Lessons Learned

Corrosive Waste Spill

What Happened?

A UC Berkeley researcher was working in a lab with a highly corrosive sulfuric acid and hydrogen peroxide (piranha) solution to clean the surface of a glass sample in a fume hood.

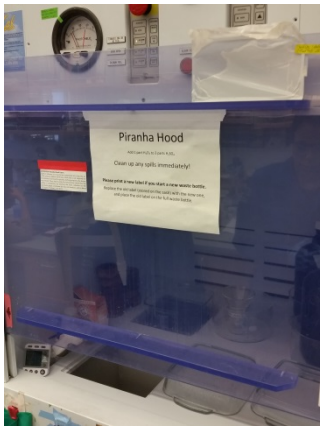

Figure 1: Photo of a fume hood designated for piranha solution

After completing the work, the researcher found the existing waste container to be greater than 75 percent full. Rather than add the recently used piranha solution to the already overfilled waste container, the researcher found an additional empty waste container and attempted to pour off some of the overfilled waste into the empty bottle.

During this attempt, some of the corrosive material spilled inside the hood. Moments later, the researcher's arm felt "itchy". The researcher removed all personal protective equipment (PPE) including a face shield, splash goggles, sleeveless chemical apron, lab coat, nitrile and rubber butyl gloves, and immediately irrigated the affected area for 15 minutes.

Other lab members neutralized the spill inside the hood and on the lab coat. The researcher was escorted by a colleague to the Tang Center and treated for two small burns. After returning from the medical center, the researcher was able to make contact with emergency response professionals.

What went right?

- The researcher was wearing the personal protective equipment (PPE) specified in the standard operating procedure (SOP)[1].
- The researcher noted that the waste container was overfilled before adding any new solution to it.
- Emergency protocol was followed after the incident took place including irrigation of the affected area, contacting of emergency personnel, and neutralization of the spill.
- The lab used the Chemical Hygiene Plan to locate the correct emergency response contact information.

What should have been done differently?

- The lab did not have an established policy on how to handle overfilled waste containers.
- The waste container did not have a maximum fill line marked. Maximum fill lines provide clarity on how much waste can be added to a bottle. This is particularly important when using an amber colored bottle which can make the noting of volume levels more difficult.
- Though the injured researcher called the emergency response line after being treated, the researcher's colleagues had already unsuccessfully attempted to call an emergency response line immediately after the incident occurred. Unfortunately, the emergency response greeting was not listened to in its entirety, and the necessary prompt to "press 1" to be connected to the emergency response team was never heard.

What corrective actions have been taken?

- EH&S Hazardous Materials Management Team (HMMT) will supply campus piranha waste generators with clear 2.5 liter exterior poly-lined waste collection containers only.
- No other bottles (other than the 2.5 liter clear) will be allowed for waste collection. Currently, some researchers generating smaller amounts are using one-liter non-lined bottle or other containers. These containers will be phased out.
- Prior to distribution, HMMT staff will mark each piranha waste bottle with a max fill line, and each bottle will be affixed with a "Do Not Overfill" sticker or similar.
- The EH&S emergency line voice greeting has been changed to inform callers reporting an emergency to "press 1" prior to any other information being given.

[1] *Standard Operating Procedure: Piranha Solution*

Lessons Learned

How can incidents like this be prevented?

When research requires the use of strong corrosives such as piranha solution, all involved personnel, including those working nearby, must be aware that certain precautions and measures need to be taken prior to beginning that work. In addition to completing the required *EHS 101: Laboratory Safety Fundamentals* training, all researchers must be trained on how to safely use hazardous materials. Any applicable SOPs must be created, reviewed by the principal investigator (PI), and signed by researchers. The SOPs must then be updated as procedures change or improve. The following are some general considerations when handling strong corrosives:

- Always wear the necessary PPE. Corrosives like piranha solution require extra protection.
- Given the strength of the piranha corrosive, EH&S requires that researchers wear chemically resistant aprons with sleeves or full arm gloves. The lab coat will not provide suitable protection against such a corrosive material.
- Always check waste containers prior to beginning an experiment to ensure that the vessel has suitable space for the waste solution.
- Never attempt to transfer corrosive waste from an overfilled bottle. Instead, contact EH&S HMMT for immediate pickup.