

ABSTRACT

Objective: To compare the potential for reduction of infection by removal of protective biofilms or application of disinfectant, or their combination, using two commercial oral rinses, Decapinol® and Colgate Periogard®.

Methods: Model I consisted of the biofilm growth of *Candida albicans* on denture acrylic. Four groups of denture acrylic were evaluated, n=2. Model II involved infected bone marrow and fragments. Each Oral Rinse was applied by "swishing" 2X, for 30 seconds.

Results: 100% effectiveness of either Decapinol alone or Periogard alone, or Decapinol followed by Periogard, for removal/inactivation of all *Candida albicans* on all test surfaces at all titers and all incubation periods.

Conclusions: For thick biofilms of the infective yeast *Candida albicans*, growing on denture acrylic, Decapinol (Delmopinol)-induced collapse and release of the biofilm was sufficient to disinfect these materials without the use of an active toxic or anti-bacterial agent. Periogard (Chlorhexidine) similarly disinfected *Candida albicans* biofilms by chemical action, without removal of the film itself. Purulent infections of human bone could not be completely disinfected with either Decapinol or Periogard alone or in combination, although there was an apparent benefit to the prior treatment of the infective biofilm with Decapinol before adding the Periogard

OBJECTIVE

To compare the potential for reduction of infection by removal of protective biofilms or application of disinfectant, or their combination, using two commercial oral rinses, Decapinol® and Colgate Periogard®.

INTRODUCTION

Purulent wounds including pressure ulcers, resist prompt healing due to infectious biofilms. They require excessive use of both systemic and topical antibiotics, while biofilms resist bacterial breakdown. *Decapinol* has been recently approved by the FDA as a device. This non-chemical reaction allows the oral rinse to be FDA approved due limiting the biofilm by removing the slime layer, rather than chemically altering the components. The main mechanism of this rinse is to coagulate and weaken the protective alginate slimes of infective biofilms, so they physically detach from the surface with gentle rinsing.

MATERIALS and METHODS

Biofilms were grown with *Candida albicans* in addition to Brain Heart Infusion media on PMMA samples (Figure 1) and human bone marrow containing bone fragments (Figure 2), producing visible thick films having the same numbers of culturable microorganisms. Model I consisted of the biofilm growth on three different denture material acrylic discs. The materials were: Cad-cam (machine-milled), Diamond D and Lucitone (fabricated using technician method). Each model was divided into four treatment groups as follows: Control group, application of Decapinol only, application of PerioGard only, and the application of Decapinol followed by PerioGard (n=2).

Model I: The denture discs were sterilized using an autoclave, carefully transferred to sterile culture wells, then assigned randomly to the four treatment groups. The media was switched every three days to ensure a thick biofilm growth. After a 14 day period of growth, the samples were subjected to treatment applications. Each Oral Rinse was applied by artificially "swishing" 2X, for 30 seconds with a disposable pipette (Figure 3). Streak plates were prepared, then incubated for 24 hour period prior to the analysis of colonies.

Model II: The procedures for Model I remained constant for the human infected bone marrow and fragments EXCEPT for the sterilization procedure. The samples were NOT sterilized and no preservatives were used. The bone fragments and marrow were combined to create a composed, later divided uniformly among three 12 well tissue-culture treated polystyrene dishes.



Fig. 1: Denture acrylic samples composed of PMMA (poly(methyl methacrylate))



Fig. 2: Human marrow and fragments were excavated from the femur bone. The discolored component (green) consists of bone marrow, no preservatives used. To the right of that is bone fragments.

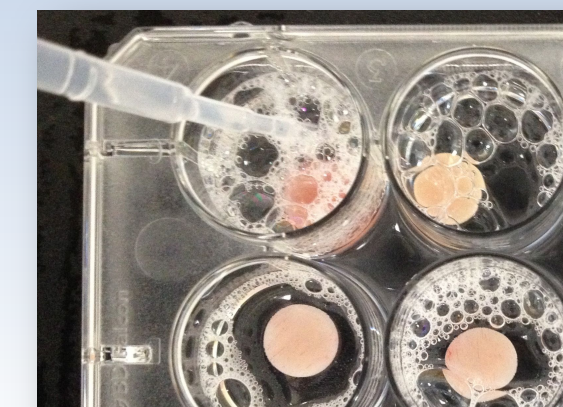


Fig. 3: Artificial "swishing"

RESULTS

In the preliminary testing on the biofilm grown on denture acrylic discs containing three different fabrication methods, qualitative results showed nearly complete visible removal/inactivation of all *C. albicans* on the discs using Decapinol alone, Periogard alone, or Decapinol followed by Periogard for removal. Illustrated in Figure 4, the three treatments show a less dense distribution as the treatment becomes more intense (using both treatments). Illustrated in Figure 5, samples from Model II illustrate a similar appearance allowing the lead to the qualitative results.

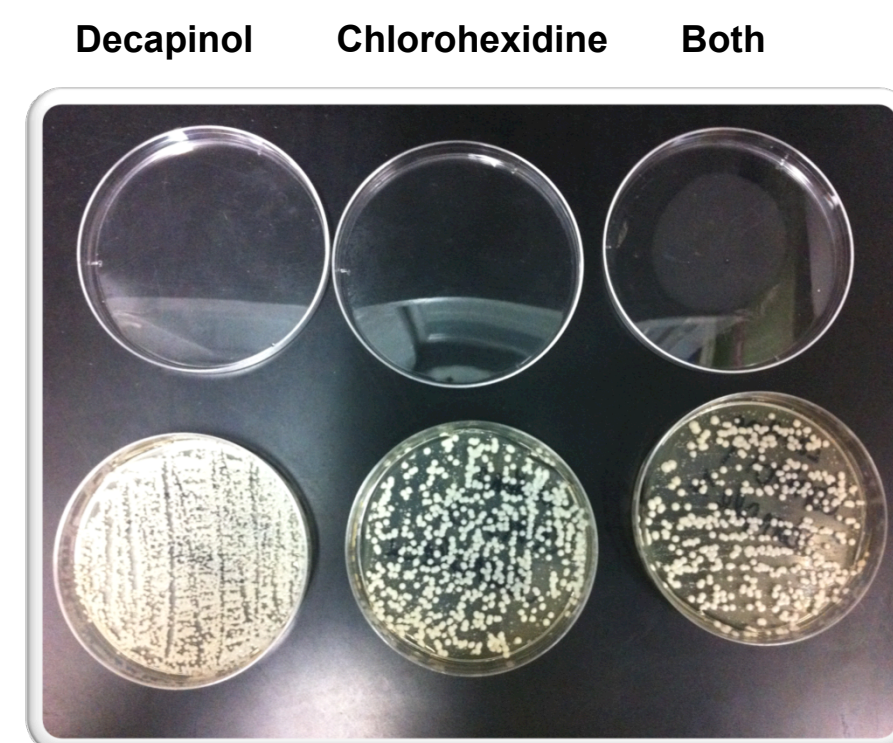


Fig. 4: Infected PMMA discs obtained from pilot study (Model I)

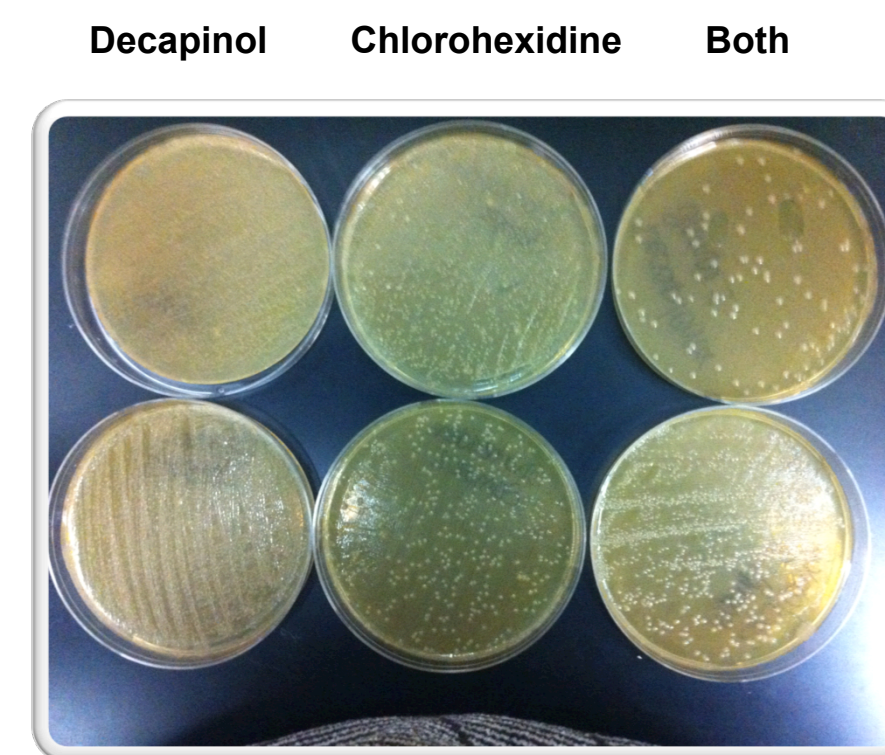


Fig. 5: Model II infected bone marrow and fragment results

Decapinol	Periogard
<p>Mechanism: Coagulates and weakens the protective alginate slimes of infective biofilms, so they physically detach from the surface with gentle rinsing.</p> <p>Active ingredients:</p> <ul style="list-style-type: none"> • 0.2% delmopinol • 1.5% alcohol 	<p>Mechanism: Acts as a broad spectrum anti-microbial oral rinse. It works by decreasing the amount of live bacteria in the mouth, helping to reduce swelling & redness of the gums & bleeding after brushing.</p> <p>Active ingredients:</p> <ul style="list-style-type: none"> • 0.12% chlorhexidine gluconate • 11.6% alcohol

CONCLUSIONS

For thick biofilms of the infective yeast *Candida albicans*, growing on denture acrylic, *Decapinol* (Delmopinol)- release of the biofilm was sufficient to disinfect these materials without the use of an anti-bacterial agent (Chlorhexidine). *Periogard* (Chlorhexidine) similarly disinfected *Candida albicans* biofilm on the denture acrylic.

Purulent infections of human bone could not be completely disinfected with either Decapinol or Periogard alone or in combination, although there was an apparent benefit to the prior treatment of the infective biofilm with Decapinol before adding the Periogard disinfectant.

REFERENCES

Colgate-Palmolive Company. *Colgate PerioGard Rinse*. <http://www.colgateprofessional.com/products/Colgate-Periogard-Rinse-Rx-only/details>

Katz, Sue. *The Streak Plate Protocol*. <http://www.microbelibrary.org/component/resource/laboratory-test/3160-the-streak-plate-protocol>

Sinclair is Pharma. *Decapinol*. <http://www.decapinol.com/>

ACKNOWLEDGEMENTS

The authors extend their gratitude to Dr. Thomas Mang and Peter Bush at UB SDM (Buffalo, NY) for the preparation and analysis of the biofilm growth.