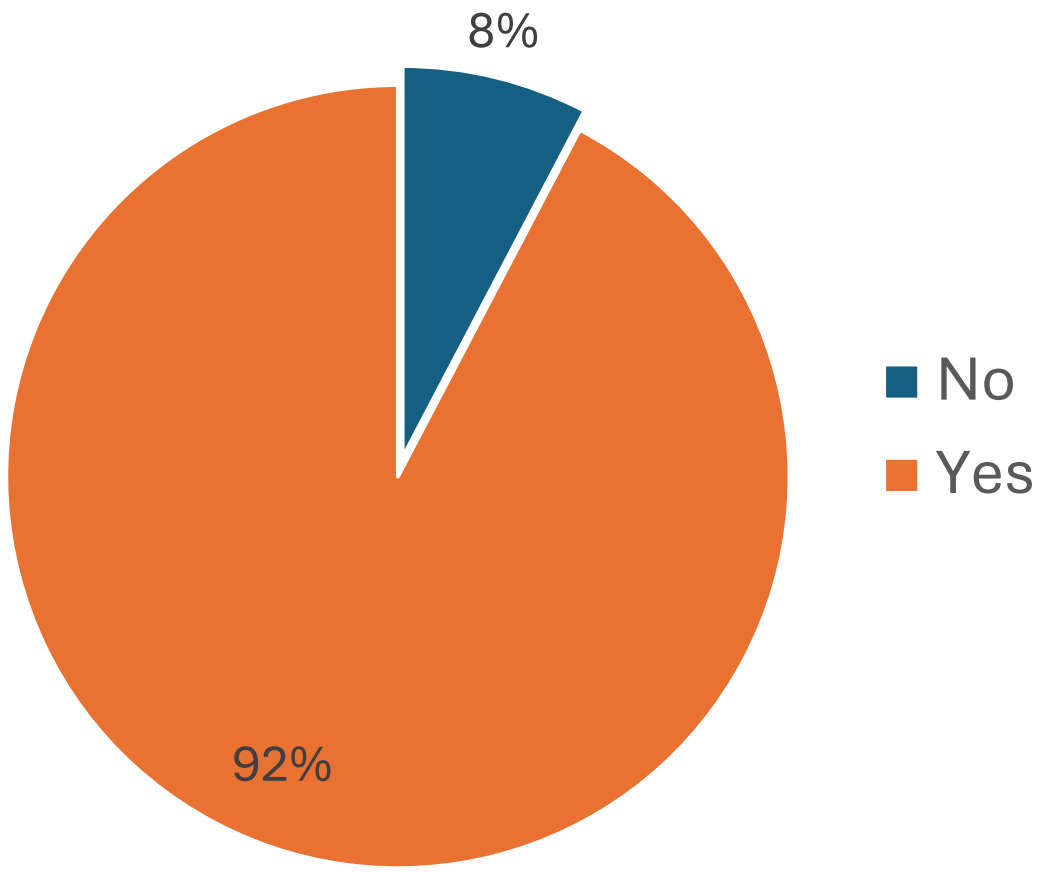
BioEM Talks

Collaborate, Explore, Innovate

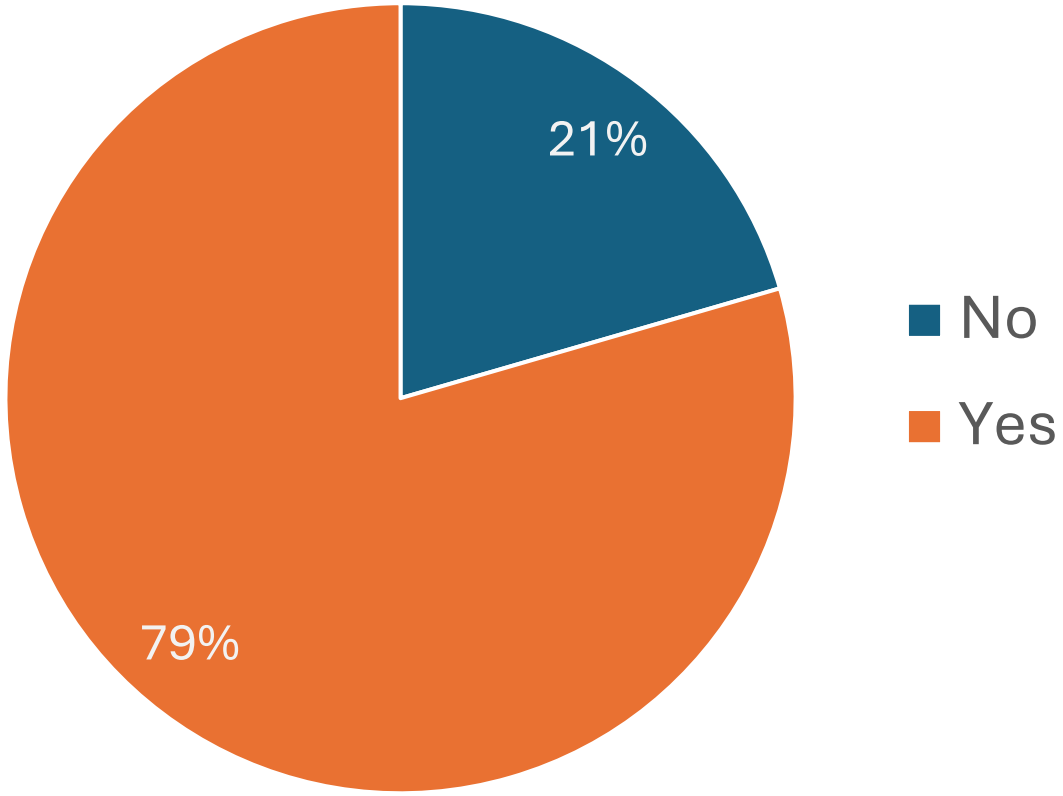
EM Lab Safety and Waste Management Survey

01/16/2025

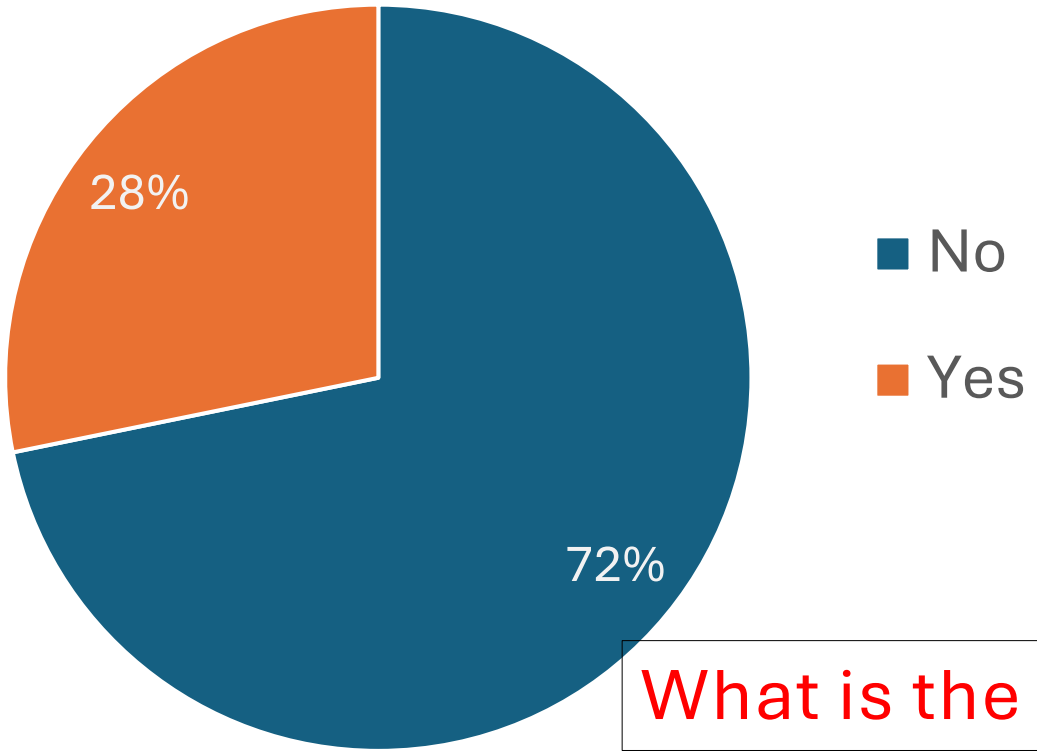
Q1 Do you provide EM fixatives to your collaborators or EM core facility users?



Q2 Do you include instructions regarding the proper handling and disposal of aldehydes and cacodylate buffers when providing fixatives to your users?



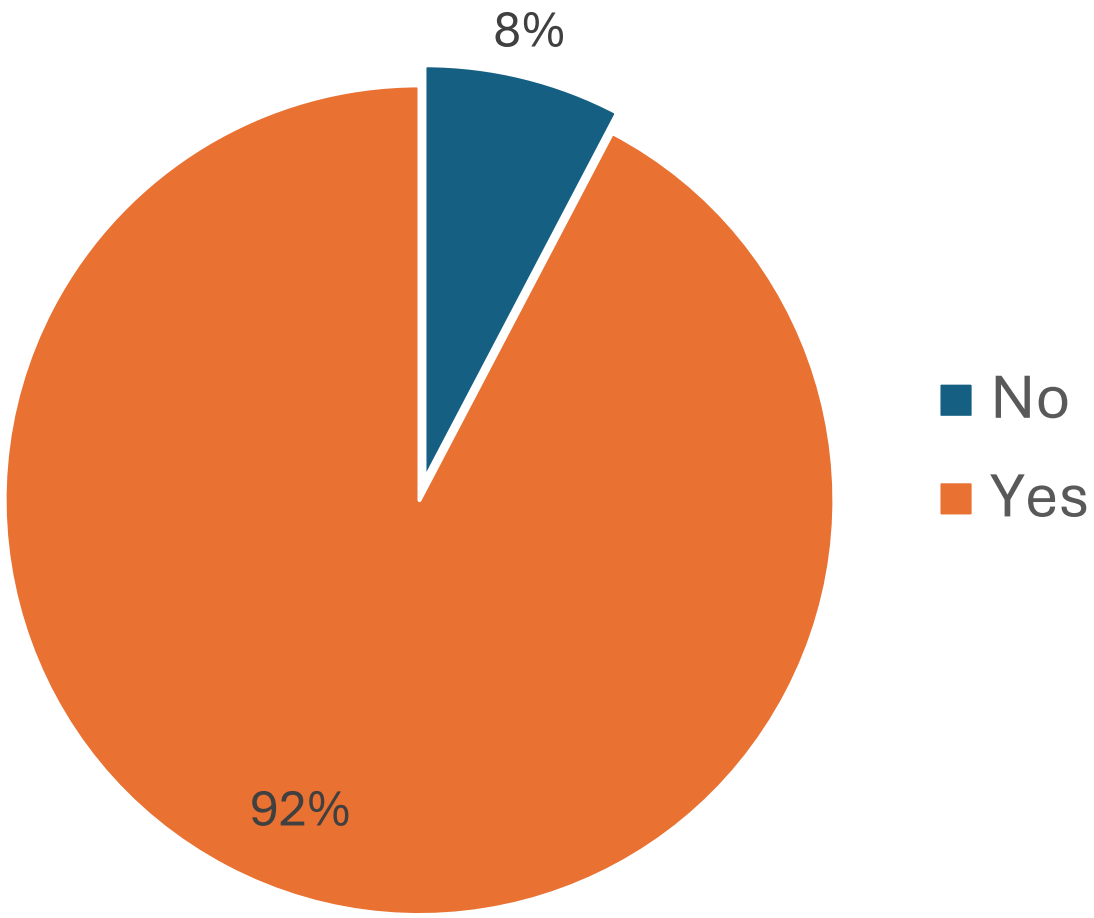
Q3 Have you ever received an EM sample with fixative leakage/spill during shipment?



- Four incidences involving improperly sealed multi-well plate
- Three incidences involving cracked tubes or caps

What is the best way to ship multi-well plate???

Q4 Do you collect cacodylate buffers as chemical waste?



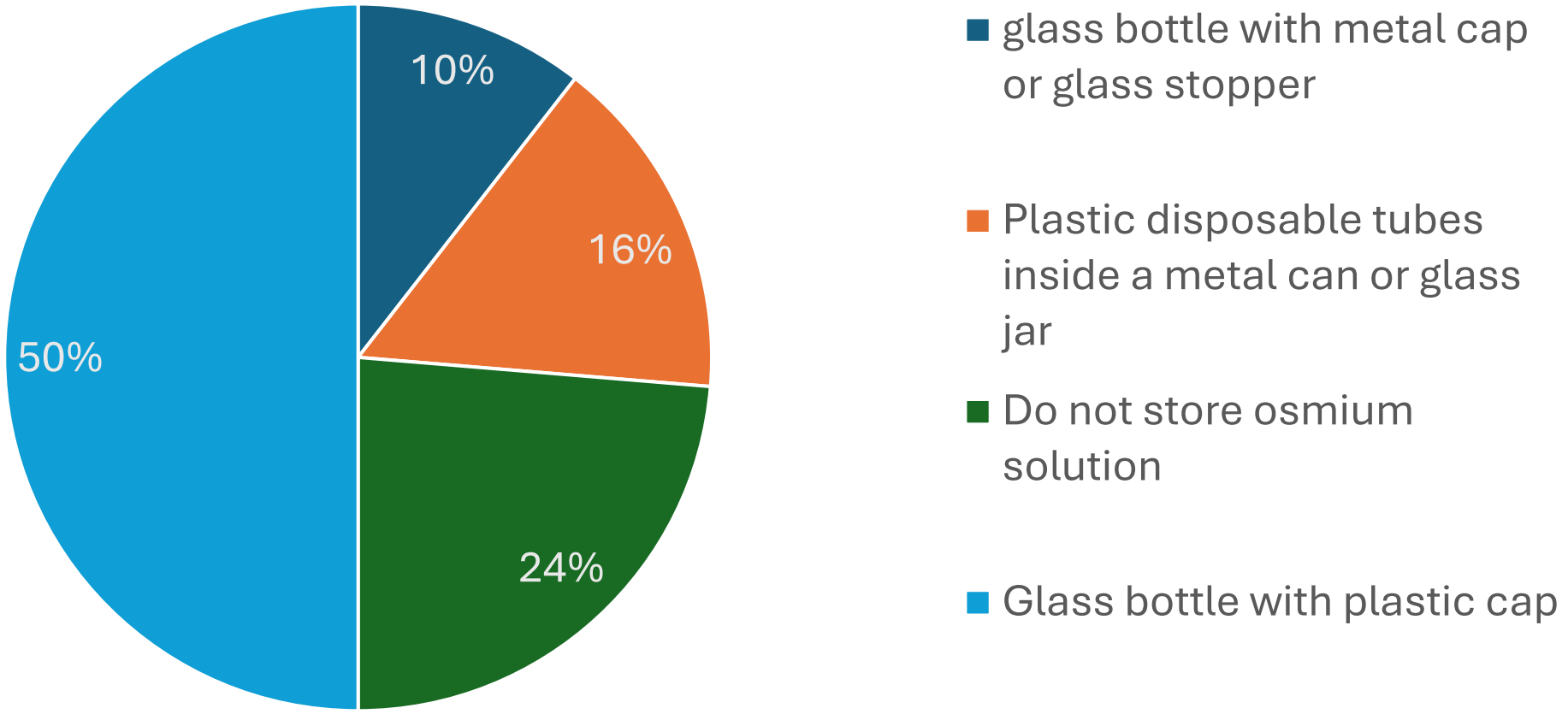
Consult your EHS

© Journal of Microscopy, Vol. 109, Pt 2, March 1977, pp. 249–251.
Revised paper accepted 2 December 1976

How dangerous is sodium cacodylate?

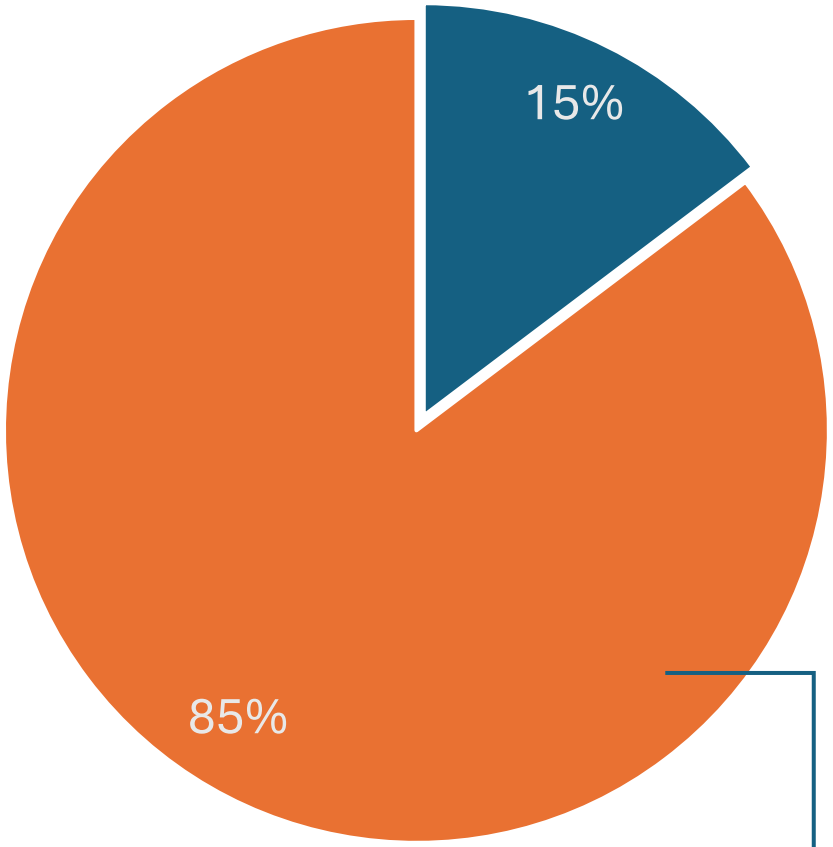
by BRENDA S. WEAKLEY, Department of Anatomy, University of Dundee, Dundee

Q5 What type of container do you use to store osmium solutions?



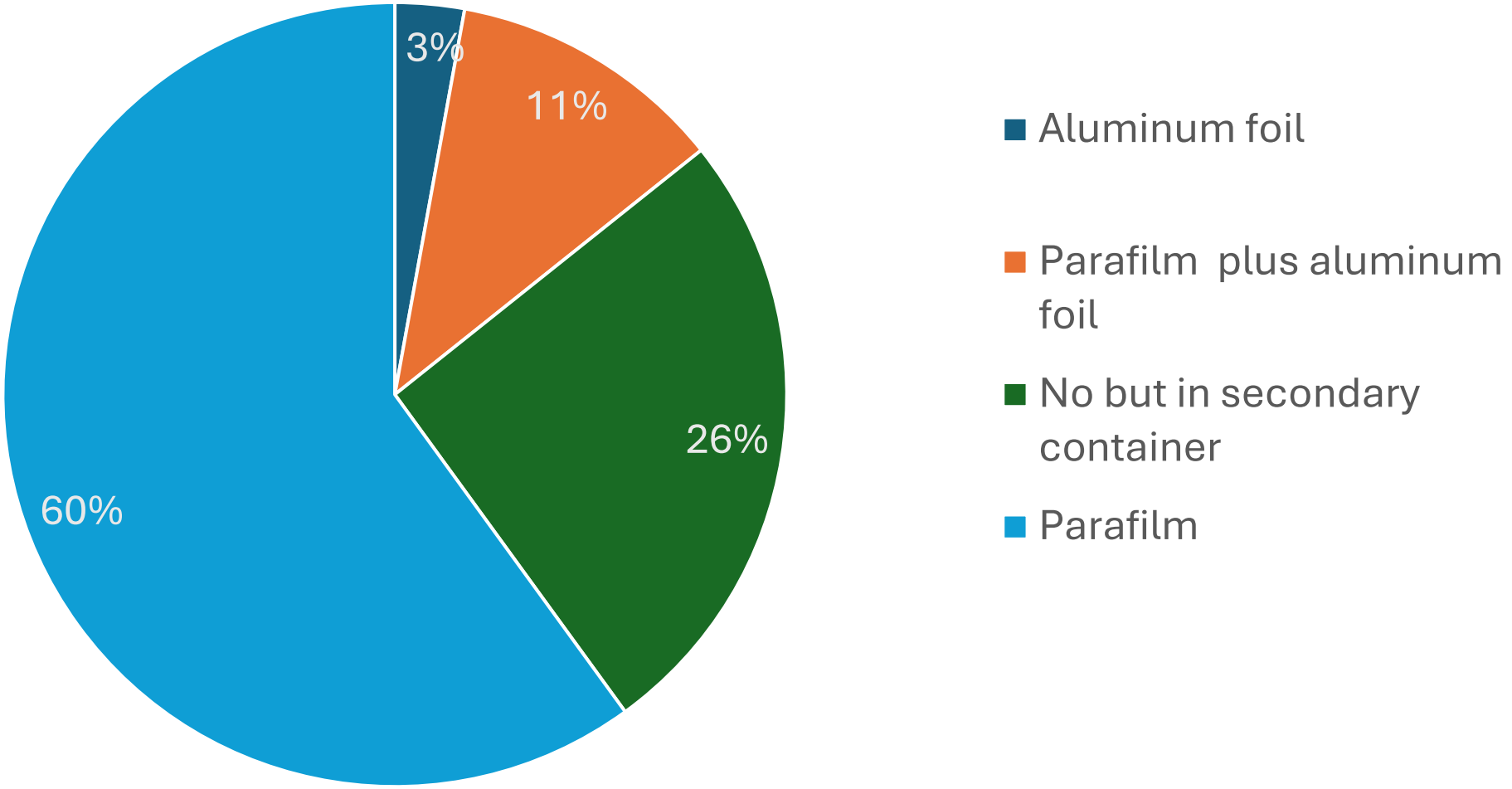
DO YOU MAKE UP OSMIUM FROM CRYSTAL OR PURCHASE OSMIUM STOCK SOLUTION INGLASS AMPULES?

Q6 Do you use a secondary container for added safety?

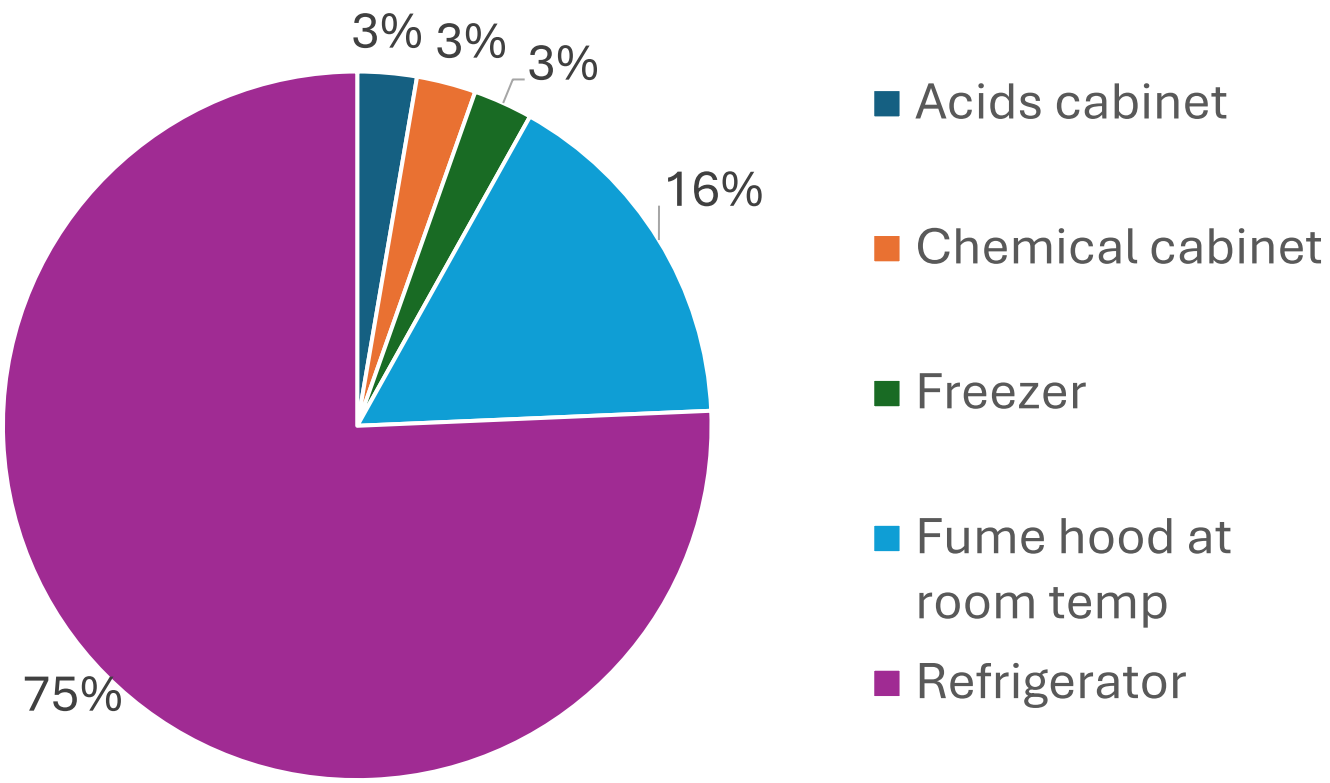


Metal can
Metal paint can
Designated chemical cabinet
Designated fridge

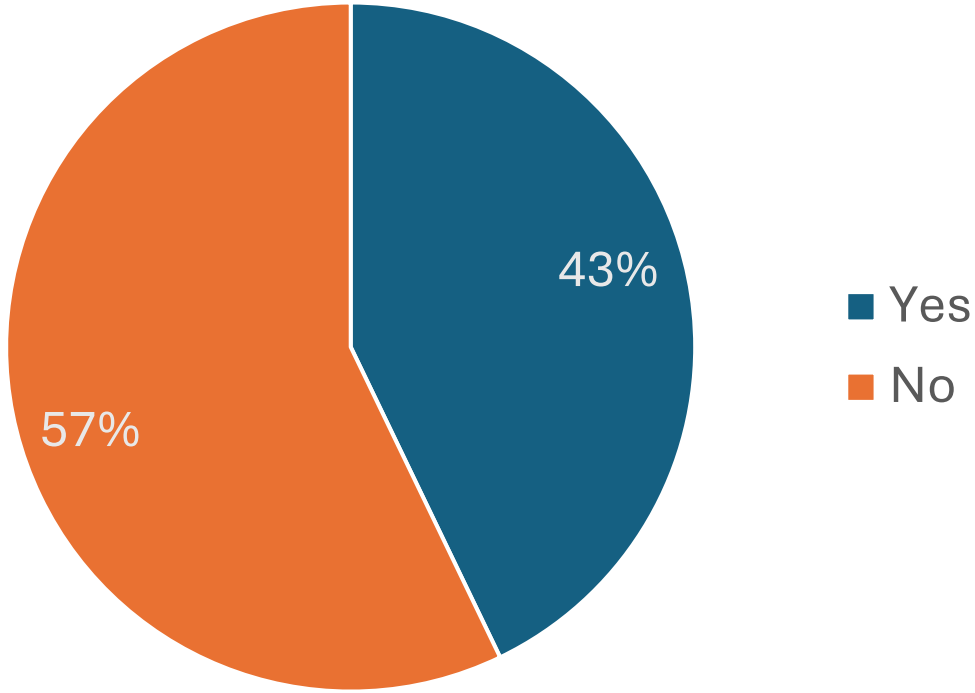
Q7 How is the osmium bottle or tubes sealed?



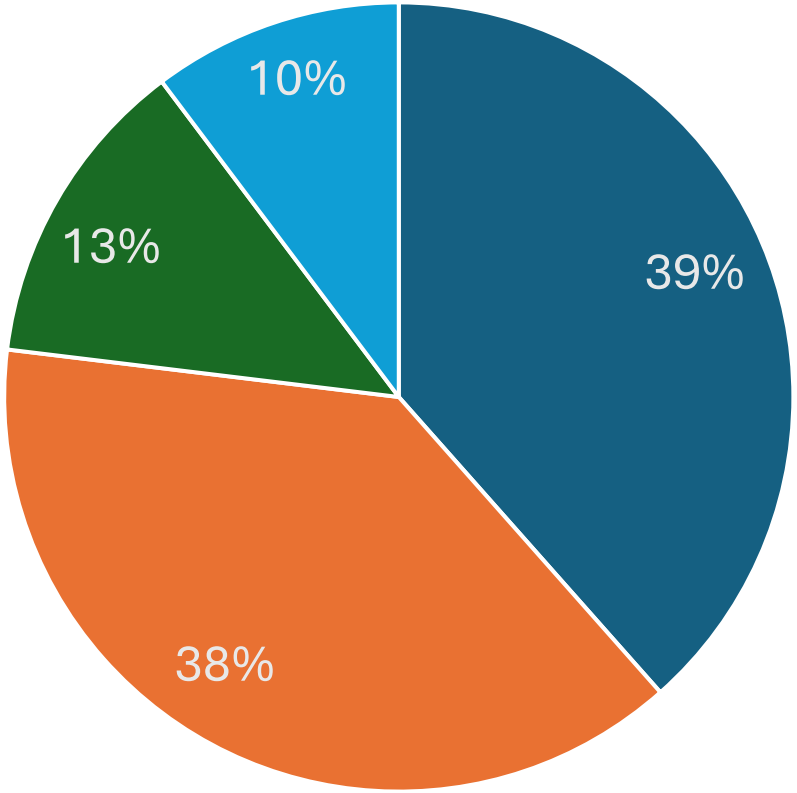
Q8 Where do you store your osmium stocks?



Q9 Have you detected any sign of leakage (blackening of the fridge)

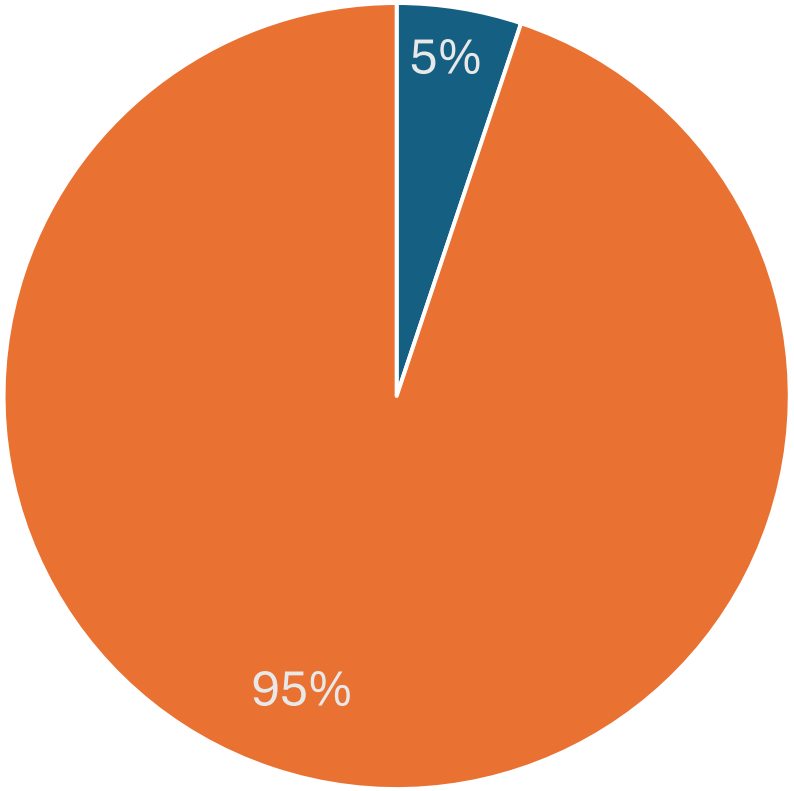


Q10 Do you deactivate osmium first before disposal



- No deactivation collect with other chemical waste
- mixing with corn oil → Add 3 parts of corn oil to 1 part of osmium to deactivate.
- mixing with ethanol
- Others →
  - Ascorbic acid 2%
  - Dry milk dissolved in water
  - 50% v/v ethanol with a layer of oil

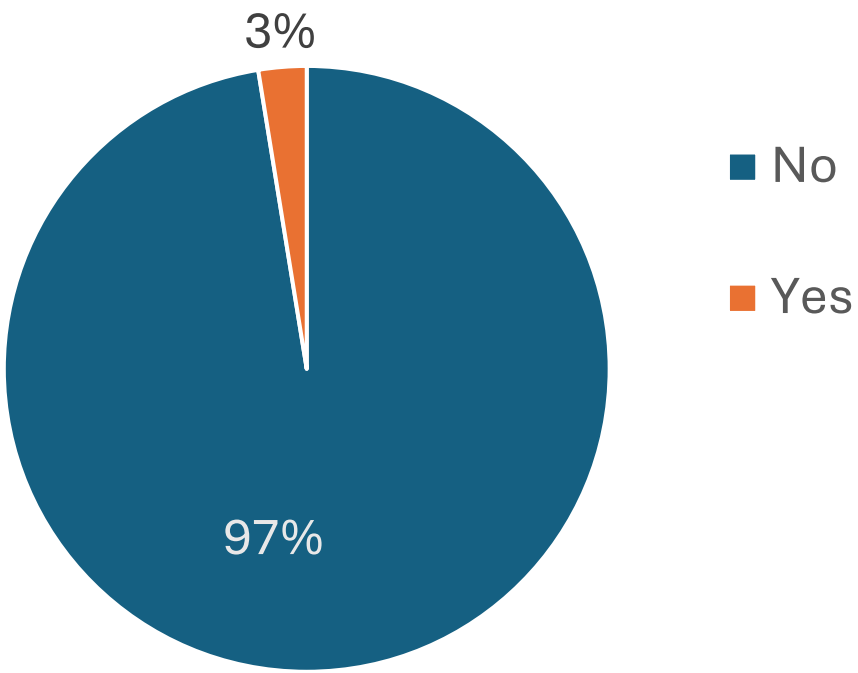
Q11 How do you dispose of resin waste in your lab?



Reusable items, such as scissors, are soaked in 100% ethanol, wiped dry and placed in a fume hood.

Do you also bake other disposable wares in contact with resin e,g, plastic tubes, tips, tooth picks?

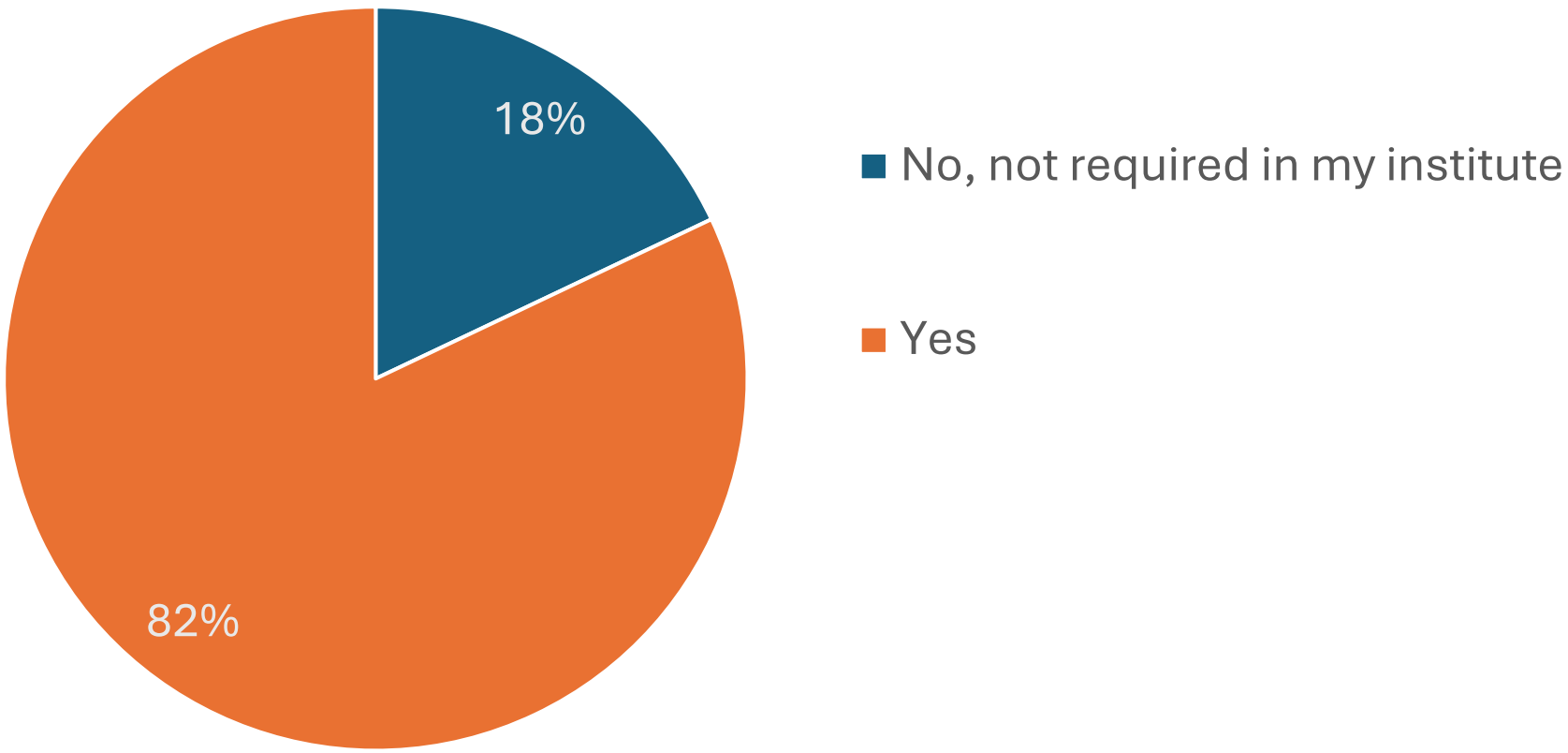
Q12 Do you use picric acid in your lab?



Only one responder reported using picric acid

We have had the same 100 gm bottle of picric acid for many years. We keep the crystals covered with water and draw out the saturated solution to use in our fix. As the water level drops, we top it off. The waste is collected according to our Safety Office guidelines. The picric acid is VERY dilute (trace levels) by the time the waste is collected. The picric acid is VERY dilute by the time it

Q13 Do you separate uranyl acetate and uranyl formate waste from other chemical waste?



Relevant comments

- Many things can go wrong even with experienced professional following strict safety protocols. We are fully prepared for spills when it happens
- Chemical safety made us acquire a fire extinguisher for metals this year.
- Here, we collect all waste and then EH&S pick them up every week. Everything is separate, except for alcohol waste (MeOH, EtOH, etc, together). UA is collected by radiation team, even if it's extremelly diluted and not radioactive, they will still collect it.
- I don't notice a blackening of the fridge where I store the osmium. However, the secondary container does blacken despite the osmium solution being stored in a glass bottle (plastic cap) that has been parafilm wrapped.
- I try to only make up enough OsO_4 for the experiment. I do waste OsO_4 due to this so if there is a better way would love to know
- Users are not allowed to handle toxic chemicals such as osmium, uranyl acetate, propylene oxide, etc.
- We no longer create mixtures of flammable chemicals (e.g., ethanol) with uranyl acetate as it is exorbitantly expensive to dispose of. It is a minimum cost of $2,500 for a minimum of 5 gallons.
- We have to log all UA usage with local Radiation Protection Office and this is then added to a national log.

some thoughts concerning chemical safety:

- Osmium tetroxide volatilizes readily at room temperature; its vapors smell similar to chlorine bleach.
- No resin block for electron microscopy is completely polymerized. Therefore dust and small chips produced during the sawing or filing of polymerized blocks are hazardous. Resin dust should not be allowed to remain on a bench, on the floor, or in a wastepaper basket. It should be collected with a damp paper towel or cloth or a vacuum cleaner.
- Uranyl acetate is a dual hazard, being both chemically and radiologically toxic. A daily uptake of 50 mg is considered lethal.

Information provided by Han Chen, Penn State College of Medicine

- All epoxy resins are mutagens and some may be carcinogens (Ringo et al., 1979, 1982; VCHD is carcinogenic, A.M. Glauert, personal communication). Moreover, epoxy resins (or their components) may be allergenic to some people.
- Protective gloves should be worn when handling any resin or resin component as a safety device in case of a spill.
- Ventilation: Components of the low-viscosity mixtures are volatile, especially at oven temperatures. Therefore, it is essential that all polymerization ovens be properly vented away from the laboratory.

Information provided by Han Chen, Penn State College of Medicine

PPE: gloves

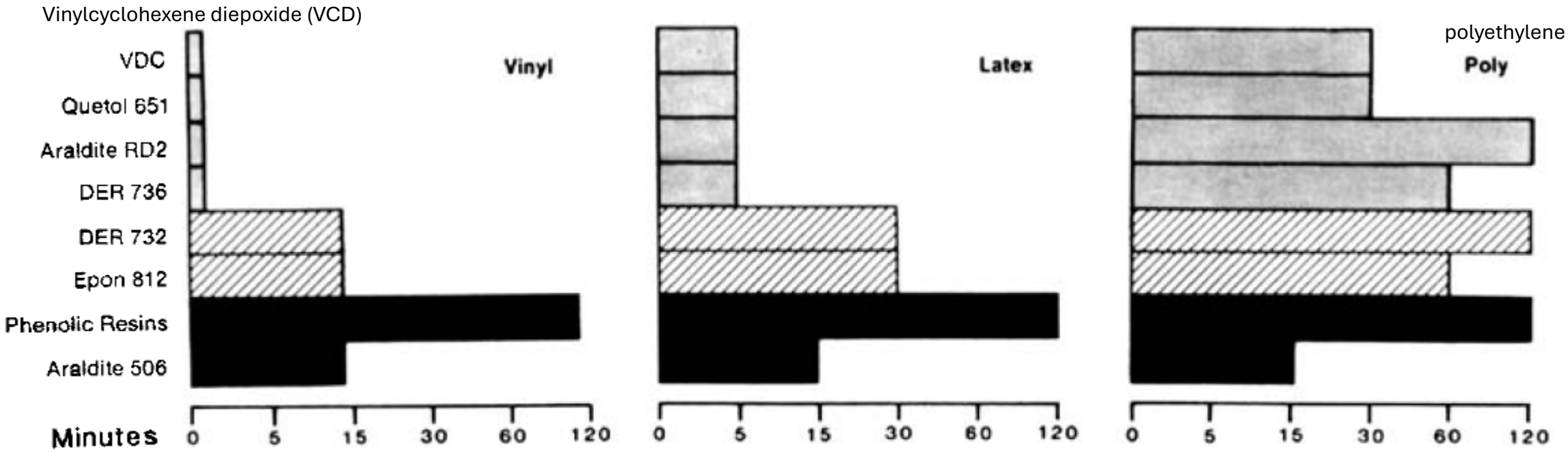


Figure 1. Disposable laboratory gloves were exposed to the epoxy resins listed on the left of the graph; bars represent the length of time before penetration was detected.

Information provided by Han Chen, Penn State College of Medicine

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Artifacts Caused by Dehydration and Epoxy Embedding in Transmission Electron Microscopy

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KEY WORDS TEM, Sectioning techniques, Specimen preparation

ABSTRACT Epoxy resins are the principal embedding media for the preservation of tissues to be sectioned and examined by transmission electron microscopy. Their primary advantages are good ultrastructural preservation, little or no shrinkage, ease of sectioning, and reasonable stability in the electron beam. However, epoxy resins also have disadvantages; namely, some are toxic, they may mask antigenic sites to a greater extent than do some other embedding resins, and they do not penetrate tissues as well as less viscous embedding formulations. Some unusual characteristics may also be revealed, for example, as shrinkage of organelles, as problems in poststaining sections, and as movement of tissue elements within the block and section. Some of the properties of epoxy resins are discussed in this report.