Reconstructing a brass box for Roman eye medicines

by Dr Nick Summerton, General Practitioner

In the September 2013 edition of *ARA News* (issue 30, pp28–30) I outlined a collaborative project (supported by a very generous donation from Dame Mary Perkins at Specsavers) to manufacture and test out the microbiological efficacy of a number of Roman eye medicines (collyria).

Based on an assessment of the most common constituents mentioned on collyrium stamps combined with information derived from the chemical analysis of collyria found in excavations, we were particularly interested in recipes involving the following: cadmia (zinc carbonate), cerussa (lead acetate), spodii (zinc oxide), stomoma (copper acetate) and gummi (gum arabic).

One of the most interesting findings to date is that the *Philo* collyrium (consisting of lead acetate, zinc carbonate and gum arabic) exhibits the same microbiological efficacy (in vitro!) as does one of the most commonly prescribed ophthalmological antibiotics that I use as a general practitioner: fusidic acid. Figure 1 demonstrates the bacterial 'kill zone' around the *Philo* collyrium.

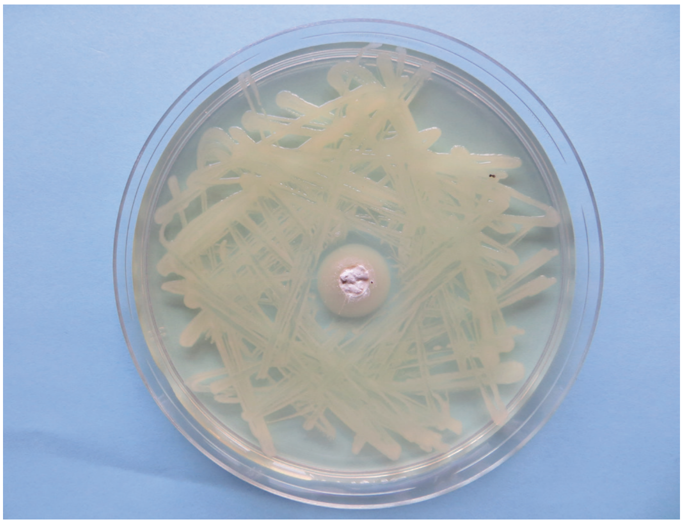


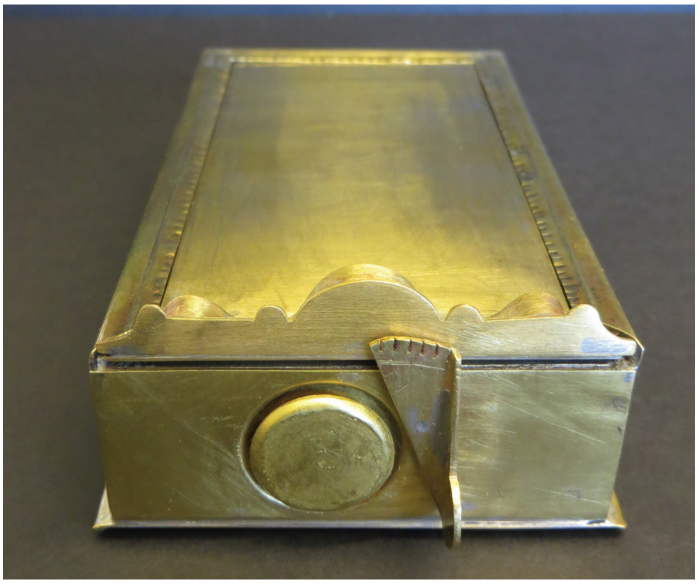
Fig. 1. *Philo* collyrium in the centre of a Petri dish, with a circular bacteria 'kill zone' around the collyrium. *Photo: © Nick Summerton.*

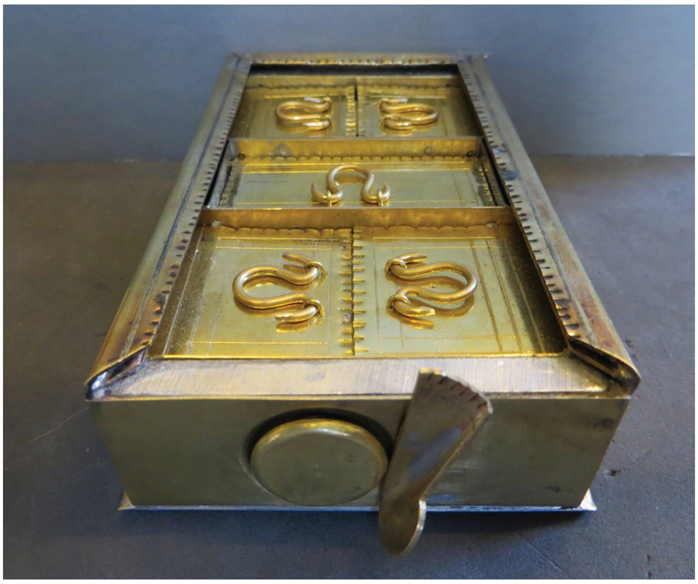
In addition to looking at the collyria themselves we have also begun to examine some of the associated equipment of the peripatetic Roman eye healers. Back in 1990 Boyer described the excavation of a cremation burial from Lyon. In the grave was found a brass box with four compartments that contained 20 baton-shaped collyria. Eight of these were clearly stamped in Greek or Latin. Also discovered were three brass probes of the type used to mix medicaments (contained within a brass cylinder) alongside a worn slate grinding stone.

In order to better understand the nature of the eye medicine box and the process of manufacture I persuaded Martin Jones, a semi-retired Design Technology teacher at a local school, to manufacture a facsimile. Using the description in the paper by Boyer, together with a very useful video of the preservation of the Lyon box (available on-line at http://videotheque.cnrs.fr/doc=607), in addition to information on other medicine boxes found elsewhere in Europe (e.g. the box from Yortan in Turkey kept at the British Museum) Martin kindly produced a beautiful copy (see Figs. 2 and 3). Figure 4 shows the reconstructed box alongside the example in the British Museum.

The dimensions of the box are: length 114mm; width 65mm and height 28mm. In keeping with the original it consists of thirteen individual pieces of brass sheet (0.56mm thick) joined together by soft solder. In addition to the brass it incorporated some steel and lead elements. Inside the box are five small compartments covered by a sliding lid held in place by a tongue-shaped locking mechanism. On the underside is a cup-shaped depression in the brass – spherical diameter 42.5mm, depth 13.7mm (Fig. 5).

Four particularly challenging elements of the reconstruction were selecting an appropriate solder (and soldering approach), making the cup-shaped hollow, fitting in the lid for the central compartment and understanding the locking mechanism. The difficulty with the soldering was to produce a resilient box – suitable for a travelling eye healer – without melting any previously soldered joints or the brass itself!





Left: Fig. 2. The reconstruction, with its sliding lid locked in place.
Right: Fig. 3. The reconstruction with the lid removed, showing the lids of the five compartments. *Photos: © Nick Summerton.*

Left: Fig. 4. The reconstruction (*left*) next to a Roman eye medicine box from the British Museum.
Right: Fig. 5. The cup-shaped depression on the underside of the box and the tools made to create it. *Photos: © Nick Summerton.*

The original plan was to use a hard silver solder for the basic box structure and then to add in the other components using a lower temperature soft solder. Unfortunately initial experiments with silver solder proved to be very difficult due to its high melting temperature combined with the thinness of the brass sheets; after damage to the brass, several parts had to be re-made. The final reconstruction used soft solder, as in the case in most Roman boxes examined to date, and during construction Martin used spare pieces of metal to absorb and radiate away excess heat, which actually worked much better than anticipated. Clearly our Roman forebears knew what they were doing!

In order to make the cup-shaped depression a series of hardwood punches and formers had to be made (Fig. 5) and then, with regular annealing, the brass sheet was gradually beaten to the shape and depth required (Fig. 6). Moreover the remainder of the brass sheet had to be carefully clamped in place during this process in order to prevent any distortion of the surrounding areas. Fitting the lids onto the compartments (on pin hinges) proved to be reasonably straightforward until the central compartment was attempted. This presented another challenge and served to explain why the manufacturer of the Lyon box had inserted small pieces of steel to allow the opposing walls to flex. This permitted the central lid to be positioned in place while the walls were momentarily held out of position (see Fig. 7).

To date the majority of the medicine boxes that have been discovered are made of bronze (copper with tin) or brass (copper with zinc). From a medical perspective copper alloys are an interesting choice, in light of their anti-microbial properties. For example, it has recently been demonstrated that many harmful bacteria will die in a few hours on a copper alloy surface but not on stainless steel or plastic surfaces.

In the ancient world brass was made by the 'cementation process' in which broken metallic copper is heated to about 1,000 degrees centigrade in contact with cadmic (zinc carbonate) and charcoal within a closed crucible. Intriguingly, cadmia is also a key component of a number of recipes for Roman eye medicines (e.g. *Lutron,* described by the Roman physician Galen) so a region where brass could have been made might also have been an ideal location to find the ingredients for a number of eye collyria.

According to Bayley (1992) there are various allusions to brass-making by the ancient authors Strabo, Dioscorides and Pliny. Brass ingots have also been discovered in Romano-British archaeological contexts (at Gloucester and Claydon Pyke, Gloucestershire) and a heavily worked brass sheet was excavated at Colchester. In addition small lidded crucibles used in the 'cementation process' have been found at Roman sites in Canterbury and Colchester.

In the Roman world brass sheets would not have been formed by rolling, as nowadays, but by hammering and then cutting to shape. The process might also have been facilitated by pouring the molten brass onto an inclined stone mould prior to forging. Sand may also have been used as an abrasive to produce the desired finish to the brass sheet.

Aside from the mechanical properties (such as strength, hardness and malleability), the resistance to wear and

Fig. 6. Martin Jones creating the cup-shaped depression. *Photo: © Nick Summerton.*

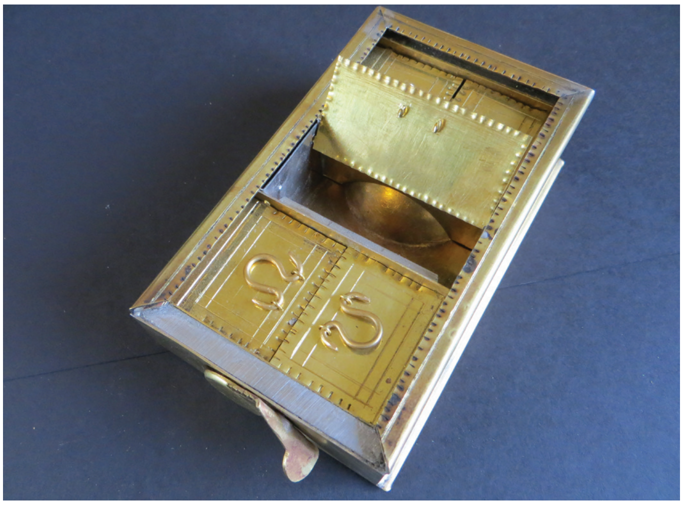


Fig. 7. Internal view of central compartment, showing a steel insert and a pin hinge.
Photo: © Nick Summerton.

corrosion plus the intriguing preservative and anti-microbial properties of brass, it is interesting to speculate as to whether there are any other possible reasons why this alloy was specifically selected for the medicine box.

In Roman Britain, brass was used mainly for decorative objects such as jewellery, and for ritual or religious objects of various sorts where the golden appearance of the metal was doubtless appreciated. Moreover the lids of several medical boxes were decorated with incised and inlaid work, sometimes with a direct medical association – such as the attributes or image of the healing god Aesculapius.

Interestingly, appearance also clearly mattered in the choice of the stone used for collyrium eye stamps – of the 202 stamps from Gaul, 57% were made of green stone. Baker (2011) suggests that some magical or religious significance might be associated with green eye stamps aside from their practical role in impressing marks onto collyria.

Both the golden colour of the box together with its ingenious design and craftsmanship might also have served to impress and reassure the patient about the quality of both the contents and the skills of the owner!

The box would have been opened by pressing the central springing button permitting the tongue-shaped swivel to rotate anti-clockwise (see Figs. 8 and 9). The bevelled brass lid could then be retracted revealing five lidded brass compartments containing a range of embossed collyria.

It is suggested (Jackson, 1996) that the peripatetic eye healer might then have selected and removed a collyrium from inside the box and cut off a small piece. The residue would then have been put back into the relevant compartment and the box secured again with the sliding lid. After crushing the collyrium fragment on a stone palate (similar to the one found in the excavation at Lyon) using a brass probe, the resulting powder would have been mixed with water, egg or milk as appropriate in the cup-shaped depression on the underside of the box, in order to produce a paste for application to the eye.

It has always been assumed that the eye paste would have been placed into the eye using a metal probe (such as those found in the grave at Lyon). This suggestion has always concerned me as a doctor because it risks further injury to the eye and, moreover, many recipes mention the use of a brush. The collyrium stamp from Cambridge, for example, is inscribed on one face:

> L. IVL. SALVTARIS PE/NICILLUM AD LIPPITUD
>
> '*the collyrium of Lucius Julius Salutaris, to be applied with a fine brush for lippitudo of the eyes*'

From our work in making a copy of the Lyon box it is also now clear that the manufacturing of the cup-shaped depression would have resulted in a further thinning of the brass – from 0.56mm down to 0.23mm. Consequently if, as traditionally suggested, a metal probe had been used to mix things within this well (as opposed to something more gentle such as a brush or a fine wooden stick) then it would not have taken long for a hole to appear!

Further reading

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Bayley, JC (1992) *Non-ferrous metalworking in England late Iron Age to early Medieval,* University of London, PhD Thesis.

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Jackson, R (1990) 'A new collyrium stamp from Cambridge and a corrected reading of the stamp from Caistor-by-Norwich', *Britannia* 21, pp275–283.

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Acknowledgements

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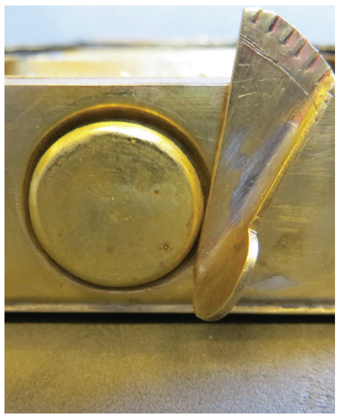

Left: Fig. 8. The locking mechanism on the British Museum box.
Right: Fig. 9. The locking mechanism on the reconstruction.
Photos: © Nick Summerton.