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# Oral Health by Using Probiotic Products

*Razzagh Mahmoudi, Sara Moosazad and Katayoon Aghaei*

## Abstract

One of the most prevalent and important health problems in the world is periodontal and plaque-related diseases that antibiotic drugs are used with their side effects as their treatment. With increasing resistance to antibiotics and a desire from the general public for “natural” therapies, there is a need to minimize antibiotic use and develop new treatments for oral diseases without antimicrobial agents. Probiotics are viable microorganisms which provide a health benefit to the host when administered in adequate amounts; studies show that probiotics have the potential to modify the oral microbiota and decrease the colony-forming unit (CFU) counts of the oral pathogens being investigated to prevent or treat oral disease, such as dental caries and the periodontal diseases. In addition, the identification of specific strains with probiotic activity is required for any oral infectious disease, in order to determine the exact dose, the time of treatment, and the ideal vehicle.

**Keywords:** probiotics, periodontal diseases, dental caries, oral health

## 1. Introduction

As we know tooth decay and oral health is one of the most common worries in the world [1], and with widespread public concern about the use of industrial drugs to reduce dental caries, natural base treatments are highly welcomed, but the question is: Can probiotics be used as a therapeutic agent? A few years before 1908, the theory is drawn up according to this theory; the Bulgarian people have a longer life; the reason of longer life was Bulgarian people used more fermented products. These products have increased the health of their digestive system [2]. This theory won the Nobel Prize in Physiology and Medicine (1908) [3]. Since then, many publications that have referred to this theory said using probiotic products can be factor in improving the health of the digestive system, reproductive organs, and oral hygiene [4, 5]. Oral holes are environments with homeostasis conditions, which affect the nutritional conditions and individual health conditions and conditions of the environment [3, 4, 6]. Probiotics, as nonpathogenic microorganisms, can have beneficial health benefits at low levels in food. They have the ability to change this homeostasis environment [3, 7]. Probiotic bacteria consist of two main groups of *Lactobacillus* and *Bifidobacterium*. The *Lactobacillus*, as a member of oral microbial flora, can play an important role in the microcosm balance of the oral cavity. Less information is available about the useful role of *Bifidobacterium* in oral cavity health [8, 9].

## 2. Oral health

The mouth has a varied and heterogeneous microbial community. Oral health can be a state of being free from chronic mouth and tooth pain, such as oral and throat cancer, tooth loss, periodontal disease, and the other diseases that affect this tissue. The etiology of periodontal diseases and caries shows the prevalence of these both having microbial components. Host microbiota has important role in the individual's health. The theory from Nobel laureate Ilya Metchnikoff says "we fight microbe with microbe" and has attracted numerous followers [10].

## 3. Probiotics background

As we know, the presence of microorganisms in the body always had been a concern of a large group of scientists. Because the health of the oral and intestinal organs is depends on the balance of these microorganisms and their functioning [10]. For many years, scientists and doctors have been using antibiotics to improve the function of the oral cavity, lymph system, and intestinal organs and control the demographic of these microorganisms. However, the widespread use of antibiotics not only caused a lot of problems in the human body but also led to microorganisms exhibiting resistance and even in some cases caused new species in microorganisms. All these problems forced scientists and researchers to find new methods for controlling microorganisms in the body organs.

## 4. Probiotic bacteria

As it is mentioned in the introduction, probiotic bacteria consist of two main groups of *Lactobacillus* and *Bifidobacterium*. The best growth environments for these two groups are anaerobic or minimal oxygen conditions, for example, in saliva, vagina, vegetable juices, and dairy products. Probiotic bacteria were used in a variety of ways over time. For example, and prevent food corruption, Today, these bacteria are also used in industrial food products such as milk, wine and vegetables [11]. The name probiotic comes from the Greek word *proboisis*, which means for life. This word was first used in 1965 by Lily and Stool to describe the secreted material by microorganisms to stimulate the growth of other microorganisms. In 1974, Parker introduced the word to describe microorganisms controlling the intestinal microbial population [12–14]. Today, probiotic bacteria refer to viable microorganisms that control the microbial population of the gut. They have lots of positive effects on the health of the host such as reduced constipation, decreased blood cholesterol, and improved lactose tolerance and calcium intake [14].

## 5. Probiotic foods are functional foods

Diets play an important role in health. These diets can play a leading role in reducing disease. Today, with increasing awareness of people about the beneficial effects of probiotic bacteria, consumption of functional foods is increasing. But what are these foods? Functional foods are such food that promotes health [14]. A wide range of foods are included, but the most important ones are oligosaccharides and probiotic foods [15].

What are the main criteria for selecting probiotic food as functional? Functional food must have three items:

1. They have a different effect from a nutritional point.
2. They reduce the risk of pathological illnesses.
3. Consuming them benefits the community and the consumer [15].

Probiotic foods not only have the main characteristics that are mentioned but also have more benefits. These features include:

- A. Useful effects on the host
- B. High shelf life in the product
- C. Ability to survive the intestines
- D. Ability to produce antimicrobial agents
- E. Stabilization of intestinal flora
- F. Nonpathogenicity and non-toxicity [16]

## **6. Which foods have the best tissue for the transfer of probiotic bacteria to the human digestive system?**

New food products are converted into probiotic foods by adding probiotic bacteria. These foods include a variety of different types such as cheese, ice cream, milk-based dessert, baby milk, and mayonnaise. In making these foods, the main thing is the texture of these foods. It can be said that among all foods, dairy products are known as the best option for the transmission of probiotic bacteria [17–20].

## **7. What are the main mechanism probiotics in the body?**

Probiotics can function through several mechanisms. Probiotic bacteria through colonization in the intestinal environment, connect to each other, using the food in the body before it is taken by pathogenic microorganisms so by creating competition, it eliminates pathogens. Also, probiotics, unlike many harmful bacteria, are capable of producing acid to survive in the regulation of the local and systemic immune system [21].

## **8. Probiotics and dental caries**

Dental caries is one of the most common oral diseases, even though it is preventable. There are different reasons for dental caries such as such as maternal characteristics, environment, child's individual factors and epigenetics, and sugar and sugar-rich diet [10]. A usual feature for caries-promoting bacteria is that they are acidogenic and aciduric. One of the most caries-promoting bacteria is *Streptococcus mutans*. For this reason lactobacilli and bifidobacteria are excellent acid producers, since we can use probiotics several times a day and they are safe for infants [22].

## **9. Probiotics and periodontal disease**

Periodontal diseases include gingivitis and periodontitis. They are manifested by bleeding on probing, swelling, color alterations, pain, and tooth mobility in

advanced stages. Scaling and root planning and deep pocket debridement are usual treatments [10]. Periodontal pathogens could be regulated by means of antagonistic interactions. According to the results of studies probiotics have been shown to reduce the number of the most frequently isolated pathogens such as *Bacteroides* sp., *Actinomyces* sp., *Staphylococcus intermedius*, and *Candida albicans* at optimal concentrations of  $10^8$  cfu/ml [23].

## 10. Probiotics and oral candida infections

Another role of a probiotic is to restrain the chronic candida infections of the soft tissues in the mouth. Those that are isolated from oral cavity include *C. albicans*, *C. glabrata*, *C. krusei*, *C. parapsilosis*, and *C. tropicalis*. Many in vitro studies have shown that the strains of lactobacilli have inhibitory activity against oral candida, but the true value of probiotics in controlling oral candida is still an open question [10].

## 11. Probiotics and halitosis

One of the most common problems that people in the world suffer from is halitosis. This phrase is used in 1921 to describe the unpleasant odor of the mouth [23]. This complication has many causes such as bacterial coating of the tongue, systemic disorders, and different types of food [24]. At all levels, all physical and chemical treatments alone have not been able to completely control this pathology. All physical and chemical treatments alone have not been able to fully control this problem. Today, scientists believe that the use of probiotics as supportive therapies will play a role in controlling this problem. But how can these bacteria help?

1. Probiotics can act as antibiotics and inhibit gastrointestinal diseases, which can reduce the odor associated with these diseases.
2. Probiotics can reduce bacteria in terms of immunity.

These two methods are the main methods for reducing odor in the mouth by probiotics [25].

## 12. Mechanism of probiotics in the oral cavity

The ability to adhere to and colonize surfaces in the oral cavity is an essential requirement for an oral probiotic [9]. There are four main mechanisms for the effect of probiotic bacteria in the mouth. Probiotics compete with pathogens to stick to the mucosa and tooth and prevent the sticking of pathogenic bacteria [26]. Probiotic produce peroxide and bacteriocin as antibacterial agents against oral pathogens, so they remove from oral area [27]. The presence of probiotics can change the oral conditions such as reducing pH that can prevent the growth of bacteria producing tooth decay or change the protein structure of salivary gland [28]. Probiotics can have beneficial effects on dental health by stimulating non-specific immunity and regulating cellular and humoral immune responses [29].

### 13. Probiotic strain in oral cavity

According to the researches and their results, *Lactobacilli* and *Bifidobacterium* could play an important role in the microecological balance in the oral cavity. *B. bifidum*, *B. longum*, and *B. infantis* are the probiotic species of *Bifidobacterium*. *Bifidobacterium* is seen in deep caries in the oral cavity and plays an important role in the development of caries, but it has been shown that its probiotic species can reduce caries in people who do not have active caries. *Acidophilus* are the probiotic species of *Lactobacillus*. According to the researches, *Lactobacillus* is more associated with decayed dentin. It is at the point of development of the decayed lesion and is at the onset of the process that caries do not have a role. Consumption of products of probiotics does not predict the cause of decay growth. Firstly, the *Lactobacillus* rarely causes cavity formation. Secondly, all *Lactobacillus* species do not induce caries, and thirdly when carriers of dairy *Lactobacillus* are present, they can have a neutralizing effect on acid production by bacteria [30].

#### Author details

Razzagh Mahmoudi<sup>1\*</sup>, Sara Moosazad<sup>2</sup> and Katayoon Aghaei<sup>2</sup>

<sup>1</sup> Medical Microbiology Research Center, Faculty of public Health Qazvin  
University of Medical Sciences, Qazvin, Iran

<sup>2</sup> Department of Health and Food Safety, Faculty of public Health Qazvin  
University of Medical Sciences, Qazvin, Iran

\*Address all correspondence to: [r.mahmodi@yahoo.com](mailto:r.mahmodi@yahoo.com)

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## References

- [1] The role of probiotics in preventing dental caries in children. In: International Congress on Nutrition, Growth and Development in Infants and Children; 2012
- [2] Twetman S, Keller M. Probiotics for caries prevention and control. *Advances in Dental Research*. 2012; **24**(2):98-102
- [3] Seminario-Amez M, López-López J, Estrugo-Devesa A, Ayuso-Montero R, Jané-Salas E. Probiotics and oral health: A systematic review. *Medicina Oral, Patología Oral y Cirugía Bucal*. 2017; **22**(3):e282
- [4] Zarco M, Vess T, Ginsburg G. The oral microbiome in health and disease and the potential impact on personalized dental medicine. *Oral Diseases*. 2012; **18**(2):109-120
- [5] Laleman I, Detailleur V, Slot DE, Slomka V, Quirynen M, Teughels W. Probiotics reduce mutans streptococci counts in humans: A systematic review and meta-analysis. *Clinical Oral Investigations*. 2014; **18**(6):1539-1552
- [6] Hasslöf P, West C, Videhult FK, Brandelius C, Stecksén-Blicks C. Early intervention with probiotic *Lactobacillus paracasei* F19 has no long-term effect on caries experience. *Caries Research*. 2013; **47**(6):559-565
- [7] Valizadeh S, Fakheri T, Mahmoudi R, Katiraei F, Gajarbeygi P. Evaluation of antioxidant, antibacterial, and antifungal properties of *Satureja hortensis* essential oil. *Biotechnology and Health Sciences*. 2014; **1**(3):e24733
- [8] The role of probiotics in preventing dental caries in children. In: International Congress on Nutrition, Growth and Evolution in Infants and Children; Tabriz; 2012
- [9] Meurman J, Stamatova I. Probiotics: Contributions to oral health. *Oral Diseases*. 2007; **13**(5):443-451
- [10] Dore MP, Goni E, Di Mario F. Is there a role for probiotics in helicobacter pylori therapy? *Gastroenterology Clinics*. 2015; **44**(3):565-575
- [11] Malcata FX, Tavares TG, Hernández-Mendoza A, Svensson UK, Håkansson J. Safety of food and beverages: Probiotics and prebiotics. *Encyclopedia of Food Safety*. 1 Jan 2014; **3**:427-440
- [12] Everything I, But I. The anticipatory perspective-points and counterpoints. *Utopia and Gospel*; 2015. p. 376
- [13] Cruz A, Cadena R, Castro W, Esmerino E, Rodrigues J, Gaze L, et al. Consumer perception of probiotic yogurt: Performance of check all that apply (CATA), projective mapping, sorting and intensity scale. *Food Research International*. 2013; **54**(1):601-610
- [14] Jindal G, Pandey RK, Singh RK, Pandey N. Can early exposure to probiotics in children prevent dental caries? A current perspective. *Journal of Oral Biology and Craniofacial Research*. 2012; **2**(2):110-115
- [15] Coman MM, Cecchini C, Verdenelli MC, Silvi S, Orpianesi C, Cresci A. Functional foods as carriers for SYN BIO®, a probiotic bacteria combination. *International Journal of Food Microbiology*. 2012; **157**(3):346-352
- [16] Farhat R. Suivi de la survie de "Geotrichum candidum" pendant la digestion in vitro du fromage type Camembert [thesis]. 2017
- [17] Soccol CR, de Souza Vandenberghe LP, Spier MR, Medeiros AP, Yamaguishi CT, De Dea Lindner J, et al. The

potential of probiotics: A review.  
 Food Technology and Biotechnology.  
 2010;**48**(4):413-434

[18] Mahmoudi R, Zare P, Hasnzade P, Nosratpour S. Effect of *Teucrium polium* essential oil on the physicochemical and sensory properties of probiotic yoghurt. Journal of Food Processing and Preservation. 2014;**38**:880-888

[19] Mahmoudi R, Bajalanlou F, Ghajarbeygi P, Pakbin B. Chemical properties and sensory evaluation of probiotic yoghurt manufactured with aqueous extract of aloe vera. Journal of Biology and Today's World. 2016;**5**(11):197-202

[20] Mahmoudi R, Tajik H, Ehsani A, Farshid AA, Zare P. Effects of *Mentha longifolia* L. essential oil on viability and cellular ultrastructure of *Lactobacillus casei* during ripening of probiotic feta cheese. International Journal of Dairy Technology. 2012;**66**:70-77

[21] Hart A, Lammers K, Brigidi P, Vitali B, Rizzello F, Gionchetti P, et al. Modulation of human dendritic cell phenotype and function by probiotic bacteria. Gut. 2004;**53**(11):1602-1609

[22] Eva S. Abstract: Probiotics and dental caries. Microbial Ecology in Health and Disease. 2012;**23**(1):18582

[23] Sharma P, Thippeswamy H, Chandrasekar B, Thetakala RK. Oral halitosis and probiotics. TMU Journal of Dentistry. 2015;**2**(2):62-66

[24] Rösing CK, Loesche W. Halitosis: An overview of epidemiology, etiology and clinical management. Brazilian Oral Research. 2011;**25**(5):466-471

[25] Lalitha T. Probiotics and oral health. Journal of Oral Research and Review. 2011;**3**(1):20-26

[26] Comelli EM, Guggenheim B, Stingle F, Neeser JR. Selection of dairy bacterial strains as probiotics for oral health. European Journal of Oral Sciences. 2002;**110**(3):218-224

[27] Lewis S, Freedman A. The use of biotherapeutic agents in the prevention and treatment of gastrointestinal disease. Alimentary Pharmacology & Therapeutics. 1998;**12**(9):807-822

[28] Haukioja A, Loimaranta V, Tenovu J. Probiotic bacteria affect the composition of salivary pellicle and streptococcal adhesion in vitro. Oral Microbiology and Immunology. 2008;**23**(4):336-343

[29] Isolauri E, Sütas Y, Kankaanpää P, Arvilommi H, Salminen S. Probiotics: Effects on immunity. The American Journal of Clinical Nutrition. 2001;**73**(2):444s-450s

[30] Mortezaei SH, Akhlaghi N. The role of probiotic on oral health. Journal of Isfahan Dental School. 2011;**7**(2):187-199