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DEPARTMENT OF THE INTERIOR

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Storage Containers And Labels For Fluid-Preserved Collections

This *Conserve O Gram* provides information for selecting containers, closures, tags, and labels for fluid-preserved specimens.

Containers

A container is a receptacle that holds a specimen and its preserving fluid. Fluid-preserved specimen containers are usually glass, but they may also be made of metal or plastic.

A container may be a jar, bottle, or tank. A jar is a container with little or no constriction at the mouth; a bottle has a constricted neck. A tank is a large receptacle of any shape. The container mouth is sealed by means of a closure. A closure may be either a lid or a stopper. A lid fits on top of or over the top of a container; a stopper fits into the mouth of a container. A variety of closures are found on containers in fluid-preserved collections.

A compressible stopper is squeezed into the mouth of a container. Compressible stoppers, regardless of material type, react with the preservative fluid and loose their compressibility over time. As the stoppers deteriorate, they contaminate the preservative fluid and fail to prevent evaporative loss. Compressible stoppers should not be used for storage of fluid-preserved collections.

Rigid stoppers are usually made of glass. Rigid stoppers are simple closures (they have no gasket) and they are sometimes sealed with a sealant such as petroleum jelly or jar cement. Older glass stoppers and jars were individually ground to match, and cannot be interchanged. New glass jars manufactured in Europe have interchangeable glass stoppers that do not require sealants, but they are very expensive.

Lids may be simple closures (no gasket) or complex closures (with gasket). Old glass lids were often flat sheets of glass attached to the jar rim with a sealant. The most common glass lids fit over the mouth of the jar and have a compressible gasket. They are held on to the jar by pressure from wire bails or metal clamps. Because the gasket material is in contact with the preservative fluid, it eventually deteriorates. Deteriorating gaskets contaminate the fluid preservative and allow it to evaporate.

Snap-on plastic lids are usually made of polyethylene. These lids loose their elasticity and break easily. Screw-on lids may be made of either plastic or metal. Metal lids are undesirable because they eventually corrode, allowing the preservative to evaporate, and the corrosion products may damage the specimen. Among the screw-on plastic lids on the market, the hard, black Bakelite lids should not be used. Bakelite is a phenol-formaldehyde polymer, which is prone to embrittlement, and Bakelite lids will spontaneously loosen with changes in temperature. Other lids made of polyvinyl chloride (PVC) plastics also become brittle over time and should not be used with fluid-preserved specimens.

The preferred containers and closures for most fluid-preserved specimens are glass jars with plastic lids made of flexible polypropylene with Teflon™ liners.[1] These lids will screw down tightly to the jar and are less prone to deterioration than other plastic or metal lids, although they are susceptible to embrittlement from ultraviolet (UV) radiation.

Plastic Containers

The only acceptable plastic containers for fluid-preserved specimens currently available in North America are screw-top multi-gallon buckets made of high density polyethylene (HDPE).[2] These containers are prone to UV embrittlement, and some may contain impurities that render them unfit for the storage of fluid-preserved specimens. If used, they should be kept from sunlight and indoor UV light sources, and monitored closely in storage. HDPE containers that have been exposed to sunlight during shipment or during use in fieldwork should not be used for long-term specimen storage.

Other kinds of plastic containers currently on the market, including acrylic (Plexiglas®), are susceptible to embrittlement and/or oxygen permeance.

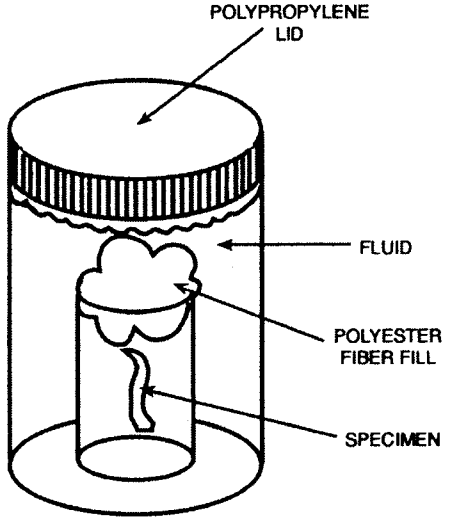

Figure 1.
Specimen vial housed in a jar filled with preservative fluid

Glass Containers

Glass jars with screw-on polypropylene lids (with liners) are currently the best containers on the market in North America for storing fluid-preserved specimens. Very small specimens should be put into smooth-sided specimen vials, the vials filled with preservative and plugged with polyester fiber plugs, and then submerged in the preservative in a glass jar secured with a screw-on polypropylene closure (see figure 1).[3]

If evaporation occurs from closed containers, the closure efficiency may be increased by wrapping the closure-container junction with polypropylene/acrylic (PPA) adhesive transparent tape.[4]

Agents of Deterioration

Temperature Fluctuations. Closures may become loose and gaskets may fail due to fluctuations in temperature. Temperature fluctuations act on the differences in the coefficient of expansion between the closure material and the container material. Over time, even small fluctuations in temperature will cause most closures to fail, and evaporation will occur. Lids should be checked on a regular basis, particularly following a period of temperature fluctuations.

Oxygen Permeance. The penetration of oxygen through the container and closure or through the jar/closure junction can cause damage to preserved specimens by allowing oxidation to occur. Oxidation reactions include the loss of color in preserved specimens, embrittlement, and other forms of deterioration.

Labels

Labels are data-bearing materials, usually made of paper. Labels are placed inside or on the outside of the specimen container; some are fastened directly to the individual specimen (sometimes known as tags).

Internal specimen labels have the advantages of not being susceptible to pest damage and being easily transferred between containers with the specimens. Internal tags and labels must be made of a material that is resistant to the preservative fluid. Labels should be made of either 100% cotton stock, neutral to mildly acidic, or a synthetic material. Papers made with alkaline buffers should be avoided. Synthetic label materials should be carefully tested by a conservation professional before they are used with fluid preservatives. Synthetic label materials that have been shown safe with most preservatives include those made of spun-bonded polyethylene (e.g., Tyvek®, Polypaper®). Many synthetic label materials may have components that will contaminate the specimens, such as plasticizers or UV blocking agents.

Some labels (tags) are tied or sewn on the specimen with thread or string. These labels should also be made of preservative-resistant materials. Avoid materials such as label-maker plastics (which deteriorate), wood, or metal (which will corrode due to the preservative) for specimen tags. These individual tags should not have sharp edges or corners that might cut or abrade the specimens.

Attach tags to specimens by means of 100% soft, white cotton thread. The length of the thread should be sufficient to prevent the tag from abrading the specimen, but not so long that the specimen tags tangle with one another.

Label ink must also be tested for the particular combination of label material and fluid preservative. Test inks by preparing two sample labels, placing one in a container of preservative, and the other in a dry container. Close both containers and monitor the labels for fading, bleeding, and durability of surface by comparing the label in fluid to the dry label.

Many problems have been reported with labels produced on desktop laser printers, particularly flaking off of the letters. The most durable labels are produced by writing the label by hand with archivally stable black ink in a technical pen, or by using a preservative-resistant carbon ink ribbon in a typewriter or impact printer. Typewriters and impact printers have the additional advantage of producing an impression of the type on the paper so that even if the ink fades, the lettering may be read under raking light.

Most synthetic label materials cannot be used in laser printers. The synthetic paper tends to melt to the heated drum of the laser printer under heat and pressure.

NPS labels should be printed using reports in the Automated National Catalog System (ANCS+).[5] Any impact printer with a Windows driver will work.

Placing Specimens in Containers

Do not overcrowd specimens in containers. Allow a ratio of approximately twice the volume of preservative to the volume of specimens. Specimens should not be forced into containers so that they are stressed. Specimens must be positioned in the bottom of the container, head-first, so that if evaporative loss does occur, the specimens will not be immediately damaged.

Handling Fluid-Preserved Specimens

Specimens must not be allowed to dehydrate when they are removed from their storage containers. It is very difficult to rehydrate specimens once they have dehydrated. When handling specimens, periodically submerge specimens in a tray of the same preservative or keep them covered with preservative-dampened cheesecloth. Never put preserved specimens in water. Preserved specimens are hygroscopic and will absorb water rapidly, which may cause physical damage to the specimen and will dilute the preservative when the specimen is returned to the storage container.

When closing containers, dry off the mouth or lip of the container before applying the closure.

Make sure that the closure does not leak before returning the container to the storage area.

Work with specimens in a fume hood or wearing a properly fitted respirator with a cartridge specific for the preservative. Wear solvent-resistant gloves.

Notes

1. Glass jars and flexible polypropylene lids are available from major biological supply companies.

2. HDPE pails, buckets and barrels, with screw-on lids, are available from Consolidated Plastics, 8181 Darrow Road, Twinsburg, OH 44087; (800) 362-1000.

3. Specimen vials are available from NPS *Tools of the Trade* and major biological supply houses; polyester fiber is available from fabric stores.

4. Polypropylene/acrylic (PPA) adhesive transparent tape is available from hardware stores; refer to the paper by Steigerwald and Laframboise for more information on this technique.

5. Additional information on NPS labels for natural history specimens is available in *Museum Handbook II*, Appendix H: Natural History, and in *ANCS+ Users Manual*, Chapter 5: Reports and Forms.

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