

# Comparison of the Clinical and Microbiological Effects of Four Mouth Rinses

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## Background

Gingivitis can lead to periodontitis, a condition in which gingival and bone tissues are destroyed<sup>1</sup>. Therefore, reducing the levels and proportions of bacteria in oral biofilms that produce metabolites that induce gingivitis is a positive step towards oral health. Since the removal of plaque by mechanical means, such as toothbrushing and flossing, may often be improperly performed, the use of antimicrobial mouth rinses may provide effective adjuncts for controlling oral biofilms<sup>2</sup>.

Both Listerine® and Peridex® have been shown to reduce dental plaque and gingivitis<sup>3,4</sup>. In addition, an herbal mouth rinse (The Natural Dentist Healthy Gums Daily Oral Rinse) has also been shown to reduce gingival bleeding and gingivitis<sup>5</sup> and inhibit the growth of selected oral bacteria *in vivo*<sup>6</sup> and *in vitro*<sup>7,8</sup>. This product contains naturally occurring anti-inflammatory agents such as aloe vera and calendula and antimicrobial agents such as goldenseal and grapefruit seed extract and may provide a natural alternative for oral care.

## Objective

To compare the *in vivo* efficacy of an herbal mouth rinse [The Natural Dentist Healthy Gums Daily Oral Rinse, formulations 1 (ND1, with bloodroot) and 2 (ND2, without bloodroot)], an essential oil mouth rinse (Listerine®), and a 0.12% chlorhexidine gluconate mouth rinse (Peridex®) on clinical parameters of gingivitis and periodontal diseases and the microbial composition of subgingival plaque.

## Methods

- Of the original 122 chronic periodontitis subjects recruited, 116 completed this longitudinal, randomized, double blind clinical trial; ND1 = 29; ND2 = 28; Listerine® = 28; Peridex® = 31.
- Subjects were > 20 years had at least 20 natural teeth and at least 4 teeth with PD > 4 mm and AL > 3 mm.
- Clinical Measures including Gingival Index (GI), Plaque Index (PI), Bleeding on Probing (BOP), Pocket Depth (PD) and Attachment Level (AL) were taken at 6 sites per tooth at baseline and 3 months.
- Subgingival plaque samples taken from the mesial aspect of 14 teeth (one upper and lower quadrant) at baseline and at 3 months were analyzed for their content of 18 bacterial species using checkerboard DNA-DNA hybridization.<sup>9</sup>
- After baseline monitoring, subjects were instructed to rinse for 1 min. twice daily for 3 months with their assigned mouth rinse.
- Significance of differences in clinical and microbiological parameters between baseline and 3 months was determined using the Wilcoxon signed ranks test and ANCOVA.
- There were no statistically significant differences among groups for any of the clinical parameters at baseline.

## Results

### Clinical Findings

- Mean Plaque Index ( $\pm$  SEM) was significantly reduced in ND1 ( $1.27 \pm 0.71$  to  $0.99 \pm 0.64$ ), ND2 ( $1.14 \pm 0.82$  to  $0.96 \pm 0.67$ ) and Peridex® groups ( $1.09 \pm 0.71$  to  $0.55 \pm 0.43$ ), while mean Gingival Index was significantly reduced in the Peridex® group ( $0.81 \pm 0.39$  to  $0.56 \pm 0.43$ ) (Fig. 1).
- After adjusting for baseline values using ANCOVA, there was a significant difference among groups for change in Plaque Index (Fig. 2).

Fig. 1. Mean ( $\pm$  SEM) clinical parameters at baseline and 3 months in the 4 groups

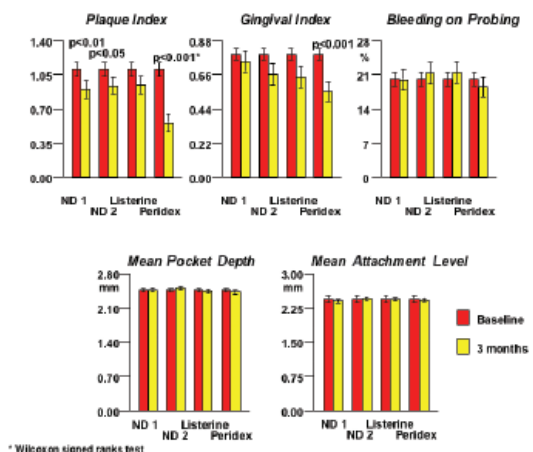
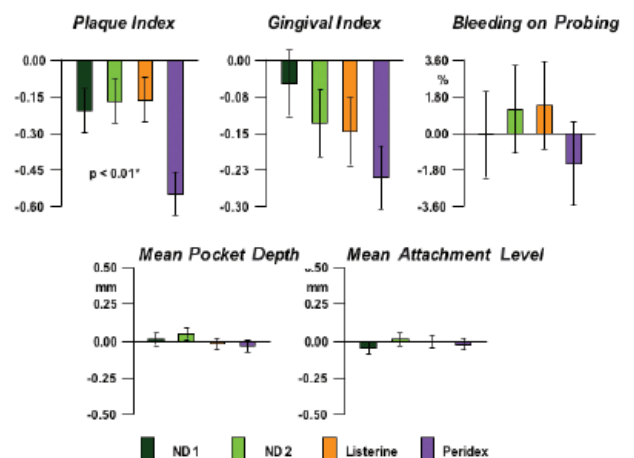
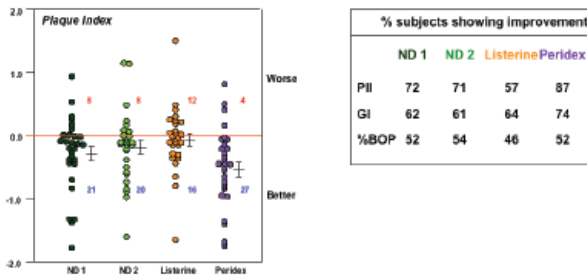


Fig. 2. Mean change in clinical parameters from baseline to 3 months

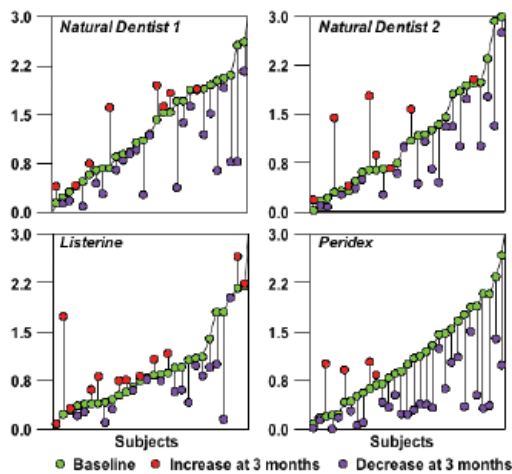


- PI showed the greatest improvement in all groups compared with other clinical parameters. 87% of subjects showed improvement in the Peridex® group (best response), compared with 57% of subjects in the Listerine® group (worst response) (Figs. 3 & 4). Percent improvements in the ND1 and ND2 were 72% and 71% respectively.

**Fig. 3. Mean change in PI from baseline to 3 months in each subject in each group**



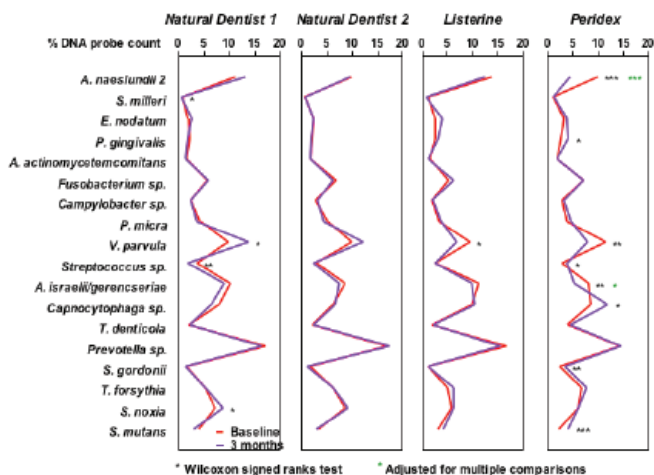
**Fig. 4. Mean PI at baseline and 3 months in each subject in the 4 groups**



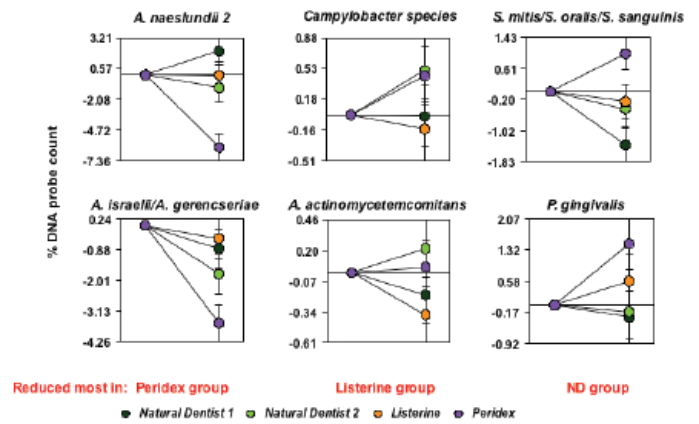
### Microbiological Findings

- After adjusting for multiple comparisons<sup>10</sup>, only the *Actinomyces* sp. showed significant reductions in the Peridex® group (Fig. 5).

**Fig. 5. Mean % DNA probe counts for 18 test taxa at baseline and 3 months in the 4 groups**



**Fig. 6. Mean change in selected species from baseline to 3 months in the 4 groups**



### Summary

- Mean Plaque Index was significantly reduced in both ND and Peridex® groups between baseline and 3 months. Percent of subjects showing improvement in the ND1, ND2, Listerine® and Peridex® groups were 72, 71, 57, 87% respectively.
- Mean Gingival Index was reduced in all groups, but significantly reduced only in the Peridex® group. Percent of subjects showing improvement in the ND1, ND2, Listerine® and Peridex® groups were 62, 61, 64 and 74% respectively.
- Change in the mean percent of sites with BOP was marginal in all groups.
- As expected, there were minimal changes in mean PD and AL.
- There were minimal changes in the proportions of the majority of test species, although *Actinomyces* sp. were significantly reduced in the Peridex® group and many of the streptococci were reduced in the ND groups.
- The 4 mouth rinses appeared to have different effects on the subgingival microbiota (Fig. 6).

### Conclusions

Peridex® provided the greatest overall benefit. The ND products showed comparable or better clinical and microbiological outcomes than Listerine® and could provide a natural alternative for oral care.

### Clinical Implications

Herbal antimicrobial mouth rinses may be effective adjuncts to brushing and flossing for patients with gingivitis providing a clinically significant benefit in the reduction of plaque.

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