AUTOPSY TECHNIQUES IN THE OROFACIAL AREA AND MACERATION USING ENZYRIM

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ABSTRACT

The current methods of maceration are imperfect and the chemicals involved are toxic, offensive smelling, difficult to clean up and difficult to dispose of. The use of enzymes for maceration accelerates the catalytic process markedly and the method is cheap, easy to handle, non-toxic, practical and totally biodegradable. **(J. Forensic Odontostomatol 2000; 18:19-21)**

Key words: Enzyme maceration, forensic odontology, oral autopsy techniques

INTRODUCTION

The post-mortem examination is like any dental examination where teeth and oral cavity are to be investigated. If *rigor mortis* has already set in however, it will be made more difficult, particularly if the corpses are burnt or drowned, in fact the cases which most need oral autopsy as identification will depend heavily on dental data.

A dentist's emergency bag for dental identification should include magnifying glass, mirror, wedges to keep the mouth open, dividers, toothbrushes and extraction forceps for the various groups of teeth. All forensic institutes on the other hand must be equipped with the full range of sophisticated instruments for dental autopsies: bone saw, chisel, anatomical and surgical forceps, thread holder, stitching material, scissors, scalpel, curved and straight clips, gauze swabs for cleaning the teeth, strong autopsy gloves, plastic bags, photographic equipment and tape recorders.

If the investigation of the jaws has to be done *in situ*, the mouth will have to be forced open, but the best results, particularly in mass disasters are achieved if the jaws can be removed. This is strongly recommended so that forensic reports can be verified repeatedly at any time, and additional X-rays performed for comparison with an existing database of missing persons.

There can be problems with jaw removal if relatives raise an objection or want to see the body and in such cases the dentist has to have the permission of a forensic pathologist or public prosecutor to perform an oral autopsy and jaw removal.

Autopsy techniques

Depending on the merits of individual cases, the investigator can decide to cut only the cheek structure to reach the intraoral area, or they can decide to remove the jaws. The latter technique allows for more reliable examination and data collection and of course makes photography and radiography much easier.

In order to remove the jaws the muscles of mastication have to be severed and the lower jaw disarticulated. The forensic literature is well provided with advice about removing the upper jaw, sawing it horizontally, parallel to the occlusal plane but this may damage the root apices of the maxillary teeth. A better and easier way is to separate the nasal septum and the lateral sinus walls with a knife (the so called le Fort I - osteotomy) so that the maxilla separates intact. When both jaws are free they are placed in a fixing solution of formaldehyde.

Maceration using Enzyrim

The current methods of maceration using potash lye and antiformin are in some respects problematic i.e. offensive smelling, toxic, difficult disposal etc. and afterwards the preparations have to be stored in a solution of sodium hypochlorite (5%) (a bleaching agent) for several hours.

Maceration with enzymes on the other hand involves the use of catalytic reactions which are accelerated extremely rapidly, often a million to a billion times faster than the speed of a reaction without a catalyst. The enzymes themselves remain unchanged during the reaction.

The main factors necessary for an enzyme-controlled reaction are:

1. Temperature of the solution to be 55 to 60°C (130 to 150°F). Enzymes only work in the temperature range between 20 and 60°C (70 to 150°F).
2. pH-value approximately 8.5. Most enzymes operate with best results in a limited pH-range as under extreme circumstances they change their structure and lose all catalytic ability. A suitable buffer is sodiumcarbonate and the pH is measured with pH-indicators or litmus paper.

Traditional maceration method	Enzyme maceration
Potash lye	Enzyrim OSA
Antiformin	Enzyrim OSS
Putrefaction	Fluid or granular
Toxic	Non-toxic
Offensive smell	No smell
Formation of soap of potash lye-cretaceous	No destruction of bone
Difficult disposal	Simple disposal (totally biodegradable)
Problems of application	Easy to handle
Concomitant maceration of bone	Without destruction of bones
Time-consuming preparation (dissection)	No time-consuming preparation (rough dissection only)

Table 1: *A comparison of the traditional maceration method and Enzyrim OSA-OSS.*

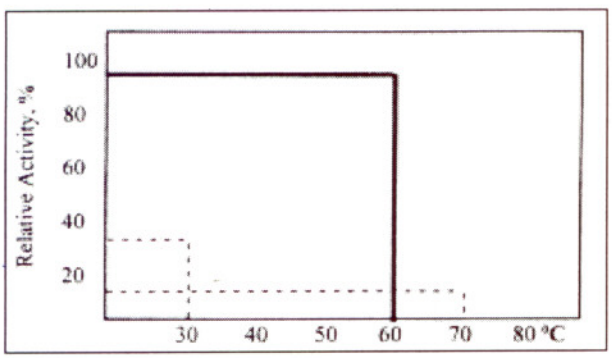

Fig.1a: *Activity of ENZYRIM-OSS at different temperatures.*

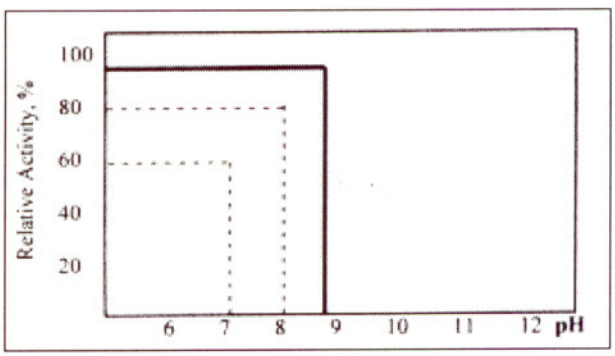

Fig.1b: *Activity of ENZYRIM-OSS at different pH-values*

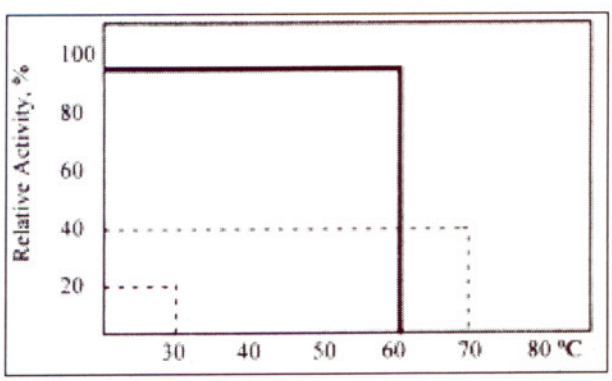

Fig.1c: *Activity of ENZYRIM-OSA at different temperatures.*

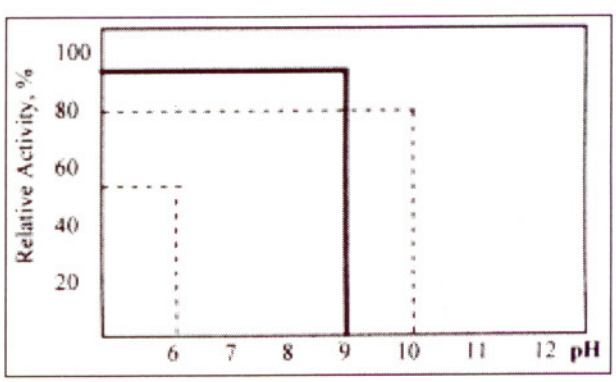

Fig.1d: *Activity of ENZYRIM-OSA at different pH-values.*

Fig.2: Lower jaw bone after dissection

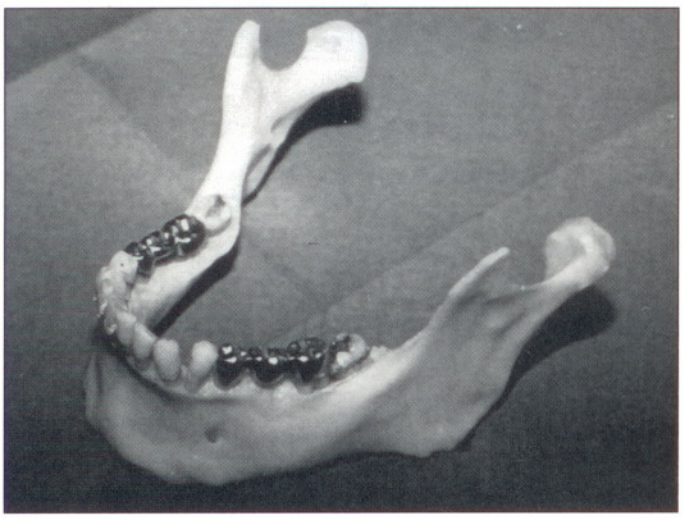

Fig.3: Lower jaw bone after maceration with Enzyrim.

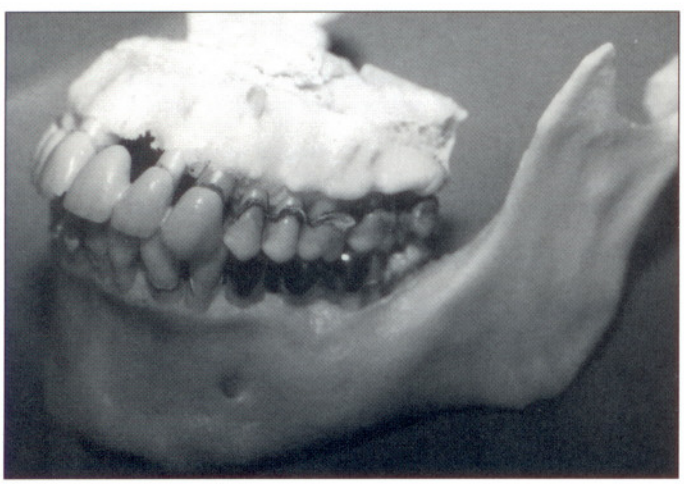

Fig.3: Both jaws after maceration with Enzyrim

A recommended solution for maceration

Two percent ENZYRIM* (granular or fluid), 1% concentrated detergent (to support the enzyme), 1 litre warm water (not demineralized) is a solution that can be used several times, but has to be kept at 60°C (150°F) otherwise it will decompose (Fig. 1a-d). The specimens shown in Figs. 2 and 3 were macerated with the ENZYRIM solution, which has already been in use generally for 6 years in the medical and biological field with excellent results.

Using the solution in an ultrasonic bath at a frequency of 35 kHz accelerates the maceration process to within 2 hours remembering that frozen or cooled material should be warmed before placing in the bath. Note that there is the possibility of teeth falling out of their sockets during maceration and a sieve should be used to catch them.

CONCLUSION

Compared with the traditional methods enzyme maceration has the following advantages:

- more cost-effective
- easy to handle
- biologically compatible
- reusable
- better results in a much shorter time without destroying the specimen and
- after only 2 hours the photographic documentation of the specimen and the specimen itself can be handed over to the dentist of the deceased person, the police or the media to allow the identification to proceed.

References may be found in the original publication.

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