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An enzyme technique for the rapid preparation of osteological specimens

by Clem Fisher and George McInnes, Merseyside County Museums.

Merseyside County Museums deal with much archaeological bone material, especially bird remains, from the north-west area. To provide comparative specimens we are continually adding to the reference collection of skeletal material held in this museum and have been, for the last six months, experimenting with various enzyme techniques. We have now developed a system which seems to produce satisfactory results and is both speedy and simple to operate.

The first problem was to devise a system for dealing with the fumes produced by the enzyme degradation as the preparation area is adjacent to offices and research collections. The apparatus was installed in the Taxidermy skinning room, which already had an efficient air extraction unit, and this has now been supplemented by an electric air freshener. These together reduced the smell to a level which can be tolerated, even by our non-zoologist neighbours.

We use a stainless-steel bath, actually an old aquarium filtration unit, with a base sloping down to the outlet (see diagram). A plastic bath would be easier to clean and less vulnerable to corrosion but it would possibly have been distorted by our heating system. A plug is fitted to the outlet in the bath and a pipe leads from here straight into the drainage channel in the skinning room, over which the bath stands. An electric stirrer (constructed from an old gramophone motor to which was attached a stirring spindle fitted with extra plastic blades) is fixed to the side of the bath and set to run at 78 r.p.m. Two 100 watt heaters are fitted to the base of the bath with suction caps and a thermostat, set at 37^{o}C and fixed to the outside of the bath and checked by an accurate thermometer suspended in the liquid.

The bath is filled to about four inches below the top with water, to which 100gm of dry Pancreatin/100 litres was added when the bath reached the correct temperature.

When set up, the bath is obviously a haven for germs and we use gloves and masks while working, disinfecting ourselves thoroughly afterwards. The surface of the bath tends to become covered with a thick layer of mould (somewhat like chamois leather) after a few days - this can be removed in large pieces with a pair of long-handled forceps. A lid will reduce the health hazard but slows the enzyme action.

Preparation of specimen

1. Defrost completely, rough-flesh as far as possible and boil in water. A few minutes is enough for small mammals and passerines, up to half an hour for very large specimens.

2. Rough-flesh further and divide joints. Pull the skin off the toes of mammals as far as possible, score those of birds heavily with a scalpal.

3. Form a suitably sized bag out of fine mesh material. We find nylon stocking is best for the lighter specimens as it can be cut and tied easily and has a mesh too fine for the smallest bone to fall through. For heavier bones that might tear stocking,we use hand-sewn bags cut from nylon aquarium filter mesh (polyester monofil, 40" wide).

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4. Place the bones in the bag, tie the mouth and hang from the sides of the bath or from supports (dowelling etc) placed over the top. Label each bag with water-proof (and enzyme-proof!) card and ink. We use plastic-coated card and "Rötring" pen.

5. Check contents every other day, removing delicate bones (e.g. bird skulls) if they show signs of deterioration. Generally small birds and mammals should be clean after about 5 days; a duck or crow will take about 8. We have yet to use the bath for the really large mammals. The only problem we envisage is the increased odour level and duration of immersion.

6. Remove the bag from the bath and wash under tap to rinse away the tissue, now soup-like, remaining inside. Turn the contents into a container and wash again, using a sieve if necessary.

7. Boil specimen for a few minutes (longer for larger specimens) in a solution of Boots' "Nappy Cleanse" and sodium perborate which will help clean and degrease the bones - keeping an eye open for overflowing foam! Clean off any remaining pieces of cartilage - we prefer to use dental tools as the bone is slightly soft from immersion and easily damaged.

8. Degrease further (usually necessary). We find this a great problem as commercial powders tend to leave a deposit on the bone and are not very efficient; we are loathe to use the various carcinogens such as carbon tetrachloride, benzene-based products, etc., that we have heard do work! Does anybody know of an alternative?*

9. The sodium perborate solution will have already bleached the bones to some extent - we use a 10% solution of hydrogen peroxide to bleach them further if necessary.

10. Wash well in cold water and spread out to dry on white blotting paper.

Suppliers

Polyester Monofil (PES 574 mesh width) Polymon G.G.: John Staniar, Sherborne Street, Manchester, M13 FD.

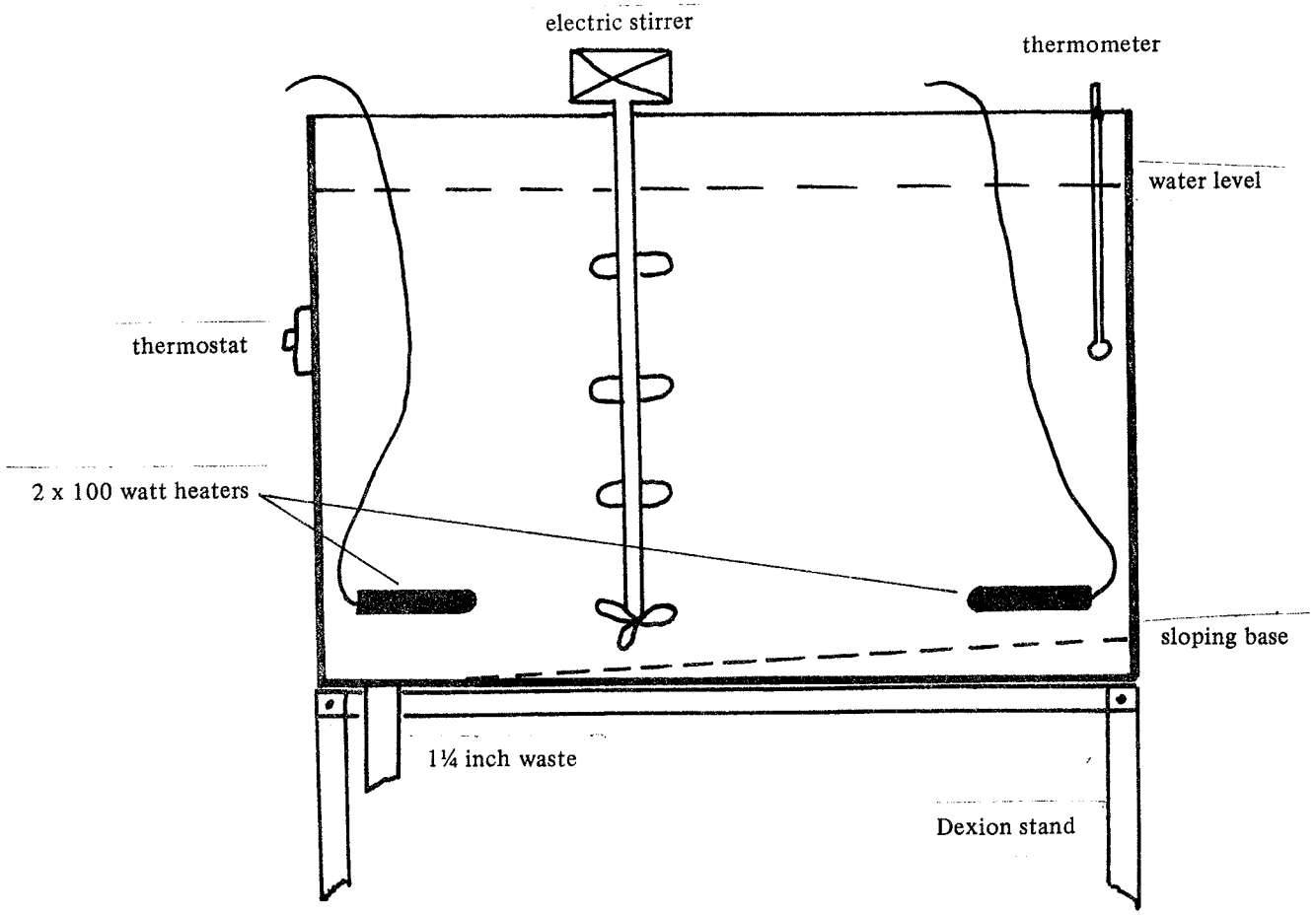
Pancreaton, Sodium perborate, Hydrogen peroxide: Oakes Eddon and Co. Ltd., Dryden Street, Liverpool 5.

Electric Air Freshener; Zal-Air Electric: Sterling Industrial, Chapeltown, Sheffield, S30 4YP.

Nappy Cleanse: Commonly found at branches of Boots the Chemists.

*Editor's Note: At Bolton we use "Inhibisol" which is 1.1.1. Trichloroethane (not Trichloroethylene!). It is non-flammable but whilst ideal for degreasing skins is not as efficient with bone material. It can be obtained from Blastobell Paints and Chemicals Ltd., Bassington Industrial Estate, Cramlington, Northumberland.

stainless steel tank 21 x 18 x 17 (inches) deep



PREPARING ARTHROPOD SKELETONS

The use of enzyme baths and general rotting are a well known way of producing vertebrate skeletons. I have just received a reprint describing a sophistication for invertebrates:- Dartevelle, Marlier & Marlier (1980) 'Mise en évidence de l'anatomie externe des arthropodes par digestion bactérienne des organes internes' Annales Soc. r. Zool. Belg., 109 (1979): 29 - 30.

The skeletons of insects and small crustacea were cleared of flesh in about a week by use of a strain of Bacillus subtilis which had a particularly strong activity on protein substrates. The technique was found preferable to maceration with caustic potash if delicate parts were required for examination because of the considerable distortion the latter treatment normally produces.

Of course, having prepared your skeleton, you then have the task of deciding its ultimate fate - cabinet-skin or a mount!

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