The Chemical Safety Mechanism
University of Wisconsin-Madison
Office of Chemical Safety

Why Hoarding Old Chemicals is a Bad Idea
(And Strategies for Reducing Risk)

Many chemists might devote a career to working in research laboratories without giving much thought to the stock of chemicals stored on shelves, in cabinets, and in refrigerators. Go into most well-established research labs and you will usually find a wide array of hazardous chemicals hidden away. Some were used in the forgotten past or there may be vague thoughts of using the chemicals in the future. Sometimes chemicals are taken from the inventory of retiring faculty because they "look interesting." More often students and researchers leave numerous chemicals behind after completion of their research or when they leave the Institution. Many of the chemicals are essentially abandoned-in-place and can eventually become hazards to the laboratory if not removed from the facility within an appropriate period of time.

These chemicals may consist of moisture and air sensitive reagents. Some air and water sensitive compounds react slowly with moisture and generate gases and other side products inside the container which may pressurize it to bursting. Other chemicals can form organic peroxides and become an explosion hazard or can polymerize and rupture the bottle. Even under an inert atmosphere such chemicals cannot last for extended periods.

During laboratory visits by our staff numerous toxic and hazardous chemicals are often found with corroded caps and missing labels (**Fig. 1**). If you open a cabinet and see bottles like those below you should probably get rid of the chemicals. Or if you pick up an old bottle and decide not to use it because of reliability concerns you should get rid of the chemical. There is no advantage in storing old chemicals that are not likely to ever be used. Fill out an online chemical pick-up request, or call us if you need help evaluating your chemicals.

Figure 1. Example of Chemical Storage

A graduate student had worked in a laboratory for four years. He had inherited chemicals from a senior student in the group. He wanted 20 mL of ether for his manipulations and found a bottle on the cold storage shelf. The student took the bottle to the fume hood where he tried to open it. During the uncapping the bottle exploded and the student was severely injured.

While removing hoarded chemicals that are well-past their useful life should be applauded, a better approach is to have an inventory management system in place to prevent this chemical build-up in the first place. A central, lab-wide inventory can act as a tracking system identifying the chemical, source, amount of chemical, and storage location. Additional information, such as the hazard classification, expiration/disposal date, and staff member responsible for the material, can be especially useful. A well-managed inventory system includes chemicals obtained from commercial sources and those synthesized in the laboratory. The comprehensive inventory system should track the purchase, creation, storage and use of every chemical until it is completely consumed or disposed of. Inventories and tracking systems should be reviewed and updated on a regular basis to ensure that the inventory is accurate.

MANAGEMENT OF CHEMICAL: KEY POINTS

Periodically review the conditions of chemicals in storage areas and dispose of old or degrading chemicals. Ask yourself, "Am I ever really going to use this chemical and do I really trust the purity and integrity of the material in this particular container?"

Students come and go and often leave a legacy. Over time these tend to become "unknowns" which could cause a high disposal cost.

Many chemicals have a limited shelf life due to decomposition reactions. You should be aware of these chemicals and should get rid of expired chemicals. Chemicals in refrigerators are often kept there due to instability. These should be reviewed more often.

In addition to maintaining a robust inventory tracking system, you can also reduce risks (and costs) by following some of the helpful strategies and procedures below:

1. Consider disposing of materials not expected to be used within a reasonable period, for example, 2 years. For stable, fairly nonhazardous substances with an indefinite shelf life, a decision to retain them in storage should take into account their economic value, scarcity, availability and storage costs.
2. If you know someone in your department who may need some of your unused chemicals consider sharing. But don't *accept* a chemical if you don't need it simply because it is offered. Chemicals that are picked up by our staff are not necessarily thrown out. EH&S attempts to find a good home for chemicals in good condition through its surplus chemical program: http://www.ehs.wisc.edu/chem-chemicaldisposalsurplus-surpluschemicallabscan.htm.
3. 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 transformation (turbidity, cloudiness, and precipitation) in the contents, you should dispose of the chemical. 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. Replace deteriorating labels before information is obscured or

lost to ensure the traceability and appropriate storage and disposal of the chemicals. Unlabeled containers picked up by EH&S staff must be tested or treated as unknowns.

5. Dispose of or recycle chemicals/synthesized chemicals before the expiration date on the container.
6. Purchase the minimum quantity of highly toxic and smelly compounds to reduce the associated risk in the laboratory.
7. Regularly clean storage areas and refrigerators and remove old and deteriorating chemicals for disposal.

References:

1. http://www.ehs.wisc.edu/chem-chemicaldisposalsurplus-chemicaldisposalsurplusinformation.htm).
2. Prudent Practices in the Laboratory, the National Academies, **2011**.
3. Laboratory Safety for Chemistry Students by Hill and Finster, Wiley, **2010**.

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