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White Paper Report

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Sterilization of Dental Handpieces in the Sterimaster

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His research focused on infection control, primarily in the development of testing procedures to provide validation of devices and chemicals designed to control the spread of infection agents. His efforts concentrated on the development of special methodologies that can measure microbial killing that occurs when performing a particular infection control procedure.

Executive Summary

In the Indiana University study, the SciCan SteriMaster (now known as the Statim 900J) steam autoclave was tested to determine if the kill of high levels of Geobacillus stearothermophilus (a bacteria most resistant to sterilization by steam) spores placed inside various dental handpieces is achieved when the instruments are processed in the SteriMaster (Statim 900J).

Results demonstrated that standard sterilization half-cycles in the SteriMaster (Statim 900J) steam autoclaves killed the high levels of Geobacillus stearothermophilus spores placed in the instruments tested.

The various instruments were inoculated at internal sites and processed using SteriMaster (Statim 900J) wrapped cycle.

Studies attempting to demonstrate the sterilization ability of sterilizers need to use challenging loads and test instruments inoculated with bacterial spores in protected sites. This helps ensure that when the sterilizers are used in healthcare and other facilities, sterilization will be achieved when manufacturer's directions are followed. Past studies from our laboratory have shown that dental high-speed handpieces inoculated internally (turbines and waterlines) with spores of Geobacillus stearothermophilus (ATCC 7953) in 10% blood provide a very major challenge to the heat-sterilization process.[1, 2] These studies showed that when the handpieces were inoculated on the internal turbine fins or in the waterlines, more sterilization failures occurred with turbine inoculations at lower temperatures or shorter hold times. Sterilization could be achieved with the higher temperatures and/or longer hold times. Thus inoculating the inside of dental/medical instruments with lumens or chambers presents a significant challenge to the sterilization process.

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Methods:

Dental handpeices were inoculated internally on their turbine fins and turbine chambers with at least one million spores of *Geobacillus stearothermophilus* in 10% sheep blood and 50 mg/mL of hydroxyapatite and then dried at room temperature overnight. The handpieces along with a *G. stearothermophilus* spore strip were packaged individually in paper/plastic peel pouches and placed into the sterilization chamber of the SteriMaster (900J) steam sterilizer.

After operating the wrapped cycle at one-half the normal cycle time (half-cycle), the end-cap and turbine of each handpiece were aseptically removed and submerged, along with the entire handpiece body, in Trypticase-soy broth. After incubation for 7 days at 56°C the cultures were analyzed for growth of any remaining live spores. Each test instrument was tested in triplicate in 3 runs for a total of 9 tests per instrument. Positive and negative controls were used, and the level of spores in the inoculum was confirmed to assure that at least one million spores were placed on each instrument tested.

Results:

No live spores were recovered from any of the individually wrapped tested instruments that were processed through the SteriMaster (Statim 900J) steam autoclave in the wrapped half-cycle.

Live spores were recovered from all the positive control instruments and no contaminants were detected from culturing the negative control instruments. Since each test and positive control instrument was inoculated with 10 microliters of the spores-blood suspension, it was confirmed that each instrument was challenged with at least one million spores.

Instruments Tested:

- KaVo 640A handpiece
- NSK Pana Air handpiece
- Midwest Tradition handpiece
- Star 430SWL handpiece

1. Miller, CH, Sheldrake, MA, and Neal K: Study limitations of heat sterilization of high-speed dental handpieces. *Proceedings*, Infection Control Symposium: Influence of Medical Devise Design, [FDA, EPA, CDC, AAMI, SB, HIMA] June 29-30 & July 1, 1992, Bethesda, MD. The Food and Drug Administration, Rockville, MD 1995, pp. 169-174.

2. Miller, CH, Riggen, S, Gaines, D. and Sheldrake, M: Sterilizing the inside of handpieces. J. Dent Res 1995; 74:153 (abst #1133).