

Probiotics: A Review

Abstract

Probiotics have been found to be beneficial to host health. In medicine, probiotics are used mainly in support therapy for gastro-intestinal diseases. In recent years, probiotics have been used as a treatment to promote oral health. There has also been a change in understanding of the oral disease process because of better understanding of the ecology and microbiology of the oral cavity. Very encouraging studies exploring probiotics in the fields of caries, periodontal diseases and few other areas have come up in the recent past and the results tend to suggest beneficial effects of probiotics on oral health and on the whole body in general. Extensive research to create a probiotic product intended to maintain dental and periodontal health is needed. This article reviews the role of probiotics in dental caries and periodontal disease.

Key Words

oral health; probiotics; dental caries

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INTRODUCTION

The age-old quote by Hippocrates, 'Let food be thy medicine and medicine be thy food', is certainly the tenet of today. The market for functional foods that promote health beyond providing basic nutrition, is flourishing. Within the functional foods, is the small but rapidly expanding arena of probiotics.^[1] According to a WHO/ FAO report (2001),^[2] probiotics are 'Live micro-organisms which, when administered in adequate amounts, confer a health benefit on the host'.

History of Probiotics

There is a long history of health claims concerning living microorganisms in food, particularly lactic acid bacteria. The use of microorganisms to promote health is very ancient and can even be traced back to the classical roman literature where food fermented with microorganisms was used as a therapeutic agent.^[3]

Composition of Probiotics

The composition of probiotics comprises of at least one probiotic bacteria, at least one carbohydrate ingredient, at least one fat ingredient, and at least

one protein ingredient. Probiotics can be bacteria, moulds, yeast. But most probiotics are bacteria. Among bacteria, lactic acid bacteria are more popular.^[4] Fuller in 1989 listed the following organisms as species used in probiotic preparation- *Lactobacillus bulgaricus*, *Lactobacillus plantarum*, *Streptococcus thermophilus*, *Enterococcus faecium*, *Enterococcus faecalis*, *Bifidobacterium* species, and *Escherichia coli*. With the exception of *L. bulgaricus* and *S. Thermophilus*, all the other organisms are all intestinal strains. A probiotic may be made out of a single bacterial strain or it may be a consortium as well (may contain any number up to eight strains). The advantage of multiple strain preparations is that they are active against a wide range of conditions and in a wider range of animal species.^[4]

Microorganisms Used As Probiotics^[5,6]

Bacteria:

a) *Lactobacillus* species

- *Lactobacillus acidophilus*
- *Lactobacillus bulgaricus*
- *Lactobacillus casei*

- *Lactobacillus crispatus*
- *Lactobacillus fermentum*
- *Lactobacillus gasseri*
- *Lactobacillus johnsonii*
- *Lactobacillus lactis*
- *Lactobacillus plantarum*
- *Lactobacillus reuteri*
- *Lactobacillus rhamnosus*

b) Bifidobacterium species

- *Bifidobacterium adolescentis*
- *Bifidobacterium animalis*
- *Bifidobacterium bifidum*
- *Bifidobacterium breve*
- *Bifidobacterium infantis*
- *Bifidobacterium lactis*
- *Bifidobacterium longum*

c) Bacillus cereus

d) Enterococcus faecalis

e) Enterococcus faecium

f) Escherichia coli Nissie

g) Streptococcus thermophilus

Yeast:

Saccharomyces boulardii

Different Vehicles For Administration Of Probiotics

The vehicle by which probiotics are ingested or delivered in the oral cavity, however influence the cariogenic potential and the oral colonization of a probiotic. The most commonly used dietary lactobacilli are being consumed in milk products.^[7]

Different vehicles for probiotics administration are:

a) Milk Products

- Milk drink
- Yoghurt
- Cheese

b) Fruit Juices

c) Lozenges

d) Powder

e) Gelatine

f) Straw

g) Tablets

h) A probiotic lozenge administered medical device.

i) Capsules

Different form of commercially available Probiotics

1. Yakult is a probiotic dairy product made by fermenting a mixture of skimmed milk with a special strain of the bacterium *Lactobacillus casei* Shirota.

2. ProBiora3 is a patented blend of three beneficial bacteria naturally present in healthy mouths,

including *Streptococcus oralis* KJ3® (*S. oralis* KJ3), *Streptococcus uberis* KJ2® (*S. uberis* KJ2), and *Streptococcus rattus* JH145® (*S. rattus* JH145). This blend of probiotics promotes fresher breath, whiter teeth, and supports gum and tooth health. Based on research initiated more than 30 years ago by the founder of Orogenics, ProBiora3 represents a new application of probiotics that support overall oral health (Fig. 1).

3. GUM® PerioBalance® is a probiotic developed to reduce harmful dental plaque and promote healthy teeth and gums when taken daily. The mint lozenges contain a unique blend of naturally occurring probiotics known as Prodentis™, which help to reduce dental plaque buildup by creating a balanced oral environment with daily use. GUM® PerioBalance® promotes a healthy mouth and freshens the breath (Fig. 2).

4. Probiotic juice deliver a powerful daily dose of live and active probiotic cultures of *Lactobacillus plantarum*299v, a well-studied probiotic strain formulated for daily digestive health.

5. Periobiotic probiotic Tooth paste containing functional lactobacillus dental hygiene probiotic. specific *Lactobacillus paracasei* strain, has shown that it competes with unhealthy strains of oral bacteria including *Streptococcus mutans*, thereby helping to maintain healthy teeth and gums (Fig. 3).

6. Therebreadth Daily mouth rinsing with Probiotic mouth wash resulted in substantial reductions in the numbers of the bacterium, *S. mutans*, which attacks teeth, as well as two target periodontal strains, *Porphyromonas gingivalis* and *Campylobacter rectus*, associated with gum disease and bad breath.

7. FloraBright contains three probiotic strains, *S. oralis* KJ3™, *S. rattus* JH145™, and *S. uberis* KJ2™, to help, Noticeably and naturally whiten teeth, Crowd out “bad-breath” bacteria and freshen breath, Promote healthy teeth and gums.

8. Choconat includes nature’s “good bacteria.” Probiotic is GMO free, has high-survivability, and is superior to other traditional probiotic organisms - such as lactobacilluchocolate with superior health benefits (Fig. 4).

Mechanism of Action

The suggested mechanisms of probiotic action on oral health are drawn entirely from gastrointestinal studies. Several mechanisms have been suggested to contribute to the probiotic action on systemic health.^[8-12] They relate to immune modulation, modulation of gut immunological mechanisms, mucin production, down regulation of

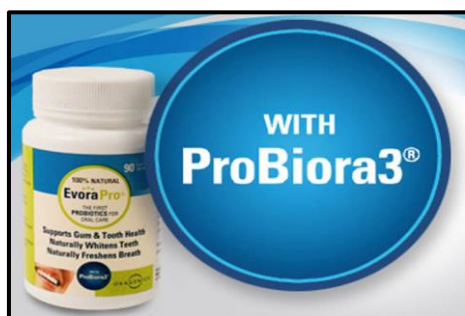


Fig 1: ProBiora3



Fig 3: Periobiotic probiotic Tooth paste

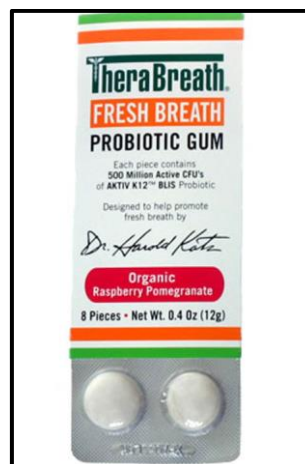


Fig 2: GUM® PerioBalance®



Fig 4: Choconat

inflammatory responses, secretion of antimicrobial substances, competition with other flora, including potential pathogens by competitive blocking of adhesion sites at epithelial and mucosal surfaces, and inhibition of epithelial invasion by regulation of intestinal permeability, inhibition of pathogens mucosal adherence and stimulation of immunoglobulin A production. There is also evidence of production of anti-microbial substances, such as organic acids, hydrogen peroxide and bacteriocins.^[13-15]

Clinical applications of Probiotics

Probiotics have traditionally been used to treat diseases related to the gastrointestinal tract. Several gastrointestinal health claims have been made for probiotics,^[16] such as:

- Lactose intolerance
- Antibiotic-associated diarrhoea (AAD)
- Infective diarrhoea/ Rotavirus-associated diarrhoea
- Clostridium difficile associated diarrhoea
- Traveller's diarrhoea
- Inflammatory bowel disease
- Ulcerative colitis
- Crohn's disease
- Constipation
- Helicobacter pylori

- Urogenital infections
- Atopic disease

Probiotics and oral cavity

The oral cavity is a rather intricate habitat providing the establishment of a great diversity of microbial species. Each environment within the mouth supports distinct yet overlapping communities of hundreds of species.^[17,18] It has been recently estimated that over 1000 bacterial species are present in the oral cavity.^[17] Probiotics are beneficial in treating Gingivitis, Periodontitis, Halitosis, Dental Caries, Oral Cancer etc.

Safety and Probiotics

Safety is the state of being certain that adverse effects will not be caused by an agent under defined conditions. The reciprocal of safety is risk. The issue of safety for any product is arguably paramount during pregnancy and in newborn babies. They may be responsible for three types of side-effects:^[19-21]

- Systemic infections
- Metabolic and enzymatic effects
- Immunological effects

CONCLUSION

The use of probiotics is an interesting emerging and not to be neglected field in general and oral healthcare. Probiotics have made their way into oral

health care and are more likely to be our friend than our enemy. Keeping in view of the FAO/WHO guidelines and recommendations, there is scope for further studies and standardizations of probiotics therapies which can definitely open up a new era of various disease prevention at affordable prices where common man can reap the benefits of probiotics.

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