Biology Curators Group Newsletter

Title: What Fluid is in This Bottle?

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water will condense in the spirit. Gradually the liquid will become less and less of a preservative. The lower the RH the less likely is condensation to occur, or conversely the more likely water is to evaporate alongside the ethanol. The vapour pressure of water in a 70% spirit solution is equivalent to around 35% RH. So this RH will ensure that the ethanol and H20 will evaporate at the same rate. Although the level of the liquid in the jar may be dropping, at least the preservative properties will remain the same. A low RH will also contribute to the lack of rusting of metal clips on bottles etc., though it will not reduce the internal rusting of metal lids due to the contained water and acids. Keeping the RH this low in a storeroom requires the use of a dehumidifier.

Light

All the components of the specimen will be affected by the energy in radiation to some extent. The effect of light on the water and any dissolved oxygen will tend to produce radicals which react rapidly with susceptible groups in the specimen. This is the principle of bleaching by light used for linen and in paper conservation. Various components of the specimen will react, the colouring agents, dyes and pigments, being particularly reactive because both of the absorption of radiation and of the presence of unsaturated chemical groups, such as double bond sequences, which are easily oxidised.

The ultra violet radiation is of course more energetic and damaging than visible radiation. The glass of jars will absorb the most energetic wavelengths of UV but will still allow through quite a bit. Also the liquid itself will absorb some of the UV. However about half the fading of (textile) colours is caused by the UV component of sunlight. The rest is caused by the visible component. Only a small proportion of this is absorbed or reflected by the glass and liquid. The most accessible reactants are those in solution, so light will encourage the degradation and discolouration of the fluid. This is probably one reason for the staining of jars as the degrading materials react nearest the light source.

Light also supplies energy in the form of heat to the jar, which might act as an effective greenhouse. Light will go in but infra-red radiation cannot come out. Care must be taken to limit the exposure of jars to strong light for this reason. The MGC *Standards* recommend a maximum of 200 lux and the complete elimination of UV radiation. In general it is sensible to prevent light exposure, except when viewing is required. This can be achieved simply by switching off the lights in blacked out store rooms. Alternatively one can use storage cupboards whose doors are shut and opaque.

Pollutants

Dust and grime are the most obvious pollution problems, especially in major cities. This can obscure labels and make handling unpleasant - or even dangerous. Preventing, by filtration, the dust from entering the store room can be expensive. High levels of pollutant gases, sulphur and nitrogen oxides will affect the labels, but can also diffuse into the jars, though less readily than H2O and O2.

Controls

Air extraction is usually necessary in spirit stores. The seals on jars are seldom good enough. Leakage of alcohol and formaldehyde into the air creates hazards, mostly toxic. If people are working in the room, the levels must be kept down to the Occupation Exposure Standards, OES for ethanol 1000 ppm (HSE 1991), and preferably lower for comfort reasons. We were advised (F. Howie) that 70% ethanol was not a fire risk, though it is of course sensible to take precautions against build-up of vapour, sparks etc. In practice in our spirit store room, we find that an air change rate of ca. 5-7 changes/hour is the minimum to keep the atmosphere tolerable. This means sucking in air at a rate faster than could be practically filtered or dehumidified. As a result, the shelves and jars become dirty. Fortunately, the RH in the building is already fairly low throughout the year. We are addressing this problem by a programme of rebottling into more secure jars, as finances allow.

References

Cox, H. 1993. *The deterioration and conservation of chocolate from museum collections.* Studies in Conservation 38, 217-223.

HSE 1991. *Occupational Exposure Limits.* EH40/91, Health and Safety Executive.

MCG 1992. *Standards in the Museum Care of Biological Collections.* Museums and Galleries Commission.

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WHAT FLUID IS IN THIS BOTTLE?

One of the most tedious and necessary chores of museum curators is the maintenance of fluid-preserved collections which involves a great deal of topping up. Although museum jars are being developed to reduce evaporation it still occurs. Polythene acrylic tape (PEA tape) wrapped around the junction of jar and lid has been found to reduce evaporation even further (Steigerwald and Laframboise, in press - SPNHC *Collections Forum*).

None the less curators are faced with daunting rows of jars containing (normally) colourless fluids and either resort to:

1. Nasal analysis - Health & Safety Officers get very twitchy as the results can eventually be disastrous to the health of the curator.
2. Filling the jars with museum spirit and never mind if the specimens are in formalin - disastrous for the specimens.

3 Filling the jars with water - even more disastrous for the specimens.

Alternatively they can use:

4 Leuco-basic fuchsin impregnated papers which go pink with formalin and other aldehydes (including curators' hands) which may be fine but can be messy, time consuming and the curator is still inhaling fumes from the discarded papers.

5 Use an LCD readout specific gravity meter - a small amount fluid is sucked into the meter using a rubber bulb and a precise readout of the fluid's specific gravity is obtained - fine for alcohols but it will not distinguish between low grade alcohols and formalin; the meter is expensive and slow to use.

6 The Simon Moore method (below). Although this also does not distinguish between low-grade alcohols (of which there should be none in your collection!) and formalin it has the advantage of being much faster, cheaper (home-made), much safer (no sniffing) and it's accurate!!

You will need: a dropping bottle with reservoir and mapping pins of assorted colours with heads small enough to fit into your dropping bottle reservoir.

1 Make up a range of those preservative solutions for which you will be testing.

2 Remove heads of red, yellow and blue pins using pliers (these colours are not obligatory!).

3 Test flotation of pin heads in solutions and replace pins (point first) into pin heads to weight them.

4 Trim off pins to various lengths so that some will float, some will sink in the various solutions: eg yellow has no pin, red has half a pin, blue has pin right through.

5 When each pin has been trimmed to correct weight, push the remainder of the pin into the head.

6 Put weighted pin heads into bottle's reservoir.

7 Test - suck up fluid into reservoir, give a shake to get rid of any adherent air bubbles, note the distribution of floaters and sinkers:

8 Yellow will float below 55% alcohol and in 10% formalin, it sinks in 60-80% alcohol; red will float in 30% alcohol and 10% formalin, it sinks in 50% and 70% alcohol; blue floats only in formol-glycerin.

9 A simple method of just distinguishing between 70% alcohol and formalin will only require one red ball - floats in formalin, sinks in alcohol (if strength greater than 55%).

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A SHORT NOTE ON PRESERVATIVES THE IDENTIFICATION PROBLEM - A POSSIBLE SOLUTION

During the course of a one year, externally-funded conservation project in the Hunterian Museum (Zoology Section) in Glasgow, work was undertaken to address a backlog relating to various parts of the collections, including the wet material. Some 2,000 jars were dealt with in the available time.

The main problem encountered in this project with regard to preservative was one of identification. Many curators rely on smell, but this was obviously not to be recommended where some of the jars contain formalin or unidentified, possibly toxic, fixatives or preservatives. There is a published method using a strip test to distinguish between formalin and alcohol, but it was found to be difficult, time consuming and expensive to make the strips up. The method used in this project to tell preservatives apart was more or less discovered by chance while labelling the jars.

It was found that a strip of Goatskin Parchment label (8mm x 20mm), when dropped flat on the surface of preservative behaved in different ways:

* Alcohol (down to about 30%) will soak through the paper immediately and the label sinks after a short time.
* Formalin (even at low concentration) repels the paper and the label will float on the meniscus for a long time, sometimes curling up at the edges.
* Phenoxetol is neutral, being mostly water, and the label sits flat on the surface for a time until the fluid slowly soaks through.

Although this method has not been rigorously tested, it never failed in use, and sometimes identified alcohol when the nose could not. It also identified the common situation where the preservative is mostly alcohol but with a little formalin residue from the fixing process (this mixture frequently fools the strip test method). With practice, it was also possible to recognise some other preservative types, eg alcohol with glycerine. At the very least, the method readily identified formalin which the nose should never be allowed near!

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LIQUID PRESERVATION - HOW LITTLE WE KNOW

There is a wealth of information in specialist books and journals on the liquid preservation of biological material, but very little of this concerns plants. Following the reorganisation of the science departments at the Natural History Museum in 1990 a newly-formed Curation Programme undertook the task of monitoring and improving methods of specimen conservation. In my role as Curator of Algae I had to decide the fate of the largest liquid-preserved collection in the department as well as manage other disparate holdings, such as pressed herbarium specimens,