

Acquaintance and Safety Perception of Probiotics in Opposition to Oral Malady-An Overview

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Abstract: In recent years, probiotics have been used to promote oral health. The Time has come to shift the paradigm of treatment from elimination of specific bacteria to altering bacterial ecology by using probiotics. Probiotics are dietary supplements which contain potentially beneficial bacteria or yeasts. They help in stimulating health promoting flora and also suppressing pathogens which cause and spread diseases. The Probiotic approach has shown promising results in the oral health with respect to control of chronic disease such as dental caries, periodontitis, and recurring problems like candidal infections and halitosis. The aim of this review is to understand the mechanism of action of probiotic bacteria in the oral cavity and summarize observed effects of probiotics as well as their varied applications in the field of dentistry.

Keywords: probiotics, oral malady, acquaintance, perception, oral health

1. Introduction

The role of diet in well-being and overall health is universally acknowledged. With the evolution of the science of nutrition, research is now directed towards improving the understanding of specific physiologic effects of the diet beyond its nutritional effect^[1]. In this aspect, probiotics are the subject of intense and widespread research in food and nutritional science. The term probiotic, is derived from the Greek language, meaning "for life". It was first used by Lilly and Stillwell in 1965 and described probiotics as "substances secreted by one microorganism which stimulates the growth of another" and thus was contrasted with the term Antibiotic^[2]. Probiotics can be defined as living microbes, or as food ingredients containing living microbes, that beneficially influence the health of the host when used in adequate numbers. As adopted by the International Scientific Association for probiotics and prebiotics, "Living microorganisms, which when administered in adequate amounts, confer beneficial effect on the health of the host."

2. Probiotics Products

Probiotics are provided in products in four basic ways:

- As a culture concentrate added to a beverage or food (such as fruit juice).
- Inoculated into prebiotic fibers.
- Inoculants in a milk-based food (dairy products such as milk, milk drink, yogurt).
- As dietary supplements in concentrated and dried cells packaged (non-dairy products).

3. Properties of Probiotics

Should be non-toxic and non-pathogenic preparation

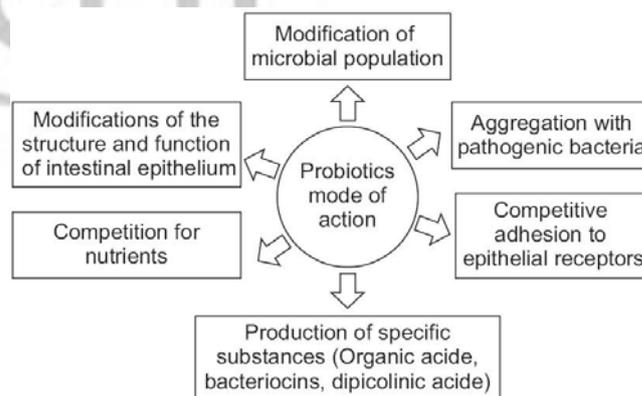
- Should produce beneficial effect
- Should withstand gastrointestinal juice

- Should have a good shelf life
- Should reinstate and replace the intestinal microflora

4. Microorganisms Used as Probiotics^[7-8]

Lactic acid producing bacteria	Non-lactic acid producing bacteria	Bifidobacterium species
<i>L. acidophilus</i>	<i>Bacillus cereus</i>	<i>B. adolescentis</i>
<i>L. bulgaricus</i>	<i>Propionibacterium</i>	<i>B. animalis</i>
<i>L. casei</i>	<i>Enterococcus faecalis</i>	<i>B. bifidum</i>
<i>L. crispatus</i>	<i>Enterococcus faecium</i>	<i>B. breve</i>
<i>L. crispatus</i>	<i>Escherichia coli Nissle</i>	<i>B. infantis</i>
<i>L. reuteri</i>	<i>Escherichia coli Nissle</i>	<i>B. lactis</i>

5. Probiotic –Mode of Action



6. Mechanism of Probiotic Action on Oral Health

The general mechanisms of action of probiotics can be divided into three categories:

- Modulation of immune response
- Normalization of intestinal microbiota
- Metabolic effects^[3]

First, several probiotics alter the ability of pathogens to adhere to or invade colonic epithelial cells in vitro. Second, probiotics could sequester essential nutrients from invading pathogens and impair their colonization ability. Third, probiotics may inhibit the expression of virulence functions by altering the gene expression program of pathogens. Lastly, probiotics may create an unfavourable environment for pathogen colonization by altering the mucus layer, pH and other factors in the local surroundings.

7. Role of Probiotics in Dental Caries

Dental caries is an infectious disease affecting most of the population. This multifactorial and complex disease process occurs along the interface between the enamel surface and dental biofilm. Several methods may be used to alter the cariogenicity of the biofilms responsible for dental caries. Researchers are developing “probiotic” methods to treat the caries causing infection. Probiotic mechanisms are employed to selectively remove only the harmful pathogen while leaving the remainder of the oral ecosystem intact^[5]. One of the replacement therapy options entails the application of a genetically engineered “effector strain” of *S. mutans* that will replace the cariogenic or “wild strain” to prevent or arrest caries and to promote optimal remineralization of tooth surfaces that have been demineralized but that have not become cavitated. *S. mutans* strain BCS3-L1 is a genetically modified effector strain designed for use in replacement therapy to prevent dental caries. Recombinant DNA technology was used to delete the gene encoding lactate dehydrogenase in BCS3-L1 making it unable to produce lactic acid. This effector strain was also designed to produce elevated amounts of a novel peptide antibiotic called mutacin 1140 that gives it a strong selective advantage over most other strains of *S. mutans*^[6].

8. Probiotics in Periodontal Disease

Periodontal disease is characterized by the presence of gingival inflammation, periodontal pocket formation, and loss of connective tissue attachment and alveolar bone around the affected teeth. The current concept concerning the etiology of periodontitis considers 3 groups of factors that determine whether active periodontitis will occur in a subject: a susceptible host, the presence of pathogenic species and the absence of so called “beneficial bacteria”. Taking into account the two major treatment strategies for periodontal disease viz, elimination of specific pathogens and suppression of destructive host response, the probiotic approach may add some value in achieving these treatment goals.

9. Guided Pocket Recolonization (GPR)

Recently, Teughels et al reported that the subgingival application of a bacterial mixture including *Streptococcus sanguinis*, *Streptococcus salivarius* (*S. salivarius*), and *Streptococcus mitis* after scaling and root planing significantly suppressed the re-colonization of *Porphyromonas gulae* (canine *P. gingivalis*) and *P. intermedia* in a beagle dog model. Animal study performed to test the concept of bacterial replacement therapy in the treatment of plaque related periodontal

disease, this study assessed quantitative changes in the subgingival microbiota after root planing when beneficial bacteria were applied adjunctively. Although application of beneficial bacteria did not exclude pathogen recolonization, it did delay the recolonization process significantly^[11].

In another animal study evaluated radiologically the impact of replacement therapy by monitoring bone density changes and alveolar bone level in periodontal pockets in a dog model. The bone density within periodontal pockets treated with beneficial bacteria improved significantly after 12 weeks, there was a significant increase in the bone level at the end of the study for the pockets receiving beneficial bacteria, and no significant changes were noted in the control pockets^[12-13]. This novel approach of Guided Pocket Recolonization may provide a valuable addition or alternative to the armamentarium of treatment options for periodontitis.

10. Safety Aspects of Probiotics

Increased probiotic supplementation of different food products during the recent years has raised safety concerns. When probiotics are applied orally, at least a part of them will be ingested and can interact with a patient's systemic health. When ingested orally, probiotics are generally considered safe and well tolerated with bloating and flatulence occurring frequently^[9]. The increased probiotic consumption inevitably leads to increased concentrations of these species in the host organism. Although rare, cases of probiotics-related bacteraemia, *Lactobacillus* endocarditis and liver abscess secondary to *L. rhamnosus* have been reported in the literature and such cases have responded well to appropriate antibiotic therapy. Recently, major and minor risk factors for probiotics-associated sepsis have been identified. Major risk factors include immunosuppression (including a debilitated state or malignancy) and prematurity in infants^[10]. Although administration of probiotics generally can be considered safe, each strain of probiotics has specific properties that should be considered before its use in any patient.

11. Summary

- Probiotics are living microorganisms, principally bacteria, that are safe for human consumption and have beneficial effects on human health.
- Probiotic therapy is being considered for application in oral health due to the emergence of antibiotic-resistant bacteria.
- Probiotics incorporated into dairy products neutralize acidic conditions in the mouth and interfere with cariogenic bacteria.
- Patients with periodontal disease who used chewing gum or lozenges containing probiotics saw their periodontal status improve.
- Probiotics in gargling solutions or gum inhibit the production of volatile sulphur compounds that contribute to bad.

12. Conclusion

The oral cavity with a well-maintained balance of species and species interactions may be a potential source for health-promoting probiotic bacteria. Probiotics play an important role in combating issues with overuse of antibiotics and antimicrobial resistance. It is right time to change the way bacteria are treated in today's new technological era. Further studies are required to understand the ability of probiotic bacteria to survive, grow, and have a therapeutic effect when used for treatment or when added to foods, to fix the doses and schedules of administration of probiotics. Hence, randomized controlled trials and systematic studies are needed to find out the best probiotic strains and means of their administration in different oral health conditions and oral health promotion. With fast evolving technology and integration of biophysics with molecular biology, designer probiotics pose huge opportunity to treat diseases in a natural and non-invasive way.

References

- [1] Isolauri E. Probiotics in human disease. *Am J Clin Nutr.* 2001;73(6):1142S-6S.
- [2] Caglar E, Kargul B, Tanboga I. Bacteriotherapy and probiotics' role on oral health. *Oral Dis.* 2005;11(3):131-7.
- [3] Meurman JH, Stamatova I (2007) Probiotics: contribution to oral health. *Oral Dis* 13: 443-451.
- [4] Meurman JH. Prebiotics and Probiotics and Oral Health. In: Charalampopoulos D, Rastall RA (eds). *Prebiotics and Probiotics Science and Technology*, Springer, New York, 2009;1067-1098.
- [5] Anderson MH, Shi WA. Probiotic approach to caries management. *Pediatr Dent.* 2006;28(2):151-3.
- [6] Anusavice KJ. Present and future approaches for the control of caries. *J Dent Edu.* 2005;69(5):538-54.
- [7] Suvarna VC, Boby VG. Probiotics in human health. A current assessment. *Current Science* 2005; 88: 1744-8.
- [8] Senok AC, Ismaeel AY, Botta GA. Probiotics: facts and myths. *Clin Microbiol Infect* 2005; 11 (12): 958-66. Santosa S, Farnworth E, Jones PJ. Probiotics and their potential.
- [9] Chatterjee A, Bhattacharya H, Kandwal A. Probiotics in periodontal health and disease. *J Indian Soc Periodontol* 2011;15(1):23-28.
- [10] Meurman JH, Stamatova I. Probiotics: contributions to oral health. *Oral Dis* 2007; 13(5): 443-451.
- [11] Twetman S, Derawi B, Keller M, Ekstrand K, Yucel-Lindberg T, Stecksén-Blicks C. Short-term effect of chewing gums containing probiotic *Lactobacillus reuteri* on the levels of inflammatory mediators in gingival crevicular fluid. *Acta Odontol Scand* 2009; 67:19-24.
- [12] Teughels W, Newman MG, Coucke W, Haffajee AD, van der Mei HC, Haake SK, et al. Guiding periodontal pocket recolonization: A proof of concept. *J Dent Res* 2007; 86:1078-82.
- [13] Nackaerts O, Jacobs R, Quirynen M, Rober M, Sun Y, Teughels W. Replacement therapy for periodontitis: pilot radiographic evaluation in a dog model. *J Clin Periodontol* 2008;35(12):1048-52.