

RESEARCH ARTICLE

Alternative Approaches to Antibiotics in Dentistry: Probiotics, Antimicrobial Peptides in Periodontal Disease

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ABSTRACT

Background: A common oral health issue, periodontal disease is characterized by inflammation and eventual tooth loss of the periodontal tissues and bone that surround and support each tooth. Probiotics and antimicrobial peptides have emerged as potential adjunctive therapies due to their ability to modulate the oral microbiota and combat pathogenic bacteria.

Materials and Methods: Patients with periodontitis were the subjects of a randomised controlled experiment. Two groups of participants were formed: one receiving probiotics and the other receiving antimicrobial peptides, in addition to standard periodontal treatment. Clinical parameters, such as clinical attachment level (CAL) and probing pocket depth (PPD), were measured before and after six months of therapy.

Results: Both probiotics and antimicrobial peptides demonstrated significant improvements in PPD and CAL compared to baseline values. In the probiotics group, mean PPD decreased from 5.6 ± 0.8 to 3.2 ± 0.6 mm, while CAL improved from 6.8 ± 1.2 to 4.5 ± 0.9 mm. Similarly, in the antimicrobial peptides group, mean PPD decreased from 5.8 ± 0.7 to 3.1 ± 0.5 mm, and CAL improved from 7.0 ± 1.0 to 4.4 ± 0.8 mm.

Conclusion: Both probiotics and antimicrobial peptides show promise as adjunctive therapies in the management of chronic periodontitis. Their use alongside standard periodontal treatment leads to significant improvements in clinical parameters, suggesting their potential efficacy in combating periodontal disease. Further research is warranted to explore their long-term effects and optimal dosage regimens.

Keywords: Periodontal disease, Probiotics, Antimicrobial peptides, Adjunctive therapy, Clinical parameters.

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INTRODUCTION

Periodontal disease, encompassing gingivitis and periodontitis, is a multifactorial inflammatory condition characterized by the destruction of periodontal tissues and, if left untreated, can lead to tooth loss.¹ The primary etiological factor is the accumulation of dental plaque biofilm, which triggers an immune response leading to tissue destruction.² Despite advances in conventional periodontal therapy, including scaling and root planing, adjunctive treatments are often necessary to address the complex microbial community associated with the disease.³

Probiotics and antimicrobial peptides have recently gained popularity as potential supplementary treatments for periodontal disease. When taken in sufficient doses, probiotics, which are living bacteria, may improve health.⁴ They work by changing the composition of the oral microbiota, which in turn encourages the expansion of good bacteria while stifling the development of periodontopathogens.⁵ Antimicrobial peptides, on the other hand, are small cationic peptides produced by various cells in the oral cavity, including epithelial cells and neutrophils, with potent antimicrobial properties.⁶ They

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function by disrupting bacterial cell membranes, leading to bacterial death.⁷

Several studies have investigated the efficacy of probiotics and antimicrobial peptides in improving clinical parameters of periodontal disease. While some studies have reported favorable outcomes, others have shown conflicting results.^{8,9} Therefore, additional study is necessary to clarify these supplementary treatments' possible advantages and disadvantages.

This study aims to find out if people with chronic periodontitis perform better when traditional periodontal treatment was supplemented with probiotics and antimicrobial peptides. Clinical variables such as probing pocket depth (PPD) and clinical attachment level (CAL) are examined to determine the impact of these supplemental therapies on periodontal health.

By elucidating the role of probiotics and antimicrobial peptides in the treatment of periodontal disease, this study aims to contribute to better periodontal health and halt the development of periodontal disease.

MATERIAL AND METHODS

This research aims to assess the effectiveness of probiotics and antimicrobial peptides as supplemental treatments for chronic periodontitis. As a randomized controlled experiment. About 100 patients with chronic periodontitis were enlisted. The participants were between the ages of 18 and 65, have a minimum of 20 natural teeth, and have four teeth with a probing pocket depth (PPD) of 5 mm or more in order to be included. The research did not include patients who had a history of antibiotic usage during the last three months, those who were pregnant or nursing, or those who had systemic disorders that impact periodontal health.

Interventions

Participants were randomly assigned to one of two groups:

Probiotics Group

Participants received a daily oral dose of probiotics containing *Lactobacillus reuteri* for a period of six months.

Antimicrobial Peptides Group

Participants received a daily oral rinse containing antimicrobial peptides for a period of six months.

Both groups received standard periodontal treatment, including scaling and root planing, at baseline and were instructed on proper oral hygiene practices. Baseline clinical data were recorded for each patient, including their CAL and

the depth of their PPD. The intervals between the first treatment session and the subsequent examination were three and six months, respectively. Periodontal probes were used to assess each participant's PPD and CAL six times per tooth and the average was taken.

The SPSS program (version 23) was used for statistical analysis. Baseline characteristics were the subjects of descriptive statistics. Paired t-tets were used to signify the changes of PPD and CAL in each group from baseline to six months. The categories were contrasted using separate t-tests. A *p-value* >0.05was considered statistically significant.

RESULT AND DISCUSSION

Individuals who took part in the study using either probiotics or antimicrobial peptides had similar baseline characteristics, as shown in Table 1. Regarding the age distribution and gender breakdown, there were no discernible variations between the two sets of data, smoking status, or baseline clinical parameters.

Changes in Clinical Parameters

In Table 2, probiotics and antimicrobial peptide groups' PPD and CAL changed between the baseline and six-month marks."

At six months, the groups treated with probiotics and those treated with antimicrobial peptides showed no statistically significant differences in the decrease of CAL and PPD (*p* >0.05). No significant adverse events related to the use of probiotics or antimicrobial peptides were reported during the study period.

DISCUSSION

The management of chronic periodontitis often necessitates adjunctive therapies to achieve optimal treatment outcomes. Probiotics and antimicrobial peptides have garnered attention for their potential role in combating periodontal pathogens and modulating the oral microbiota.^{1,2} For the purpose of managing chronic periodontitis, this research assessed the effectiveness of antimicrobial peptides and probiotics (especially, *L. reuteri*) when used as adjuvant therapy with conventional periodontal treatment.

Our research shows that clinical parameters including PPD and CAL showed substantial changes after six months of therapy with probiotics and antimicrobial peptides. The observation of decreased PPD and CAL in both groups suggests that these supplemental medications may have a positive effect on periodontal health. Previous research has shown

Table 1: Baseline characteristics

Baseline characteristics	Probiotics group (n = 50)	Antimicrobial peptides group (n = 50)
Age (years), Mean ± SD	45.6 ± 6.8	44.9 ± 7.2
Gender (Male/Female), n (%)	28 (56%)/22 (44%)	30 (60%)/20 (40%)
Smoking Status, n (%)	15 (30%)	18 (36%)
PPD (mm), Mean ± SD	5.7 ± 0.9	5.9 ± 1.1
CAL (mm), Mean ± SD	7.1 ± 1.0	7.2 ± 1.2"

Table 2: Comparison between groups

Clinical parameters	Baseline (Mean ± SD)	6 Months (Mean ± SD)	Change (Mean ± SD)
Probiotics group			
PPD (mm)	5.7 ± 0.9	3.2 ± 0.6	-2.5 ± 0.7
CAL (mm)	7.1 ± 1.0	4.5 ± 0.9	-2.6 ± 0.8
Antimicrobial peptides group			
PPD (mm)	5.9 ± 1.1	3.1 ± 0.5	-2.8 ± 0.6
CAL (mm)	7.2 ± 1.2	4.4 ± 0.8	-2.8 ± 0.7

that probiotics and antimicrobial peptides may be helpful in managing periodontal disease, and our findings are in line with that.^{3,4}

The mechanism of action underlying the efficacy of probiotics in periodontal disease management involves their ability to modulate the oral microbiota by promoting the growth of beneficial bacteria and inhibiting the growth of periodontopathogens.⁵ *L. reuteri*, in particular, has been shown to produce antimicrobial substances such as reuterin, hydrogen peroxide, and bacteriocins, which exert inhibitory effects on periodontal pathogens.⁶ Similarly, antimicrobial peptides possess broad-spectrum antimicrobial activity against a wide range of periodontal pathogens, thereby reducing inflammation and tissue destruction.⁷

There are a number of caveats to be aware of, even if the research did find some encouraging outcomes. First, the research only lasted six months, and the sample size was small. This study's results should be further supported by larger-scale randomized controlled studies that assess the long-term effectiveness of antimicrobial peptides and probiotics in the treatment of periodontal disease. Additional research is necessary to determine the optimal formulations and doses of the probiotic and antimicrobial peptide strains used in this study, since their effectiveness may differ.

CONCLUSION

In conclusion, our study suggests that probiotics and antimicrobial peptides are promising adjunctive therapies in managing chronic periodontitis. By modulating the oral microbiota and exerting antimicrobial effects, these agents contribute to the improvement of clinical parameters and periodontal health. Future research should focus on elucidating the mechanisms of action, optimizing treatment regimens, and exploring the long-term effects of probiotics and antimicrobial peptides in periodontal disease management.

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