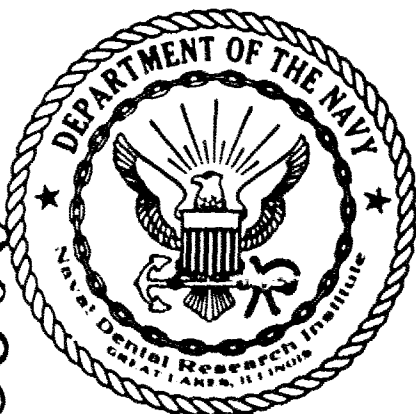


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INTRODUCTION

A survey of the level of biological contamination in the dental operating room was conducted at the Naval Training Center, Great Lakes, Illinois. Contamination was measured by the growth of organisms on the instruments in trypticase soy agar incubated aerobically for 72 hours at 37°C. This method of recording biological contamination is offered as a means of monitoring the effectiveness and the preservation of sterilization of an operating room.

METHOD

Ten of each of a group of selected instruments routinely used in the treatment of patients were sterilized by means of an autoclave, dry heat, or ethylene oxide gas. Five of each of these instruments would serve as sterilized controls. The other five of each of the instruments would be exchanged for instruments ready to be used on a patient. These instruments included the mouth mirror, number 23 explorer, hot and cold air-syringe tips, water-syringe tip, handpiece, and the instrument tray containing instruments within the dental cabinet.

After sterilization, five of each of the selected instruments were exchanged for clinically exposed instruments, that is, for instruments that were considered sterilized and intended for use in treatment. They were on the unit, on the bracket table, or in the dental cabinet.

The dental operating rooms from which instruments would be exchanged were selected at random. The sterilization in the dental operating rooms was the responsibility of the doctors who had graduated from several different dental schools. The operating room was sampled only if it was about to receive a patient. After the room was entered, a sterilized pair of surgical gloves was put on to remove the exposed items. When a tray was removed from the dental cabinet, the drawer was opened by an assistant, so that the tray could be picked up using



Figure 1

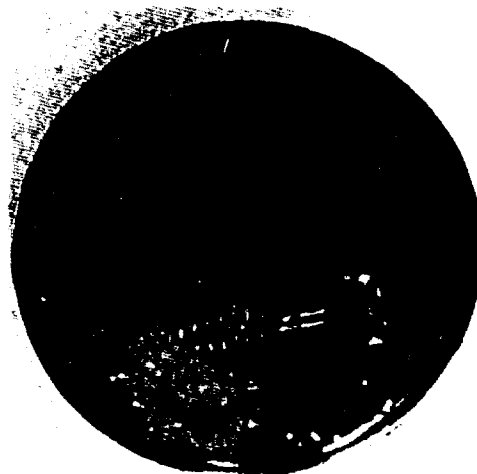


Figure 2

sterile gloves. Each of the items from the bracket table, dental unit, and cabinet were placed in sterile petri dishes or Kolle flasks.

Several methods for bacterial contamination evaluation were available from the literature¹⁻⁵. The direct plating of instruments in a sterile petri dish or Kolle flask was selected as the method of choice. Trypticase soy agar was poured over the exposed instrument, and over the control and exposed cabinet trays. The agar was allowed to harden and incubated aerobically at 37°C for 72 hours. The cultures were inspected and some were photographed.

RESULTS

After 72 hours the instruments were examined for evidence of contamination. Instruments that developed no biological growth were considered sterile and those that developed one or more colonies were considered contaminated.

The exposed instruments showed levels of biological contamination varying from slight contamination, figures 1 and 2, to gross contamination, figure 3. The sterilized controls were negative in the vast majority of cases, figure 4. The contaminated controls had only one or two colonies. A comparison of an exposed instrument tray from the dental cabinet and that of a control instrument tray is shown by figure 5. The contamination of the exposed instruments was compared to the sterilized wrapped instruments. Table 1.

Eighty percent of the instruments planned for use in treatment developed biological growth when cultured in trypticase soy agar. Ten percent of the control instruments were also contaminated. Some of the non-sterile instruments that came from the dental operation rooms had less than ten colonies, however, most had colonies too numerous to count. Two of the non-sterile instruments that served as controls had one colony each. Two of the handpieces that

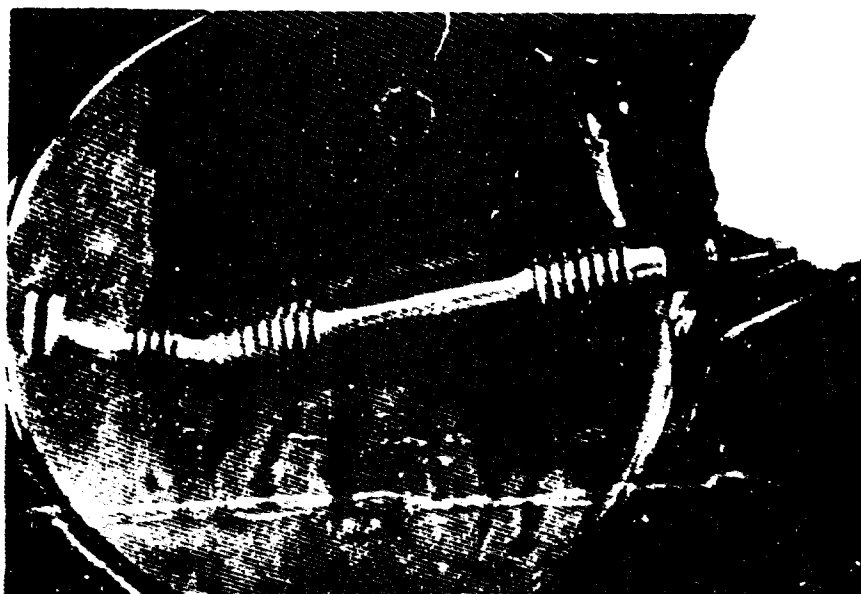


Figure 3. Exposed handpiece incubated in trypticase soy agar at 37°C for 72 hours.

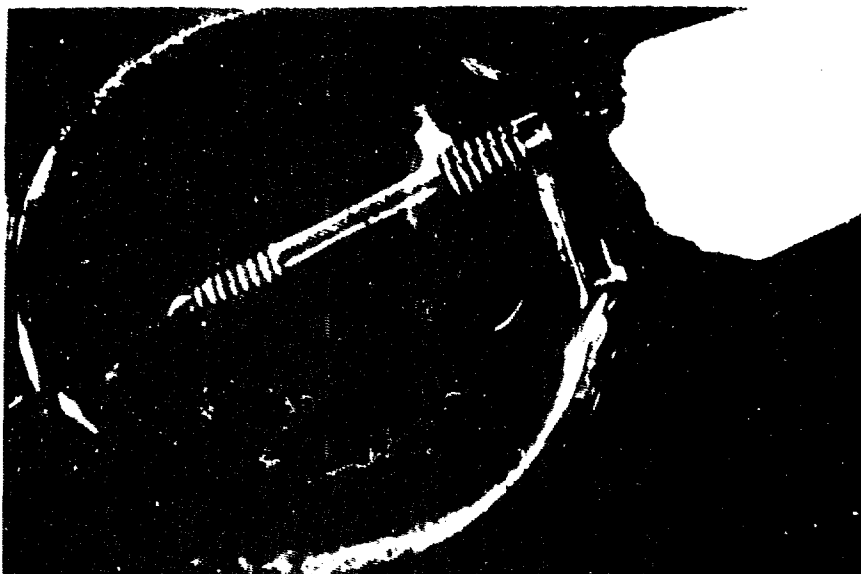


Figure 4. Sterilized control handpiece incubated in trypticase soy agar at 37°C for 72 hours.

served as controls developed a small dark brown area from the chuck opening which could not be conclusively identified as biological growth, chemical effect, or corrosion. These handpieces, however, were considered non-sterile.

DISCUSSION

Sterilization of operating room instruments and equipment should be essential in the treatment of dental patients. The recommended methods of sterilization are the steam autoclave, the dry heat oven, and moistened heated gas, such as ethylene oxide. The methods of sterilization used in the operation room must be tested from time to time by an effective means. One method of testing

the effectiveness of sterilization is by the direct plating of the instruments into a suitable culture medium to see if any biological growth develops.

The management of instruments for sterilization, storage, and delivery to the treatment area is extremely important. The instruments should be wrapped in cloth, paper, or plastic for steam autoclaving, or placed in containers for the dry heat oven. When instruments are stored in the dental cabinets they should remain covered. When one instrument is picked up the adjacent instruments on the tray can become contaminated. If sterilized unwrapped instruments are then placed in this contaminated tray they become contaminated. This is

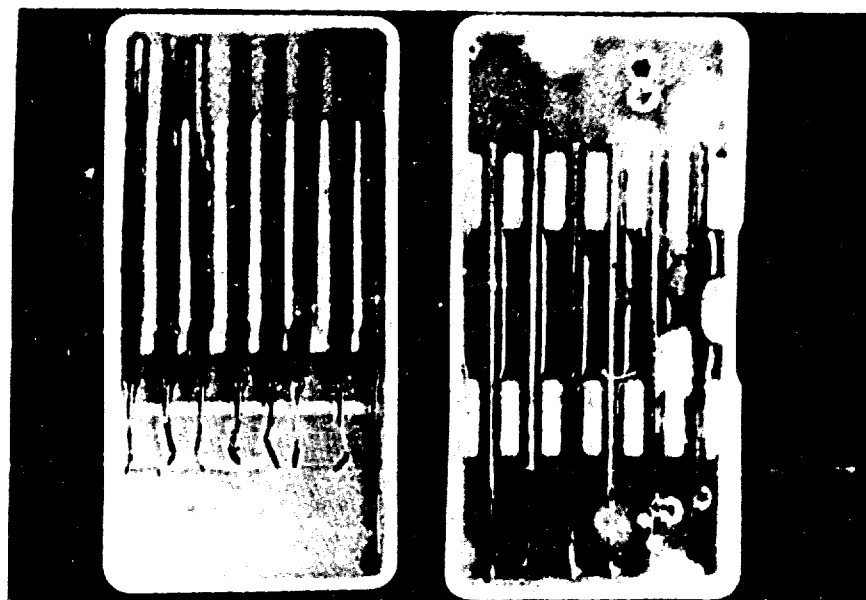


Figure 5. The exposed tray (left) was removed from a dental cabinet. The micro-organism-free tray (right) was sterilized and stored wrapped.

Table 1
A Comparison of Exposed Instruments to
Sterilized Wrapped Instruments

Exposed			Sterilized-Wrapped		
Instrument	Sterile	Contaminated	Instrument	Sterile	Contaminated
Mouth Mirror	4	1	Mouth Mirror	5	0
Explorer	3	2	Explorer	5	0
Air Syringe	0	5	Air Syringe	5	0
Water Syringe	0	5	Water Syringe	5	0
Handpiece	0	5	Handpiece	4	2*
Cabinet Tray	1	14	Cabinet Tray	13	2**
TOTAL	8	12		16	2

* colonies appeared in 72 hours at chuck opening

** One colony on these controls

cross-contamination by means of the storage tray in the cabinet.

To minimize contamination the dental operator is prepared for the treatment of a patient just at the time the patient presents himself for treatment. The dental unit, patient, and operative area are prepared using disposable items, dry-claved packs, autoclaved packs and other sterilized instruments. The follow-up instrument packs for specific operations such as amalgam or silicate restorations are introduced to the operative area as programmed.

The equipment, instruments and other items used for treatment should be cleaned after use and reassembled into the original pack set-up. Missing or damaged items are replaced and cutting instruments are sharpened. It is recommended that the dental unit be stripped of all removable sterilizable equipment, including the handpiece, syringe tips, and evacuator tips. These should be properly sterilized by one of the

approved methods. Some handpieces can be autoclaved, others can be dry-claved. If time is available for ethylene oxide gas, this can be used.

Handpieces should at least be washed with surgical soap, wiped with alcohol, wrapped in moistened zephiran four-by-four inch gauze, and stored in a covered dish. Disposable items are discarded.

All items of supply and equipment are grouped according to their method of sterilization, disposability, and/or function. The autoclaveable groupings should be placed in cloth, paper, plastic envelopes or wrappers and over-wrapped with muslin or paper for sterilization and storage. The instruments to be sterilized by dry heat are placed in a covered metal dish or wrapped in aluminum foil. Items are wrapped or covered, sterilized and stored in this manner. The dental cabinet is used for storage of wrapped sterilized equipment, disposable items, and wrapped back-up items.

The instrument pack can be sterilized by dry heat at 375°F for one hour.

The wrapped instruments for autoclaving are placed in an office type autoclave or placed in a large autoclave as the need arises. The packs are autoclaved at 20 pounds pressure and 250°F for 15 minutes.

Dry-heat and autoclaved packs remain wrapped after sterilization for storage in the dental cabinet. The storage date should be recorded on the pack so that the items stored for more than one month can be resterilized. Back-up instruments are stored in paper envelopes at a convenient location for support in dental operations.

SUMMARY

A survey of the level of biological contamination in the dental operating room was measured by the growth of organisms on instruments in trypticase soy agar. Selected instruments routinely used in the treatment of patients were wrapped and sterilized. Half of the wrapped sterilized instruments were exchanged for clinically exposed instruments that were intended for use in the treatment of patients, and half of the wrapped sterilized instruments served as controls. The exposed and control instruments were placed in sterile dishes or flasks and cultured in trypticase soy agar for 72 hours at 37°C. Eighty percent of the instruments planned for use in the treatment of a patient were contaminated.

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APPENDIX C

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Sterilization
Dental Operator
Microbiological Sampling
Contamination