



# Salvation of Endodontics: Anti-Biofilm Medicament Using Probiotics (Part 1 Discovery)

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## Objective:

- The concept of probiotics has not yet been evaluated in endodontics although it has proven successful in periodontal disease. (Figs. 3, 4, 5) The aim of this study was to evaluate the effectiveness of a probiotic cocktail against *E. faecalis* and *C. albicans* which are associated with apical periodontitis. (Figs. 1, 2)



Fig. 1

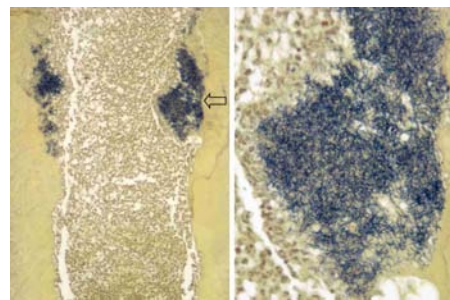


Fig. 2

## Methods:

- Five groups (G 1, 2, 3, 4, and 5) of commercial probiotics were selected and evaluated based upon numbers and concentration of organisms. Pathogenic test organisms were *C. albicans* (ATCC 10231) and *E. faecalis* (ATCC 47077) set to a 1 McFarland standard challenge.
- Testing was conducted by a disc diffusion assay to evaluate Zones of Inhibition (ZOI) in millimeters of the selected probiotics against the *E. faecalis* and *C. albicans*. Micro-organisms from probiotic samples were extracted and placed on sterile discs. A five probiotic disc template on a blood agar plate was inoculated with a lawn of either *E. faecalis* or *C. albicans* and incubated at 37 degrees for one week. Sterile disc templates with a lawn of *E. faecalis* and *C. albicans* were run parallel as a control. (Figs. 8, 9)

Probiotic Strains		
Lactobacillus species	Bifidobacterium species	Others
<i>L. acidophilus</i>	<i>B. bifidum (animalis)</i>	<i>Bacillus cereus</i>
<i>L. rhamnosus</i>	<i>B. longum</i>	<i>Clostridium butyricum</i>
<i>L. gasseri</i>	<i>B. breve</i>	<i>Escherichia coli</i>
<i>L. casei</i>	<i>B. infantis</i>	<i>Propionibacterium freudenreichii</i>
<i>L. reuteri</i>	<i>B. lactis</i>	<i>Saccharomyces boulardii</i>
<i>L. bulgaricus</i>	<i>B. adolescentis</i>	<i>Enterococcus faecalis</i>
<i>L. plantarum</i>		<i>Streptococcus thermophilus</i>
<i>L. johnsonii</i>		VSL#3 (4 strains of lactobacilli, 3 strains of bifidobacteria, and 1 strain on <i>Streptococcus salivarius</i> subsp. <i>thermophilus</i> )
<i>L. lactis</i>		

Fig. 3

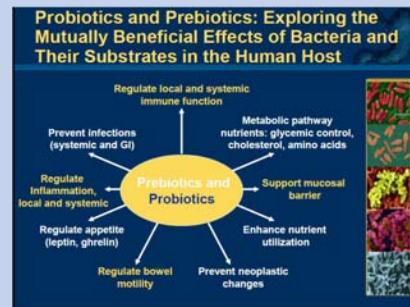


Fig. 4

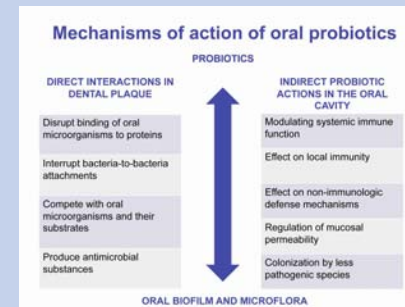


Fig. 5

## Results:

- Based on a One-Way ANOVA analysis, Group I, IV and V showed the most statistically significant results ( $P < 0.05$ ) with a Mean ZOI of 7.4mm, 10.05mm, 11.2mm for *C.a* and a Mean of 6.7mm, 11.1mm, and 12.5mm for *E.f* accordingly. *L. acidophilus*, *L. casei*, *L.rhamnosus* and *B. longum* were all common strains in the groups. (Figs. 6, 7, 10, 11)

## Probiotic Group 1, 2, 3, 4, 5

### Enterococcus faecalis



Fig. 6

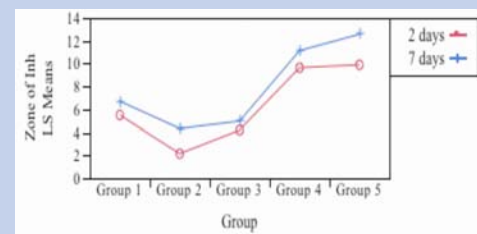


Fig. 7

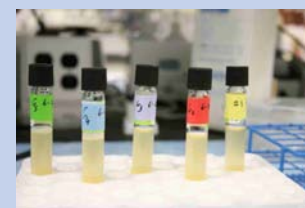


Fig. 8



Fig. 9

### CFUs (Colony Forming Units per Mil)

### Candida albicans

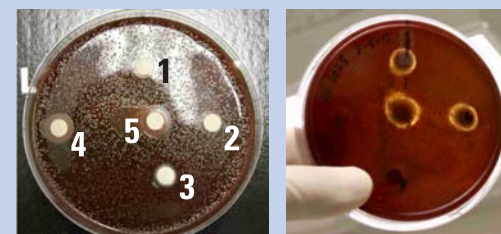


Fig. 10

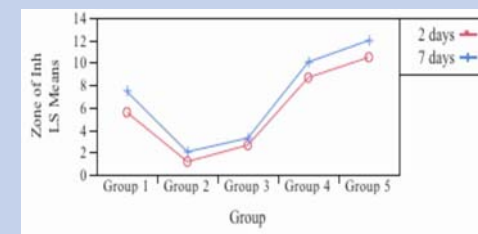
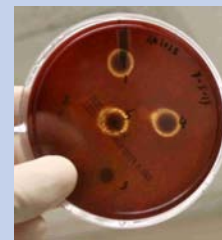


Fig. 11

## Conclusion:

- Recognizing probiotics act differently based on composition and concentration our study suggested that the above mentioned organisms are effective against *E. faecalis* and *C. albicans* and suggest further evaluation. (Fig. 12))

## Discussion:

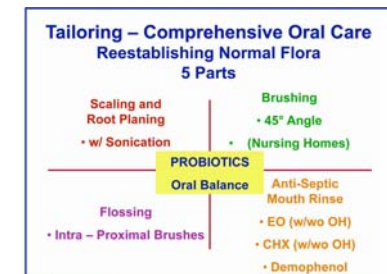


Fig. 12



Fig. 13—Pre-op



Fig. 14—1 year follow up

## References:

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