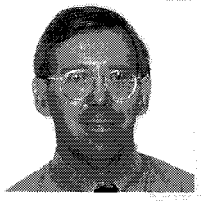
sciendo DOI: 10.2478/aoj-1992-0004





A NOVEL METHOD OF STERILIZING ORTHODONTIC INSTRUMENTS

AUTHORS
Jo-Ann Miller A.D.B.L.T., B.App.Sci.(CIAE)*
Keith M. Harrower B.Sc.(Hons) St.And., M.Sc.(Exon), Ph.D(Exon), M.A.S.M.#
Maurice J. Costello B.D.Sc.(Qld.), M.D.Sc.(Syd), F.R.A.C.D.S.**

A range of orthodontic instruments was artificially inoculated with a mixed culture of representatives of the oral microflora and a marker bacterium and subjected to dry heat sterilization using a glass bead sterilizer. The shortest time which would guarantee total sterilization of the functional parts of the instruments was thirty seconds.

Key Words
instrument,
sterilization,
dry heat.

*Technologist, University College of Central Queensland, Rockhampton.
#Lecturer in Microbiology, University of Central Queensland, Rockhampton.
**in private practice at 80 High Street, Rockhampton.

Introduction

For many years orthodontic instruments have been chemically or heat sterilized between use with different patients. A range of chemicals have been used including ethanol and small sterilizers or autoclaves suitable for the small private surgery have also been routinely used.

This paper describes a little known method of rapidly sterilizing instruments using dry heat in a 'glass bead sterilizer' (Fig. 1). Such units consist of a heating element in association with a steel bowl containing glass beads. In some models the temperature is set by the manufacturer to 250°C and in other models it is adjustable. The steel bowl is approximately 4 cm in diameter and about 7 cm deep and contains a loose mass of glass beads. The beads are 1-2 mm in diameter. A 'PULPDENT' model was used in this study.

The principle of the apparatus is simple. The beads and interstitial spaces are allowed to heat to the prescribed temperature and the instrument to be sterilized — or, more precisely, the functional part of the instrument — is inserted into the bead mass. Residual liquid on the surface of the instrument is rapidly heated to 250°C and the very nature of the bead matrix arrests sputtering thus avoiding generating aerosols of bacteria.

In order to dispel concern that such units were not effective a typical unit was submitted to a series of simple experiments involving members of the oral microflora and also a 'marker' bacterium — *Serratia marcescens*.

Materials and Methods

Four representative instruments were selected for this study. They were a:

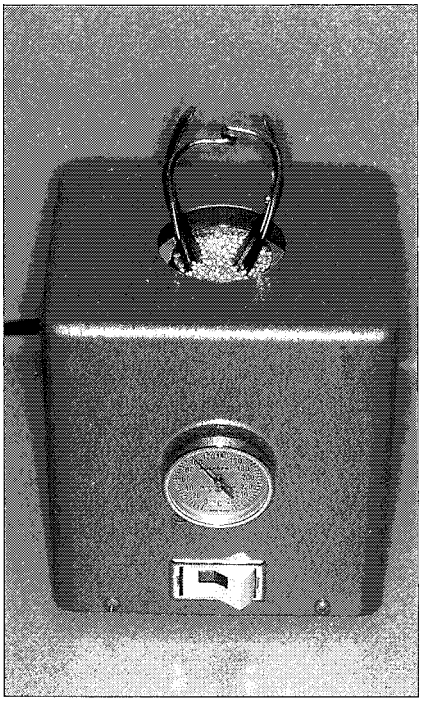


Fig. 1

(a) Matheiu needleholder (RMO),
(b) ligature cutter (RMO),
(c) distal arch cutter (ETM), and
(d) a bird beak plier (RMO).

Each instrument in turn was immersed in a broth derived from several mouth rinses using plain tapwater. This was topped up with distilled water in a beaker to a depth of 6cm. The handles of each instrument were not submerged in the broth and were used to open and close the jaws of the instruments several times. Excess liquid was allowed to drain from the surface of each instrument which was then subjected to the heat treatment as described above. The following time periods were used, in order: -0s (control), 10s, 20s, 30s, 1 min. 2 min. and 4 min. The instrument was then allowed to cool to room temperature and attempts were made to isolate viable

bacterial cells from the jaws and hinge area of each instrument. The process was repeated twice for each of two different methods of isolation.

Firstly, the treated end of the instrument was soaked in a solution of glucose broth with bromocresol purple pH indicator. The instrument was then agitated to loosen viable cells from its surface. Each instrument was treated twice at each treatment time and the vials were then incubated at 25° for 48h. At the end of the incubation period vials which had received viable inoculum contained a cloudy bacterial suspension and the colour of the broth had changed from red/purple to yellow. Vials which were still sterile were red/purple.

One set of vials constituted the controls. They were shaken with an untreated instrument which had been dipped in the inoculum.

Secondly, after the end of the treatment process the jaw areas of each instrument were rolled in soft Nutrient Agar in a Petri plate. Where the agar had been breached clear outlines of the jaws and part of the hinge areas could be seen. All plates were incubated inverted at 25°C for 48h. A negative result, i.e. non-sterilization of the instrument was taken as the presence of one or more colonies of bacteria around the impression zone in the plates. These zones were checked using incident and transmitted light using a Wild stereomicroscope at ×150 magnification.

All of the above trials were repeated using an axenic culture of *Serratia mascescens* as the source of inoculum and peptone gylcerol agar (PGA). This bacterium, when grown on PGA produces intense red pigmented colonies due to an abundant production of the pigment prodigiosin. Such colonies, even when very small, could readily be seen under the stereomicroscope whereas the hyaline colonies of some members of the oral microflora were sometimes hard to see.

Results

Presence of viable bacteria after heat treatment on all instruments tested.

Duration of treatment	Oral microflora	*Serratia marcescens*
nil	× ×	× ×
10s	× ×	× ×
20s	× -	- -
30s	- -	- -
1 min	- -	- -
2 min	- -	- -
4 min	- -	- -

(× = viable colonies isolated; - = sterile)

Discussion

The chemical sterilization of dental instruments is a comon practice with a range of chemicals being used. *Aqueous benzalkonium chloride* is widely used but it has severe limitations in penetrating organic debris, is easily inactivated and lacks tuberculocidal and broad virucidal activity. Other agents sugh as gluteraldehyde and hypochlorite solutions also have disadvantages although they are still commonly used. Alcohols are generally much more reliable but still must be replenished regularly to maintain an effective concentration.

Instruments are readily sterilized by autoclaving or by dry heat in an oven. The method reported here is essentially a small compact 'oven' which will effectively sterilize the surfaces of instruments in a short time. Since it is not necessary to heat all of the instrument to the required temperature a period as short as 30 seconds effectively sterilizes the functional parts of instruments. A period of one minute would give extra assurance of sterility and, in trial, did not heat the handles of the instruments sufficiently to cause discomfort.

General References

CRAWFORD J.J. (1983)
Sterilization, Disinfection, and Asepsis in Dentistry. in, 'Disinfection Sterilization and Preservation', ed. BLOCK S.S., Lea and Febiger, Philadelphia.

Received for publication, June 1992.