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LESSON LEARNED

Berkeley UNIVERSITY OF CALIFORNIA EH&S OFFICE OF ENVIRONMENT, HEALTH AND SAFETY

Accidental Mixing of Bleach and Acid

What Happened?

A researcher working in a laboratory glassware washing area thought she should refresh the bleach solution for soaking lab glassware. In an "inattentive moment" she added fresh bleach to what she thought was the bleach soaking tub; unfortunately, the tub did not contain bleach but contained 5% hydrochloric acid. The acid solution (with bleach) immediately turned from clear to yellow. She quickly realized that bleach and acid should never be mixed because toxic chlorine gas can be created. She immediately had everyone leave the room; she considered calling 911, but since everyone was safe and there was no chlorine odor in the hallway she called EH&S (510) 642-3073, to get further advice.

In this case, it seems that very little if any chlorine gas was created. There was no observation of a dense green or brown cloud of chlorine gas as might be expected. This may have been a result of a well-ventilated laboratory. EH&S considers this accident to be a near miss; if more bleach had been added, the outcome could have been worse. It is also a reminder that the mixing of bleach with some household cleansers (e.g. toilet bowl cleaners that contain acid) can generate chlorine gas, and mixing bleach with ammonia generates toxic chloramine vapor.

Question: Bleach or acid soak?

Answer: Acid; the container needed to be clearly labeled.

A clearly labeled container that contains bleach.

Even containers of water must be clearly labeled. Also, include the chemical's hazard on the label: "Corrosive" for the 10% bleach solution.

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What was the cause?

The cause of the accident was a momentary period of inattention and a poorly labeled tub, with the experienced researcher expecting a white tub to contain a bleach solution and not to contain HCl. Glassware soaking tubs can contain solutions with detergent, bleach, caustic bath, or (less frequently) an acid bath. The acid bath in this case was not clearly labeled; there was only a small piece of tape with "5%HCl" on the lid. There was no label on the actual container.

What corrective actions will be taken?

This incident impressed upon the lab how important it is to have all containers of chemicals clearly labeled with the contents. It is also important to label the primary hazard of any chemical mixture. In this case, the acid bath should have been labeled as containing "5% hydrochloric acid, corrosive". After this incident, the lab properly labeled all their chemical containers, even containers of water.

In the future, they plan to use physically different containers or tubs so the bleach and acid baths are not confused again. Normally, the acid bath is used in an orange bucket and the bleach bath in the white square tub. If your lab has acid and bleach baths, EH&S suggests that you use very different looking containers, but always clearly label the container (not just the lid) with the contents and hazard.

There were previously written standard operating procedures (SOP) on how to work with the bleach and acid baths. The procedures described what types of protective equipment must be worn and what to do if there is an accidental spill; however, the procedures were hidden and dusty, so they were re-posted and discussed in a group meeting.

How can incidents like this be prevented?

- Clearly label all chemical containers with the chemical's name and hazards.
- Use physically different containers for bleach and acid baths.
- Emphasize the hazard of accidentally mixing acid and bleach. If your lab has acid or bleach baths discuss this incident in your lab group meeting. Document the training.
- For work with acids, bases, or bleach, have a written SOP that includes protective clothing and emergency procedures for an accident. There should be an eyewash and safety shower if acid or bleach is being handled.
- Consider placing the acid baths inside fume hoods to contain any acid vapors or hazardous gases that might be produced. The fume hood sash can also be used as a splash shield.

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Resources

- Fact Sheet: Laboratory Specific SOPs - For more information on writing laboratory-specific standard operating procedures
- Proper Chemical Storage Booklet - For information on chemical storage and compatibility
- Safety Data Sheets (formerly MSDS) - Chemical hazard information on bleach, hydrochloric acid, and other chemicals