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## Research Article

### LET'S MOVE FROM ANTIBIOTICS TO PROBIOTICS

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#### ABSTRACT

Probiotics have been extensively studied for their health promoting effects. The main field of research has been in the gastrointestinal tract. Now a day's probiotics are widely investigated in oral health perspective. There also has been a change in understanding of the oral disease process because of better understanding of ecology and microbiology of oral cavity. This article summarizes the currently available data on the probiotics, its potential benefits for oral health and adverse effects.

#### Key Words:

Functional Food, Prebiotics, Probiotics,  
Synbiotics

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## INTRODUCTION

Nowadays Chemotherapeutics are widely used to prevent and treat infections caused by indigenous and exogenous microbes, but antibiotic resistance is an increasingly important global problem with the emergence of multi-resistant strains. This unfortunate development has encouraged researchers in various fields of healthcare to develop alternative antimicrobial approaches. The application of health-promoting bacteria for therapeutic purposes is one of the strongest emerging fields in this regard. Probiotic microorganisms can shape the immune system both at the local and systemic level which will allow future probiotics as treatments for many diseases. The benefits include either a shortened duration of infections or decreased susceptibility to pathogens. These products usually contain streptococci, lactobacilli, or bifidobacteria. Although the use of such probiotics specifically to improve oral health is still in its infancy, it is moving ahead. Extensive research to create a probiotic product intended to maintain dental and periodontal health is needed.

#### History

The term "probiotic" is a relatively new word meaning "for life" and it is currently used when referring to bacteria associated with beneficial effects on humans and animals.

Pasteur and his associate "Joubert" noted as early as 1877 that the growth of anthrax bacilli in cocultures with "common bacilli" (probably *Escherichia coli*) was suppressed. They commented that "these facts perhaps justify the highest hopes for therapeutics".

#### Terminologies

According to a WHO/FAO report (2002), **probiotics** are 'Live micro-organisms which, when administered in adequate amounts, confer a health benefit on the host'.

The term **prebiotic** was introduced by Gibson and Roberfroid. 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. fruc to 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

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the prebiotic compound selectively favors the probiotic compound.

### **Mechanism of Action of Probiotics in oral Health**

Probiotic bacteria have been shown to influence the immune system through several molecular mechanism. In oral health, possible mechanisms may be:

#### **Production of antimicrobial substances**

- Organic acids
- Hydrogen peroxide
- Bacteriocins

#### **Binding in Oral Cavity**

- Compete with pathogens for adhesion sites
- Involvement in metabolism of substrates competing with oral micro organisms for substrates available)

#### **Immuno modulatory**

- Stimulate non specific immunity
- Modulate humoral and cellular immune response

#### **Modify oral conditions**

- Modulating pH
- Modification of oxidation reduction potential

### **Probiotics and Oral Health**

#### **Probiotics and Dental Caries**

Dental caries is a multifactorial disease of bacterial origin that is characterized by acid demineralization of the tooth enamel. Streptococci from the mutans group is considered the major virulence factor.

Comelli and colleagues (2002) reported that 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 a hydroxyapatite surface and to interfere with development of the cariogenic species *Streptococcus sobrinus*.

Next to lactobacilli, bifidobacteria are the probiotics commonly used for improving the intestinal microbial balance. Caglar et al. (2005) were the first to report the effect of bifidobacteria derived probiotics in reducing *S. mutans*. However, no statistically significant differences in *S. mutans* counts were found between the study groups during the intervention. The operative approach in caries treatment by probiotic implementation needs further studies.

#### **Probiotics and Periodontal Diseases**

Periodontal disease is classified into 2 types: gingivitis and periodontitis. Gingivitis is characterized by inflammation limited to the unattached gingiva, whereas periodontitis is a progressive, destructive disease that affects all supporting tissues of the teeth, including the alveolar bone. The main pathogenic agents associated with periodontitis are *P. gingivalis*, *Treponemadenticola*, *Tannerella forsythia* and *Aggregatibacter actinomycetemcomitans*. These bacteria have a variety of virulent characteristics allowing them to colonize the subgingival sites, escape the host's defence system and cause tissue damage. The persistence of the host's immune response

also constitutes a determining factor in progression of the disease.

A decrease in gum bleeding and reduced gingivitis has been observed by Krasse et al. (2006) with the application of *L. reuteri*. Koll- Klais et al. (2006) reported that resident lactobacilli flora inhibits the growth of *Porphyromonas gingivalis* and *Prevotellaintermedia* in 82% and 65% respectively.

#### **Probiotics and Imbalanced Oral Ecosystem**

Halitosis (bad breath) is believed to affect a large proportion of the population. In oral malodor, the sulphur containing gases (hydrogen sulfide, methyl mercaptan, and dimethyl sulfide), which are derived from the bacterial degradation of sulfur-containing amino acids in the oropharynx, play a significant role.

Kang and colleagues reported the capacity of various strains of *W. cibariato* inhibit the production of volatile sulphur compounds by *F. 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 a net reduction in the production of hydrogen sulphide and methanethiol and consequently a reduction in bad breath.

#### **Administration of Probiotics**

Dairy products supplemented with probiotics are a natural means of oral administration and easily adopted in dietary regime. Montal et al. (2004) administered probiotic mix both in capsules and in liquid in one of the studies. A specially designed straw with a reservoir containing probiotics has also been presented by Caglar et al. (2006). A recent invention for caries prophylaxis is a chewing gum containing *L. reuteri* *Prodentis*. Consumed twice daily, this was marketed to regulate *S. mutans* counts in the oral cavity.

#### **Adverse Effects**

The increased probiotic consumption inevitably leads to increased concentrations of the species in the host organism. Lactobacillus bacteremia is a rare entity and data on its clinical significance are mainly found through case reports. For the last 30 years, there have been approximately 180 reported cases (Boriello et al. 2003). Clinical characteristics of Lactobacillus bacteremia are highly variable, ranging from asymptomatic to septic shock-like symptoms.

Immune response: Animal experiments have shown that *L. lactis*, *L. casei*, *L. lantarum*, *L. helveticus*, and recombinant *L. plantarum* are capable of inducing both systemic and mucosal immune response against *S. pneumoniae* antigens and tetanus toxin, respectively, delivered by an intranasal route (Grangette et al. 2001, Oliveira et al. 2006).

Antibiotic resistance: Some probiotics are closely related to opportunistic bacteria and this may also cause transfer of antimicrobial resistance genes in between microorganisms (Lester et al. 2006).

## CONCLUSION

Probiotics are nevertheless, a new and interesting field of research in oral microbiology and oral medicine. The concept casts new light on the connections between diet and health, including oral health. But this area of research is in the infancy. Despite our rapidly increasing knowledge of pathogen–host interactions, the role of beneficial bacteria in preventing the emergence of pathogenic species and oral health remains obscure. There is a great need to elucidate the role of the oral beneficial microbiota to identify beneficial bacteria and to conduct proper largescale studies on the usefulness of probiotics to maintain or improve oral health.

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