Texas State University (TSU) Office of Environmental Health, Safety Risk Management (EHS&RM) Regarding Management of Chemical Inventories, August 2016

Prudent chemical retention and storage practices are vital to maintain a safe laboratory working environment and to minimize the financial costs and environmental impact associated with the handling and disposal of unwanted chemicals. Because chemical purity can be affected by factors such as temperature, light, exposure to air, and other substances, principle investigators (faculty, lab managers, students, etc.) should follow the general guidelines set by chemical suppliers and manufacturers such as Thermo-Fisher Scientific, Flinn, and Avantor which state that the stability/quality of their products, when properly stored, will range from 6 months to 5 years.

Each lab should have a comprehensive inventory system which tracks the purchase, creation, storage and use of every chemical until it is completely consumed or disposed. As part of an effective inventory system, EHS&RM requires that each laboratory follow the steps below to ensure a safe work environment.

1. Purchase only the chemicals you need. The same practice should be also applied to solutions that are created in the lab. Refrain from accepting chemicals from other laboratories simply because they are offered. All TSU laboratories should follow the American Chemical Society's guidance document Less is Better, which outlines strategies for waste reduction and the benefits of a waste minimization program.

2. All chemicals entering a lab must be marked with a "received date," and then properly segregated, stored and the lab's chemical inventory updated. Once the chemical container is opened an "opened date" should be written on the container.

3. Chemicals that have exceeded their expiration date should be properly disposed. Some chemicals retained past the expiration date can become unstable or may form explosive compounds (peroxides) over time. **EHS&RM requires that certain chemicals which are known to degrade or form peroxides must be used or properly disposed of by their expiration date**. Containers should be inspected periodically to verify their condition. Signs of peroxide formation include: crystal formation in the container, discoloration of liquids, or a "mossy" appearance around the cap. If suspect materials are recognized, **do not** handle the container. Particularly, **do not** attempt to remove the cap. If explosive crystals have formed around the cap, the friction created by the unscrewing of the cap may be enough to cause detonation. Contact the EHSRM office at 245-3616 for evaluation and disposal. Appendix A. at the end of this document will assist you in identifying time-sensitive chemicals that may present in your laboratory. To dispose of chemicals that have passed their expiration date, using the following link and log in

to arrange for a pick-up by EHS&RM HAZARDOUS WASTE PICK-UP REQUEST

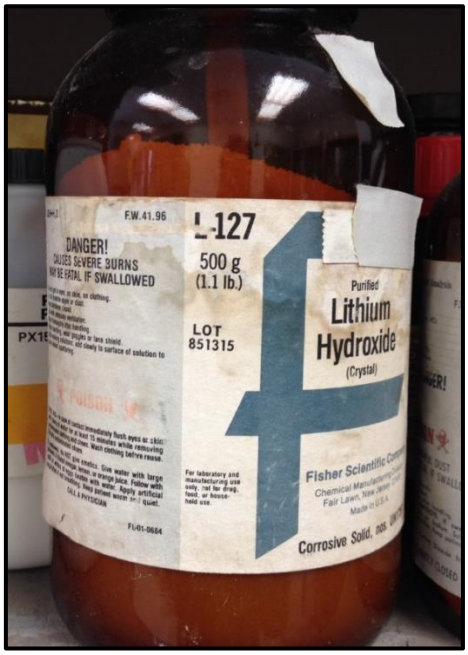
4. Refrain from stockpiling old/unused/expired chemicals (> 6 years old). Such materials may be inferred by state and federal auditors as hazardous waste and thus subject to violations and subsequent fines.

5. Although not recommended, should you decide to retain chemicals with an "indefinite shelf life", you should ask yourself:

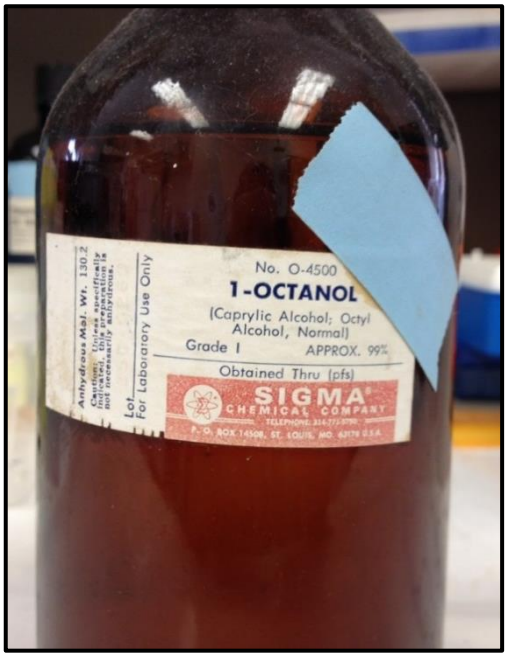
    - Do I trust the purity of the chemical(s) to not skew my research results?
    - Do I really need that chemical(s)?
    - How much space am I giving up to store that chemical(s).

6. If you are retaining older chemicals, the primary container label must comply, **at a minimum**, with OSHA's 1994 Hazard Communication chemical label requirements by having the following:

    - Chemical Name
    - Name and address of manufacturer
    - Hazard warnings



Compliant Label



Non-Compliant Label

If the labels of older chemicals does not meet the above requirement, the container must be relabeled using OSHA's 2012 mandated Globally Harmonized System of labeling chemicals (GHS), see the link for specifics GHS Label Components.

7. When moving out of your lab do not distribute your chemical inventory to other labs until you have met with an EHS&RM specialist and completed EHS&RM's "Lab Closeout Procedure" The close out form may be accessed online at LAB CLOSE OUT FORM

8. If you know someone in your department who may need some of your viable unused/unwanted chemicals, consider donating them to a lab **in need** being sure that both labs update their inventories. You can also donate your chemicals to EHS&RM's CHEMSWAP program that is currently being developed.

9. If your lab is cluttered with unwanted/unused chemicals from a previous occupant, contact EHS&RM for an assessment of the materials. Unviable/expired chemicals will be properly disposed and any usable chemicals will be retained by EHS&RM for its CHEMSWAP program.

10. Inspect your inventory frequently. If the cap on a container is degrading or if you see signs of a chemical transformation (turbidity, precipitate formation, etc…) in the contents, you should contact EHS&RM to dispose of the chemical. If you see signs of bulging in any containers contact EHS&RM immediately. If containers are losing their labels, reattach labels, and replace unreadable labels with new labels following the Globally Harmonized System of labeling chemicals (GHS), see GHS Label Components.

11. Laboratory synthesized chemicals should have a label identifying the contents and its hazards on the container. Replace deteriorating labels before the information is obscured or lost to ensure the traceability and appropriate storage and disposal of the chemicals. Unlabeled containers picked up by EHS&RM staff must be tested or treated as unknowns which can considerably increase the cost of disposal.

APPENDIX A: Lists of Common Peroxide Forming Chemicals

(NOTE: The lists below cover many commonly known peroxide formers, but are not all-inclusive)

List A: Chemicals known to form explosive levels of peroxides without concentration

Suggested safe storage period: If unopened from manufacturer, up to 18 months or stamped expiration date, whichever comes first. After opening, materials should be discarded or evaluated for peroxides within 3 months. Store under nitrogen if possible.

Divinyl acetylene	Potassium amide
Divinyl ether	Sodium amide (sodamide)
Isopropyl ether	Butadiene[a]
Vinylidene chloride	Chloroprene[a]
Potassium metal	Tetrafluoroethylene[a]

[a] When stored as a liquid monomer

List B: Chemicals known to present peroxide hazards upon concentration (distillation/ evaporation)

Suggested safe storage period: If unopened from manufacturer, up to 18 months or stamped expiration date, whichever comes first. After opening, materials should be discarded or evaluated for peroxides within 12 months.

Acetal (1,1-diethoxyethane)	2-Hexanol
Acetaldehyde	Methylacetylene
Benzyl alcohol	3-Methyl-1-butanol
2-Butanol	Methylcyclopentane
Cumene	Methyl isobutyl ketone
Cyclohexanol	4-Methyl-2-pentanol
2-Cyclohexen-1-ol	2-Pentanol
Cyclohexene	4-Penten-1-ol
Decahydronaphthalene	1-Phenylethanol
Diacetylene	2-Phenylethanol
Dicyclopentadiene	2-Propanol
Diethyl ether	Tetrahydrofuran
Diethylene glycol dimethyl ether (diglyme)	Tetrahydronaphthalene
	Vinyl ethers
Dioxanes	Other secondary alcohols
Ethylene glycol dimethyl ether (glyme)	
4-Heptanol	

List C: Chemicals that may autopolymerize as a result of peroxide accumulation

Suggested safe storage period: If unopened from manufacturer, up to 18 months or stamped expiration date, whichever comes first.

- **After opening, materials without inhibitors should not be stored for longer than 24 hours.**
- After opening, materials with inhibitors should be discarded or evaluated for peroxides within 12 months.

Acrylic acid[a]	Tetrafluoroethylene[b]
Acrylonitrile[a]	Vinyl acetate
Butadiene[b]	Vinylacetylene
Chloroprene[b]	Vinyl chloride
Chlorotrifluoroethylene	Vinylpyridine
Methyl methacrylate[a]	
Styrene	

[a] Although these chemicals form peroxides, no explosions involving these monomers have been reported.

[b] When stored in liquid form, these chemicals form explosive levels of peroxides without concentration. They may also be stored as a gas in gas cylinders. When stored as a gas, these chemicals may autopolymerize as a result of peroxide accumulation.