

## Review Article

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### Probiotics in Oral Health- A Review

Tanvir Singh<sup>1</sup>, Swapan Majumdar<sup>2</sup>, Amal Kanti Ghosh<sup>3</sup>, SP Pal<sup>1</sup>, SR Waghle<sup>2</sup>, Dakchiyani MB<sup>4</sup>

Departments of <sup>1</sup>Orthodontics, <sup>2</sup>Prosthodontics, <sup>3</sup>Conservative Dentistry, <sup>4</sup>Pedodontics  
Mithala Minority Dental College and Hospital, Mansukh Nagar, Darbhanga

#### ABSTRACT:

Probiotics are usually defined as live bacterial cultures, which contain lactic acid bacteria such as lactobacillus and bifidobacterium. They can be taken as oral supplements or added to food. During the last few years, several authors have suggested that probiotic bacteria originally planned for gut health could also be beneficial to oral health. The aim of this review is to examine potential mechanisms of probiotic bacteria in the oral cavity and to summarize observed effects of probiotics with respect to oral health.

Key words: Probiotics, Oral Health, Bacterial Cultures.

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**Corresponding Author:** Dr. Tanvir Singh, Professor, Department of Orthodontics, Mithala Minority Dental College and Hospital, Mansukh Nagar, Darbhanga

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#### INTRODUCTION

The term prebiotic was introduced by Gibson and Roberfroid(1). Prebiotic is a non-digestible food ingredient that confers benefits on the host by selectively stimulating the growth and/or activity of one bacterium or a group of bacteria in the colon, and thus improve the host health. Prebiotics are dietary carbohydrates that escape digestion in the upper gastrointestinal tract, alter the bacterial composition of the gut, by changing the type of the substrate provided to the existing microbial population in the gut e.g. fructo oligosaccharides, gluco oligosaccharides and inulin. The term synbiotic is used when a product contains both probiotics and prebiotics. Because the

word alludes to synergism, this term should be reserved for products in which the prebiotic compound selectively favors the probiotic compound(2) The mechanisms by which probiotics exert their effects are largely unknown, but may involve modifying gut pH, antagonizing pathogens through production of antimicrobial compounds, competing for pathogen binding and receptor sites as well as for available nutrients and growth factors, stimulating immunomodulatory cells, and producing lactase. Probiotic bacteria have been shown to influence the immune system through several molecular mechanisms.(3)

#### Probiotics Interest to Oral Health

Given the widespread emergence of bacterial resistance to antibiotics, the concept of

probiotic therapy has been considered for application in oral health. Dental caries, periodontal disease and halitosis are among the oral disorders that have been targeted. An essential condition for a microorganism to represent a probiotic of interest for oral health is its capacity to adhere to and colonize various surfaces of the oral cavity.(4,5) Lactobacilli constitute about 1% of the cultivable oral microflora in humans.<sup>11</sup> The species most often found in saliva are *Lactobacillus acidophilus*, *Lactobacillus casei*, *Lactobacillus fermentum*, *Lactobacillus plantarum*, *Lactobacillus rhamnosus* and *Lactobacillus salivarius*.<sup>11</sup> *L. acidophilus*, *L. casei*, *L. fermentum* and *L. rhamnosus* are found in dairy products,(4,6) but there is no evidence that these species are present in the oral cavity as a result of frequent consumption of dairy products (leading to temporary colonization), nor is there evidence that the oral environment represents their natural and permanent habitat. Sookkhee and colleagues(7) isolated 3,790 strains of lactic acid bacteria from 130 individuals and found that the isolates identified as *Lactobacillus paracasei* ssp. *paracasei* and *L. rhamnosus* had a high capacity to antagonize important oral pathogens, including *Streptococcus mutans* and *Porphyromonas gingivalis*. *Weissella cibaria* (formerly classified in the genus *Lactobacillus*), a Gram-positive facultative anaerobic lactic acid bacterium<sup>14</sup> that has been isolated from humans, is present in fermented foods and is considered a potential probiotic agent. *W. cibaria* secretes a significant quantity of hydrogen peroxide,(8) as well as a bacteriocin that acts against Gram-positive bacteria.(9) This bacterial species has the capacity to coaggregate with *Fusobacterium nucleatum* and to adhere to epithelial cells.<sup>15</sup> These properties could enable *W. cibaria* to effectively colonize the oral cavity and limit the proliferation of pathogenic bacteria.

### **Probiotics products (10)**

Probiotics are provided in products in one of the four basic ways:

- 1) A culture concentrate added to a beverage or food (such as a fruit juice).
- 2) Inoculated into prebiotic fibres.
- 3) Inoculants into a milk-based food (dairy products such as milk, milk drink, yoghurt).
- 4) (Yogurt drink, cheese, kefir, biodrink);
- 5) As concentrated and dried cells packaged as dietary supplements (non-dairy products).
- 6) (Such as powder, capsule, gelatin tablets)

### **Role of Probiotics in dental caries**

A number of researchers are developing “probiotic” methods to treat the caries causing infection. “Probiotic”, as used here, means that mechanisms are employed to selectively remove only the (odonto) pathogen while leaving the remainder of the oral ecosystem intact (11). Dental caries is a multifactorial disease of bacterial origin that is characterized by acid demineralization of the tooth enamel.(12) It appears following changes in the homeostasis of the oral ecosystem leading to proliferation of the bacterial biofilm, composed notably of streptococci from the mutans group. To have a beneficial effect in limiting or preventing dental caries, a probiotic must be able to adhere to dental surfaces and integrate into the bacterial communities making up the dental biofilm. It must also compete with and antagonize the cariogenic bacteria and thus prevent their proliferation. Finally, metabolism of food-grade sugars by the probiotic should result in low acid production. The advantage of incorporating probiotics into dairy products lies in their capacity to neutralize acidic conditions. For example, it has already been reported that cheese prevents demineralization of the enamel and promotes its remineralization.(13,14)

### Role of Probiotics in Periodontal Problems

Mucosal immune responses may be invoked by probiotic immunization. Studies of adhesion molecules have shown that superficial cell layers of the gingiva can be affected and can be stimulated to enhance the presence of immune potent cells. Regulation of microflora composition (e.g. by probiotics and prebiotics) may offer the possibility to influence the development of mucosal and systemic immunity, but it can also play a role in the prevention and treatment of diseases such as periodontitis (15). In one recent study, the prevalence of lactobacilli, particularly *Lactobacillus gasseri* and *L. fermentum*, in the oral cavity was greater among healthy participants than among patients with chronic periodontitis.(16) Various studies have reported the capacity of lactobacilli to inhibit the growth of periodontopathogens, including *P. gingivalis*, *Prevotella intermedia* and *A. actinomycetemcomitans* (16,7) Together, these observations suggest that lactobacilli residing in the oral cavity could play a role in the oral ecological balance. Krasse and colleagues(17) assessed the beneficial effect of *L. reuteri* against gingivitis. After 14 days of ingesting the probiotic incorporated into chewing gum, the oral cavity of patients with a moderate to severe form of gingivitis had been colonized by *L. reuteri* and the plaque index had been reduced. Although the exact mechanisms of action of *L. reuteri* remain to be elucidated, previous studies have suggested at least 3 plausible possibilities: first, *L. reuteri* is known for its secretion of 2 bacteriocins, reuterin and reutericyclin, that inhibit the growth of a wide variety of pathogens<sup>33,34</sup>; second, *L. reuteri* has a strong capacity to adhere to host tissues, thereby competing with pathogenic bacteria<sup>35</sup>; and third, the recognized anti-inflammatory effects of *L. reuteri* on the intestinal mucosa.

### Probiotics and Halitosis

Halitosis has many causes (including consumption of particular foods, metabolic disorders, respiratory tract infections), but in most cases it is associated with an imbalance of the commensal microflora of the oral cavity. More specifically, halitosis results from the action of anaerobic bacteria that degrade salivary and food proteins to generate amino acids, which are in turn transformed into volatile sulphur compounds, including hydrogen sulphide and methanethiol.(18)

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