

## Probiotics and oral health : myth or reality?

Mamatha S. Shetty<sup>1</sup> & Yashaswini S. Shetty<sup>2</sup>

<sup>1</sup>Reader, Department of Periodontics, <sup>2</sup>Intern, A.B. Shetty Institute of Dental Sciences, Nitte University, Mangalore , Karnataka, India.

Correspondence

Yashaswini S. Shetty

Intern, A.B. Shetty Institute of Dental Sciences, Nitte University, Mangalore 575 018, Karnataka, India.

Mobile : +91 97316 69838 E-mail : shettyyashaswini@yahoo.com

### Abstract

Human being ingests a large number of living microorganisms, predominantly bacteria. Although these organisms are naturally present in food and water, they can also be deliberately added during the processing of foods <sup>(1)</sup>. For several decades now, bacteria called Probiotics have been added to some foods because of their beneficial effects on human health. Several clinical studies have already demonstrated the effectiveness of certain probiotics in the treatment of systemic and infectious disease such as diarrhea, crohns disease, cardiovascular diseases, oropharyngeal infections and cancers <sup>(2)</sup>.

Potential application of probiotics for oral health has recently attracted attention of several teams of researchers. The concept of probiotics therapy has been considered for application in oral health. Dental caries, periodontal diseases and halitosis are among the oral disorders that have been targeted. Hence, this section gives a brief idea of probiotics and its application in oral health.

Keywords : Probiotics, oral health, oral diseases.

### Introduction

The role of diet in health and wellbeing is universally accepted with evolution of the science of nutrition, research is now being directed towards improving the understanding of specific physiologic effects of the diet beyond its nutritional effect <sup>(3)</sup>. In this aspect, probiotics are the subject of intense and widespread research in food and nutritional science.

Probiotics are described as "living microorganisms, principally bacteria, that are safe for human consumption, and when ingested in sufficient quantities, have beneficial effects on human health, beyond basic nutrition" (accepted by United Nations food and agriculture organization & WHO)<sup>(4)</sup> The term probiotic, meaning "for life", is derived from the Greek language, first probiotics

species to be introduced in research was Lactobacillus acidophilus by Hull et al in 1984 followed by Bifidobacterium bifidum.

Characteristics of Probiotics As Cited By Who<sup>(5)</sup>.

It should be a strain, which is capable of exerting a beneficial effect on the host, e.g. increased growth or resistance to a disease.

It should be non- pathogenic and non- toxic.

It should be stable and capable of remaining viable for periods under storage and field conditions.

It should not have an ability to transfer antibiotic resistance genes.

It should be able to maintain genetic stability in intestinal micro flora.

### How Probiotics Work?

Several mechanism have been proposed to explain how probiotics work

these bacteria secrete various antimicrobials (Figure 1)

In addition they compete with various pathogenic agents for adhesion sites on the mucosa <sup>(6)</sup>.

Alteration of environmental condition of the oral cavity.

probiotics provide beneficial effects by stimulating non-specific immunity and modulating the humoral and cellular immune response <sup>(7)</sup>.

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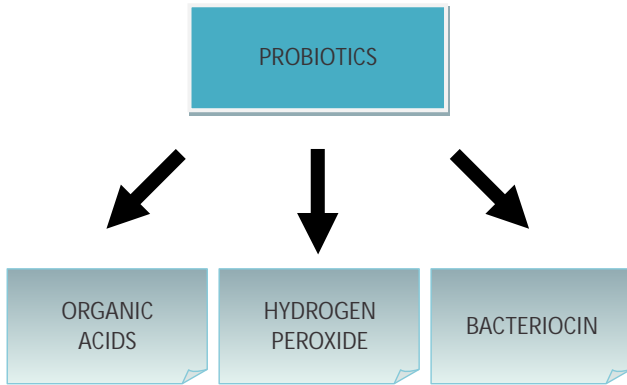


Fig. 1 Antimicrobials secreted by probiotics

Probiotics Products Are Administered In Four Ways<sup>(8)</sup> As Shown In: Table 1

1. A culture concentrate 	Added to a beverage or food (such as a fruit juice, ice creams).
2. Prebiotic fibers 	This contributes in changing the activity of resident micro flora that is beneficial for the host.
3. Inoculants into a milk-based food 	Dairy products such as milk, milk drink, yoghurt.
4. Dried cell package 	Dietary supplements: non- dairy products as powder, capsule, gelatin tablets or lozenges.

Table 1: Probiotics Products Are Administered In Four Ways

### Application of Probiotics to Oral Health

#### A. Probiotics and dental caries

Dental caries is a multifactorial disease of bacterial origin that is characterized by acid demineralization of the tooth enamel<sup>(9)</sup>. 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. The advantage of incorporating probiotics into dairy products lies in their capacity to neutralize the acidic conditions<sup>(10)</sup>.

Comelli and colleagues reported that out of 23 bacterial strains used in the dairy industry, *Streptococcus thermophilus* and *Lactobacillus lactis ssp. lactis* were the only ones with the capacity to integrate into a biofilm present on the hydroxyapatite surface and to interfere with

the development of cariogenic species *Streptococcus sobrinus*<sup>(11)</sup>.

Several clinical studies have demonstrated the regular consumption of milk or cheese containing probiotics led to a decrease in the number of cariogenic streptococci in the saliva and a reduction in dental plaque<sup>(12, 19)</sup>. More recently it was demonstrated that *Weissella cibaria* had the capacity to inhibit, both in vitro and in vivo, biofilm formation by *Streptococcus mutans* and to prevent proliferation of this bacterial strains<sup>(13)</sup>.

#### B. Probiotics and periodontal disease

Periodontal disease is classified into 2 types: gingivitis and periodontitis. Gingivitis is characterized by inflammation limited to the unattached gingiva (terminal edge or border of the gingiva surrounding the teeth in a collar-like fashion), whereas periodontitis is a progressive, destructive disease that affects all supporting tissues of the teeth, including the alveolar bone<sup>(14)</sup>. There are few experimental studies exploring probiotics use in periodontal diseases, partly reflecting a poorer understanding of the precise etiology of the disease and of the conditions that promote health.

Riccia and colleagues recently studied the anti-inflammatory effects of *Lactobacillus brevis* in a group of patients with chronic periodontitis. The treatment which involved sucking lozenges containing *L. brevis* over a period of 4 days, led to improvement in the targeted clinical parameters (plaque index, gingival index, bleeding on probing) for all patients. In that study a significant reduction in salivary levels of prostaglandins and matrix metalloproteinases (MMPs) was also observed. The authors suggested that the beneficial effects of *L. brevis* could be attributed to its capacity to prevent the production of nitric oxide and, consequently, the release of prostaglandins and activation of MMPs induced by nitric oxide<sup>(15)</sup>.

Various studies have reported the capacity of *Lactobacilli* to inhibit the growth of periodontopathogens, including *Porphyromonas gingivalis*, *Prevotella intermedia* and

Aggregatibacter actinomycetemcomitans<sup>(16)</sup>

### C. 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 the imbalance in the commensal micro flora in 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. There have also been clinical and laboratory studies of probiotics in their potential of preventing halitosis<sup>(17)</sup>.

Kang and colleague reported the capacity of various strains of *W.cibaria* to inhibit the production of volatile sulphur compounds by *Fusobacterium nucleatum*. They concluded that this beneficial effect resulted from the production of hydrogen peroxide by *W.cibaria*, which inhibited the proliferation of *F.nucleatum*. These authors also found that gargling with a solution containing *W.cibaria* was associated with the net reduction in the production of hydrogen sulphide and methanethiol and consequently a

reduction in a bad breath<sup>(18)</sup>.

### Conclusion

Probiotics represent a new era of research in oral medicine, the examination of the close relationships between food and oral health. They are emerging as a fascinating field. The use of probiotics in oral health applications is gaining a momentum.

Preliminary data obtained by various research laboratories have been encouraging, but numerous randomized control studies will be required to clearly establish the potential of probiotics in preventing and treating oral infections. Such studies will allow identification of the probiotics that are best suited for oral use, as well as the most appropriate vehicles: food products (cheese, milk, yoghurt) or supplements (chewing gum, lozenges). Better scientific understanding and extended research of these tiny forms of life and their effects on humans in the treatment of oral diseases might further broaden the field of potential applications. This short communication conveys a very basic knowledge of Probiotics and its application in oral health, which is an integral part of recent advances in the field of Dentistry.

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