentially exposed to myriad hazards: chemical, biological, physical, radioactive, and other types. In addition, repetitive tasks of production labs and high-volume analytical labs, as well as the challenges of handling research animals, can also lead to musculoskeletal disorders.

For our lab employees to perform their tasks in a safe manner, they need to understand the potential hazards associated with the work. The ability to accurately identify and assess these lab hazards must be learned through training and encouraged by all levels of management. This is the core of developing a strong culture of safety.

Reports and studies by the National Academy of Sciences, National Research Council, ACS, CSB, and others point to a strong need to develop a culture of safety consciousness, accountability, organization, and education in industrial, governmental, and academic laboratories.

So, how do we accomplish this?

Building safety culture

OSHA research has found that a strong safety culture is the best approach to accident and injury prevention and noted that organizations that have strong safety cultures also show fewer at-risk behaviors and have lower accident rates, employee turnover, and absenteeism, as well as higher productivity.

The ACS Task Force provides 17 succinct recommendations for creating a better safety culture. Though focused on academia, they can apply across the board. We do not have the space to discuss each one here, but we will highlight those we feel are most important.

Leadership

Strong and committed leadership ensures an effective safety program that is embraced by all. Safety as a priority will then flow through managers to supervisors and end with the individuals. Safety thus becomes the priority.

Attitudes and awareness

Continually teaching and highlighting safe practices and emphasizing their importance will build a deep, positive attitude and ethic in employees.

Training

Safety training is intimately tied to building awareness. Laboratories are unique and complex workplaces. Some level of training will always be needed. Do not settle for doing the minimum required by current regulations.

Learn from incidents, close calls, and near misses

Perform detailed and immediate investigations and follow-up for all accidents, close calls, and near misses. Use the information gathered for case studies and lessons learned.

Collaborate and involve

Involvement promotes a strong safety culture by reaching and immersing as many employees as possible. Involve a large representative cross-section of the organization's management and workers.

Communicate and promote

A robust safety culture needs constant promotion. The best promotion is by example. This loops back to developing positive attitudes, as promoting safe work practices goes hand in hand with having a good attitude and exercising safe behavior.

A final thought

"During the 'heroic age' of chemistry, the notion of martyrdom for the sake of science was actually accepted widely, according to an 1890 address by the great chemist August Kekulé: 'If you want to become a chemist … you have to ruin your health. Who does not ruin his health by his studies, nowadays will not get anywhere in Chemistry.'"[8]

In the nearly 130 years since, we have definitely progressed. Yet we cannot be satisfied or become complacent. There is still work to be done. Safety first!