Spills, Kits and Safety

PEGGY A. WENK, HTL(ASCP)SLS
BEAUMONT HOSPITAL, ROYAL OAK

Who is likely to *MAKE* a chemical spill in your institution? Probably everyone! It could be someone in the laboratory, a nurse on the floor, a doctor in the OR, a maintenance worker, a house keeper or someone in the kitchen.

But who is the person or persons in your institution that is responsible for *CLEANING UP* the chemical spill? Depending upon where you work, it could be:

- Person who made the spill
- Supervisor in the area of the spill
- Housekeeping
- Safety department
- Security officer
- Laboratorian, responsible for entire facility
- Outside contract company

So, if it isn't *YOU*, why should you read this article? Why should you care?

- Maybe you ARE responsible, but don't know it
- Maybe responsibility will change in the future
- Maybe you will take a new job somewhere else
- Maybe you need to educate the person responsible on the types of chemicals FOUND in a histology lab, so that they have the correct spill kits available
- Maybe you need to instruct people in other areas affiliated with histology, such as the OR

SO, What is a Chemical Spill?

Well, it's a chemical or solution that is in a location where it's not supposed to be. If it's supposed to be in a bottle in a cupboard, but it's now on the floor in the lab, that's a chemical spill. Please note, food and drink are NOT considered chemicals. However, the chemicals that you use at home, once they are brought into the work environment, are now under rules and regulations of OSHA (Occupational Safety and Healthcare Administration) and EPA (Environmental Protection Agency). The rubbing alcohol that you have at home, is now isopropanol at work. The fingernail polish remover at home is now acetone at work. And hydrogen peroxide in your medicine chest at home is now considered a chemical at work. The bleach you use to do your laundry at home is now a chemical at work. How these chemicals are stored, used, disposed of, and cleaned up at work are now under strict laws. The same applies to: oil, paint and gasoline used in the maintenance department; cleaning supplies used by housekeeping; formalin used in the OR or EC; and of course all the chemicals used in labs.

Michigan Society of Histotechnologists
Tech Points

> "There are seven (7) main types of chemicals that might be found in a medical institution. Buy those kits for the chemicals that you will be responsible for cleaning up."

Can I Dilute to Make It Safe for Disposal?

No. In most locations, diluting with water is not allowed. It does not "neutralize" the chemical. And it takes a lot of water to bring the pH back to neutral 7. I did a little experiment, using acetic acid, which is one of the least corrosive acids in the lab. At full strength, the pH was under 1.0. When I diluted by a factor of 10, it raised the pH to 2.3. When I diluted it by a factor of 100, the pH was increased to just 2.9. It took diluting the acetic acid by a factor of *1 million* times, to raise the pH to 6.9! So a spill of 1 cup of acetic acid would need 1 million cups of water, or over 60,000 gallons to bring the pH close to neutral.

Can I Kill the Chemical with Bleach?

Bleach is good for killing microorganisms. However, chemicals are not living organisms – they are chemicals. And not all chemicals are compatible with each other. For example, mixing bleach with ammonia creates toxic chlorine gas that can kill people. Did you know that Lysol™ contains ammonia?

What Kits Do I Need in the Lab?

There are seven (7) main types of chemicals that might be found in a medical institution. Buy those kits for the chemicals that you will be responsible for cleaning up.

Acid: Chemicals that have a pH less than 7.0 In the histology laboratory, the most common are: hydrochloric acid, sulfuric acid, nitric acid, formic acid, citric acid, and acetic acid. Acid spill kits will raise the pH of the spill to around 7.0 and will change the acid into a neutral salt. Most usually make a gummy mess that will solidify. Depending upon which spill kit chemical used, acetic acid might not be allowed to be neutralized. Most acid spill kits do not work with picric acid, and should never be mixed with bleach, hydrogen peroxide or oxidizers. (Remember, you are still mixing chemicals, and some chemicals are not compatible with each other).

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Base/Caustic: These are chemicals that have a pH greater than 7.0. In the histology laboratory, the most common bases are ammonia (ammonium hydroxide), sodium hydroxide and potassium hydroxide. Base/caustic spill kits lower the pH of the spill to 7.0 and create a neutral salt. Do NOT use base/caustic spill kits on bleach, hydrogen peroxide or oxidizers.

Formalin and Formaldehyde: This is found in not only the 10% NBF found in the lab, but also the containers of 10% NBF found in the EC, OR, doctors' offices, etc. It is found in embalming fluid, zinc-formalin, Bouins, and some cleaning and disinfecting solutions. So where are your institution's formalin spill kits? In all the locations where formalin is present? Probably not. Do not mix bleach with the formalin neutralizers. Many of them are not compatible.

There are a lot of types of formaldehyde neutralizing kits, and you will need to ask questions of the vendor about how their kit works. You will also need to ask your Safety department and waste hauler questions about what is allowed. Some formalin spill kits:

- Create urea as a by-product. How is your institution allowed to dispose of urea, a nitrogen product?
- Make slippery polymers, similar to soap. Are they biodegradable?
- Make salts and carbon dioxide. Which salts?
- Partially revert back to formalin. How much are you being exposed to? How is your institution going to dispose of partial (lower percent) formalin?

Bleach: Is also known as sodium hypochlorite. The spill kit for bleach should ONLY be used to neutralize bleach. Bleach is a base (pH above 7), but should not be cleaned up with the base/caustic spill kit. It should be cleaned up with the chlorine spill kit, which will lower the pH to a more neutral 7, solidify the product, and make the end product suitable for landfill (bleach is usually OK to dispose of down the drain, but never in a landfill).

Solvent: In the histology lab, if it's not an acid, base, formalin or bleach, it is probably a solvent. Examples include alcohols, acetone, xylene/toluene/benzene, and xylene substitutes. This spill kit does *not* neutralize the solvent, but instead simply *absorbs* the solvent. Something as simple as "kitty litter" can be used. However, other products are available that not only absorb the solvent, but also raise the flashpoint of the solvent, so that the resultant vapors will be less likely to burst into flame. One question to ask your safety department is how to dispose of the absorbed material. It may not be allowed to go in the trash or to be gassed out into a hood. It may need to be disposed via a licensed waste hauler.

Oil or Gasoline: These kits absorb the oil, paint or grease, to prevent it from going down the drains in the floor. The absorbent material can be purchased either as particles, embedded in pads or rolls (like paper towels), or stuffed inside socks, pillows or booms. Kits for absorbing oil or gasoline should also contain floor drain plugs, to prevent the fluids from entering the sewer or storm drain system. The shovel used to scoop up the absorbed hydrocarbons should be non-sparking, as these chemicals can burn when exposed to a spark.

Mercury: Mercury spills from broken thermometers present an additional hazard to laboratorians – not only are the droplet beads hazardous, but the vapors which are colorless and odorless are also hazardous. Even a few drops in a room can raise the concentration to a hazardous level. Mercury vapors are also heavier than air, so the person cleaning up the beads from off the floor is being exposed to even greater concentrations. Block off the area, so that the beads do not spread into hard-to-reach areas, or down drains, or onto absorbent materials (e.g., carpets). Pick up visible mercury droplets with a plastic dust pan, and transfer into a plastic container. Sprinkle a powdered sulfur compound available with commercial mercury spill kits. This will change the mercury to mercuric sulfide, and change it to a visible brown color. Then sprinkle the area with a zinc compound also contained in the commercial mercury spill kit. This will bind with the small droplets of mercury, making them easier to pick up. Contact your hazardous waste hauler for proper disposal of not only the mercury droplets, but also any clothing, furniture, etc. that may have been contaminated.

What Do I Have to Do Before I Start Cleaning?

Prior to clean-up, there are several things that need to be done to protect the people who will be cleaning up the spill.

***Evacuate the area*.** Floors and cupboards can be replaced. Lungs and eyes are difficult to replace.
Lower the temperature of the room. This will slow down evaporation of the liquid chemical.
Close doors. Close internal doors, to keep the chemical and the fumes inside the room.
Change ventilation. If possible increase the rate of ventilation, so there are less fumes in the room when the spill is being cleaned. Also, make certain that the room is being ventilated to the outside, not inside the facility.
Notify someone else. Depending upon your institution, you may need to notify Safety, Security, Housekeeping, etc. Within your area, notify either your supervisor or the lab safety officer. Someone should be watching out for you, to make certain you are not overcome by fumes.
Determine what was spilled, how much, and if you can clean this up. Or if you need to contact someone else, as the spill is too large or too dangerous for you to clean up.
Personal Protective Equipment (PPE). Put on chemical goggles (not splashproof goggles) that will prevent fumes from reaching your eyes. Put on chemical gloves, such as

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nitrile or rubber. Put on a fluid resistant gown/apron or scrubs, and coverings for your shoes. These may need to be discarded if they become contaminated. If you have been previously fit tested for a respirator, AND you have the correct filters, you could wear them during cleaning the spill.

Collect the kit. Make certain you have the correct spill kit, with scoops or brooms, plastic bags or containers for disposal.

Monitor. If your institution has fume monitor badges for the chemical that has been spilled, you may want to wear this, to see how much chemical you have been exposed to during the time you were cleaning up the chemical spill.

How Do I Use a Spill Kit?

To treat the spill, start on the *outside* of the spill, and **encircle/dike** the spill with the correct spill agent. If the chemical is flowing towards a drain, start pouring the spill agent in that spot first, or lay the pads/pillows/etc in that spot first. Then spiral inwards from the outside of the spill toward the inside. If the spill agent is poured in the center first and then spiraled towards the outside, the chemical will spread out. Mix the spill agent into the spill with a plastic scraper.

Leave the room, for at least 10 minutes, to allow the chemical to be absorbed (solvent, oil/gas, mercury) or neutralized (acid, base, formalin, bleach). Those chemicals that are being neutralized do so with an exothermic reaction – hot vapors are being given off. Hot vapors are more dangerous to people than room temperature vapors.

Scrape up spill. Use a non-sparking plastic scoop, and scrape mixture into plastic bag or plastic container.

Disposal. Discuss with your Safety Department or waste hauler the proper way to dispose of the neutralized/ absorbed chemical. Properly label the bag/container. Also dispose of the PPE and scrapers. They are contaminated with the chemical, and should not be used to clean up a different chemical.

Mop floor. Contact housekeeping/environmental services, to have someone mop the area with lots of hot soapy water. The chemical and spill kit residue will be slippery.

Replace kit. Remember to replace the spill kit and equipment, so that it is available for the next spill.

Investigate. Make certain everyone is OK – no problems breathing, eyes not burning, etc. If there is a problem, send the person to employee health or EC. Find out *why* the spill happened. If it happened once, it could happen again. Determine how to prevent it in the future. Change the work practice, if possible. Retrain the person, if needed. And, of course, there is paperwork to be filled out and filed.

Is There a Way to Prevent Spills?

Assessing the risk of spills, and changing work practices, is a very good way to reduce the incidents of spills. Some suggestions include:

Store liquids at countertop or lower. The closer the bottle is to the ground, the smaller the splash area if it falls and breaks.

Consider walking distance. If the formalin is used on THIS counter, why is it being stored under THAT counter all the way across the room, and where it has to be walked past 12 different people? Move chemicals close to where they are being used.

Use acid carriers. These are plastic containers, usually with a screw top lid and a handle, that can hold a 1 quart bottle of liquid chemical. If this chemical needs to be moved a longer distance (e.g., from one lab to another), this will prevent the bottle from breaking if dropped, or if it does break, the liquid is contained in the container.

Buy plastic bottles. If given a choice, buy chemicals in plastic bottles rather than glass.

Buy non-mercury thermometers. Use either the red alcohol thermometers, or the electronic digital thermometers.

Operating Room. Is the container of formalin being brought into the OR, and then the tissue is placed in the container? Think about what would happen if the formalin was spilled on the floor. Can they evacuate the nurses, surgeon and the patient they are operating on? Is there a way for all OR personnel to be trained yearly about spill kits? Talk this over with the people in charge of the OR, endoscopy suite, birthing center, etc. Suggest that the formalin is placed in one room that can be closed off easily, and where no one is working (or one person who would be in charge). The tissue is placed in an empty container in the OR, and then the tissue and container are brought to the room with the formalin. That way, if there is a spill, it will be easy to evacuate that one room. And fewer people need to be trained every year.

Spigots. Place containers with spigots on their side when not in use, so the spigots will not drip if accidentally left slightly open. Make certain nothing can fall on the spigots, breaking the spigot off.

Berm or Pan. Buy or have built a pan that equipment such as a tissue processor or recycler can set in. In case there is a leak, the chemicals are contained in the large pan. If chemicals are stored in a closet, have a berm (raised ledge) built across the floor in front of the door, inside the closet. If there is a leak, it will not escape out the closet.

Buy drain plug. Floors have drains in them in case of a sink overflow of water. However, in case of a chemical spill, these chemicals should not be allowed to go down the drain. In all likelihood, the EPA (Environmental Protection Agency) and the water treatment plant will not approve of the chemical getting into the water system.

Neutralizing pads. Consider placing neutralizing pads in places where small spills might occur, such as on the shelves were containers of formalin are stored before disposal.

Label and Charts. Post a "spill kit equipment" label on the cupboard that contains the spill kits. Write on the top of the containers the type of chemicals that are cleaned up (e.g., hydrochloric acid, nitric acid and sulfuric acid on top of the

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acid spill kit container). Post a chart of the steps to take when handling a spill. Include telephone or pager numbers of people to contact (supervisors, safety, air ventilation, housekeeping, etc.).

Educate, Educate, Educate. There should be yearly training on how to use the kits, which kits are used for which chemicals, and tests to verify that people learned what was being taught.

Where Can I Buy Spill Kits?

The following are some of the companies that sell chemical spill kits and/or equipment. This information is provided for the benefit of the readers. MSH does not endorse any of these companies.

- American Bio-Safety Inc.
  800-624-8021
  http://www.AmericanBioSafety.com
- American Master Tech
  800-860-4073
  http://www.americanmastertech.com
- Fisher Scientific
  800-766-7000
  http://www.fishersci.com
- Laboratory Safety Supply
  800-356-0783
  http://www.LSS.com
- Pacific Southwest Lab Equipment, Inc.
  866-429-0618
  http://www.psl-equip.com
- Sakura Finetek
  800-725-8723
  http://www.sakuraus.com
- S&S Company of GA
  800-332-2694
  http://www.sascochemical.com
- Surgipath
  800-225-3035
  http://www.surgipath.com

REFERENCES

Literature, Website and/or Personal Communication:

Anatech, Ltd; http://www.anatechltdusa.com

American Biosafety; http:www.AmericanBioSafety.com

S&S of Georgia; http://www.sascochemical.com

“Cleaning up Small Mercury Spills”, Michigan Department of Environmental Quality; http://michigan.gov/deq

Hematoxylin Shortage?

ADA FELDMAN, MS,HT(ASCP)HTL
ANATECH LTD.

In February 2008 the major American producer of hematoxylin dye powder announced that they would be unable to supply this raw material until the end of 2008. That meant that U.S. manufacturers of hematoxylin staining solutions would have to rely on current inventory to last until the end of the year, unless they could find another source.

Hematoxylin dye powder is produced from logwood trees that are cultivated in Central America. The process begins with extraction of the primary raw material from chips of the reddish-brown wood. This product is then sold to dye companies (in our case in the U.S.) for subsequent purification into dye powder. A scheduling problem at the extraction factory caused unavailability to the American purification company. While they did have a reserve, it produced a smaller yield than expected. Coupled with high volume sales this caused the shortage (the perfect storm).

Since February, hematoxylin staining solution manufacturers have been depleting their certified powder inventory with no guarantee that the pipeline would refill. Manufacturers scrambled to find other sources outside the USA for hematoxylin dye powder. Some did not find suppliers or were not willing to pay the 3-6 times markup in cost. The increase began in the first week of March and has been steadily rising like the price of gasoline! Hematoxylin powder IS out there, but it requires a search beyond the usual (USA) supplier—and a willingness to pay extreme prices.

The good news is that in April, the American producer reached an agreement with the extractor to make logwood extraction a priority. If all goes according to plan, the American producer should be able to supply manufacturers by the end of the month.

2009 Joint Commission Goals

The Joint Commission 2009 National Patient Safety Goals for Laboratories are now available online. It's never too early to start writing your histology policies with these goals in mind!

Updates include a new numbering system and minor language changes for consistency. For more info visit:

http://www.jointcommission.org/PatientSafety/NationalPatientSafetyGoals/09_lab_npsgs.htm

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It is the responsibility of the participant to retain their MSH CE certificates as proof of continuing education.

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AUTHOR: Peggy A. Wenk, HTL(ASCP)SLS

DIRECTIONS:

1. Answer the following questions by circling the one (1) BEST answer for each question.
2. Complete the information required at the bottom of the page.
3. Submit questions & *check made out to "**MSH**"(in US funds)* to: Peggy Wenk, HTL(ASCP)SLS, 3840 Elmhurst Rd., Waterford, MI 48328

To earn Continuing Education credit from MSH, completed form must be submitted within three (3) years of original date of the article.

1. All of the following Personal Protective Equipment (PPE) should be worn when cleaning up a chemical spill ***EXCEPT***:
   A. Chemical nitrile or rubber gloves
   B. Chemical fume goggles
   C. Plastic apron or disposable gown
   D. White cloth lab coat

2. The ***FIRST*** course of action, in any spill, is to:
   A. Get everyone out of the room
   B. Notify Housekeeping to send someone with a mop
   C. Pick up the bottle, to find out what chemical was spilled
   D. Pour water over the chemical, to dilute it

3. All of the following spill kit reagents ***neutralize*** the chemical ***EXCEPT***:
   A. Acid spill kit
   B. Base spill kit
   C. Formaldehyde spill kit
   D. Solvent spill kit

4. TRUE or FALSE (circle one): When cleaning a chemical spill, the spill kit agent should be poured starting at the edge and moving inwards in a spiral towards the center of the spill.

PLEASE PRINT NEATLY DATE and YEAR *Completed/Submitted* Test: _____

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