

Synbiotics- ‘SYNC’ing Together- A new and innovative approach

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Introduction

In the 21st century due to change in life style of the population resulting more prone to various diseases. For the management of these diseases, the extensive usage of various medical antibiotics for an extended period of time leads to micro-organism resistant to these drugs.

To resolve this problem, a newer method was a raise in the recent past, which is “PROBIOTICS”. The “Probiotics” word stands for “for life”. According to World Health Organization (WHO) and by the Food and Agriculture Organization of the United States (FAOUS), Probiotics defined as “Live micro-organisms which when administered in adequate amounts confer a health benefit on the host”.⁽¹⁾

Probiotics are friendly micro-organisms, which have beneficial effects on human health and most commonly available in various commercial products such as curd, yogurt, capsules, etc. Probiotics used as an effective alternative treatment modality compared to conventional antibiotics with less side-effects, more economical and natural to combat periodontal diseases.⁽²⁾

This method came into in light in recent years with the efforts made by Elie Metchnikoff and Paul Ehrlich.

The general characteristics of probiotics are⁽³⁾

- Usually present in dietary products like fermented milk products. E.g., yogurt, cheese, etc.
- Live micro-organisms (bacteria or yeast) as probiotic strains, which are called as “Effector” strains. [Table 1]

- These products consist of beneficial micro-organisms, which stimulate health promoting flora thus, suppressing the pathologic colonization and disease spread.
- Modify endogenous microflora by competitive inhibition and other mechanisms like immuno - modulation.
- Provide beneficial effect to the host.

Probiotic therapy is also known as “Bacterial Replacement therapy”. The concept of bacterial replacement therapy in periodontics was first introduced by Teughels et al in 2007. They reported that the subgingival application of a bacterial mixture including *Streptococcus sanguis*, *S. salivarius*, and *Streptococcus mitis* after scaling and root planing significantly suppressed the re-colonization of *Porphyromonas* (canine *P. gingivalis*) and *P. intermedia* in a beagle dog model.⁽⁴⁾

Probiotics consist of specific microbial cultures like lactic acid producing bacteria such as lactobacillus and bifidobacterium and yeast and / or ingredients that stimulate gut micro-flora, capable of modifying the gastro-intestinal environment thus keeping the host healthy. A marked improvement in gastrointestinal health has been reported after using probiotic bacteria and/or prebiotic supplements, which has prompted much interest in the use of this approach for oral applications.⁽⁵⁾

Table 1: Different Routes of Administration for Probiotics

Vehicle	Strain	Outcome	References
Lozenge	<i>S. salivarius</i>	Reduces oral VSC levels.	Burton et al (2005).
Straw, tablet	<i>L. reuteri</i> ATCC 55 730	<i>S. mutans</i> level reduction.	Caglar et al (2006).
Yoghurt	Bifidobacterium DN-173 010	Reduction of salivary <i>S. mutans</i> .	Caglar et al (2005b).
Cheese	<i>L. rhamnosus</i> GG; <i>Prorionibacterium</i> JS	Reduced risk of high yeast counts and Hyposalivation.	Hatakka et al (2007).

Interaction with Oral Biofilm and Microflora:⁽⁶⁾

a. Direct interactions may include;

1. Involvement in binding of oral micro - organisms to proteins (biofilm formation).
2. Action on plaque formation and on its complex ecosystem by compromising and intervening with bacteria to bacteria attachments.

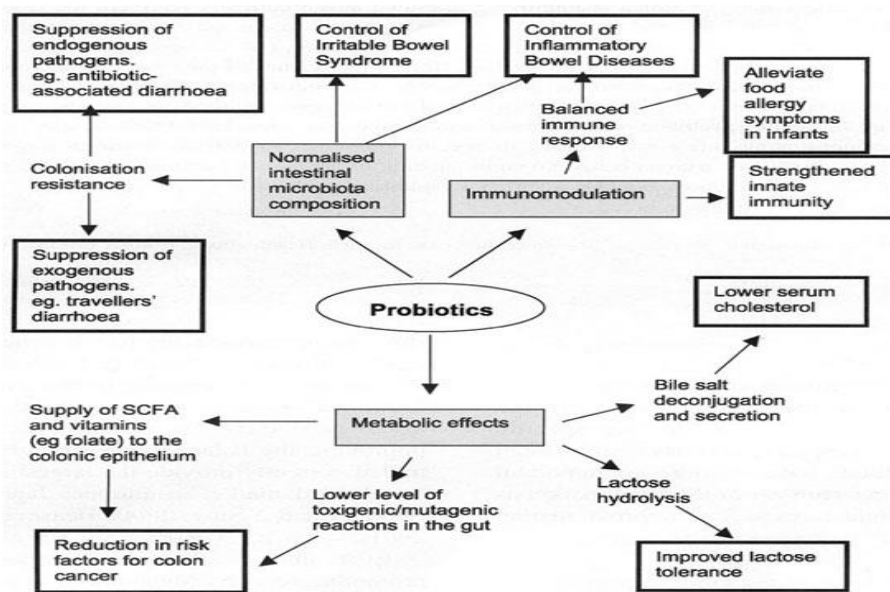
3. Involvement in metabolism of substrate (competing with oral micro – organisms for substrates available).
 4. Production of chemicals that inhibit oral bacteria (antimicrobial substances).
- b. Indirect interactions may include;**
1. Modulating systemic immune function effect on local immunity.
 2. Effect on non – immunologic defence mechanisms.
 3. Regulation of mucosal permeability.
 4. Selection pressure on developing oral micro flora with respect to colonization by less pathogenic species.
 5. Probiotics may prevent colonization resistance.
 6. Probiotics prevent colonization, overgrowth, and translocation of potential pathogens.
 7. Probiotics may reduce the incidence of future infections.

Rationale for Probiotics use as an adjunctive Therapy with Antibiotics⁽⁷⁾

1. Broad-spectrum antibiotics damage the flora and predispose the patient to additional infections.
2. Antibiotics increase the emergence of resistant strains.

Health Benefits of Probiotics: Fig. 1⁽⁸⁾

1. Elimination of lactose intolerance.
2. Anti - diarrhoeal.
3. Immuno - modulatory.
4. Anti – diabetic.
5. Anti – carcinogenic.
6. Hypo –cholesterolemia.
7. Anti - hypertensive.



Proposed health benefits stemming from probiotic consumption.

Fig. 1: Functions of Probiotics

Future Research In The Probiotics Area⁽⁹⁾

1. Determine the physiological role, mechanisms of action and extent of influence of probiotics in human health using human feeding studies.
2. Studies on high - risk human populations for colon cancer or cancer recurrence would be a possible target for some studies.
3. Validate biomarkers used for assessing probiotic function.
4. Testing of predictions based on biomarker studies with actual results in human clinical evaluations is needed.
5. Biomarker validation in the areas of immune system, cancer, and gut micro-ecology is especially important.
6. Once validated, biomarkers will be useful tools to assess dose - dependence and strain – specific responses.

Commercial Form: Probiotics are supplied along with prebiotic in form of powder sachet, gelatin capsules, or suspension. "BION" commercially available in Indian market (combination of pro- and pre-biotic) has 0.48 billion spores of *Lactobacillus bifidum*, *Streptococcus throphophilus*, and 0.10 billion spores of *Saccharomyces boulardii* along with 300 mg of fructo-oligosaccharides, is prescribed as single dose daily before meals in the morning.⁽¹⁰⁾

Lactobacillus reuteri strains were administered via chewing gum twice a day for 2 weeks at a concentration of 1×10^8 CFU (colony forming unit) along with Scaling and root planning. After 2 weeks, the clinical parameters were improved in group consuming probiotics chewing gum.⁽¹¹⁾ [Table 2]

Table 2: Commercial available products

Rinse Solution	W.cibaria	Reduction of VSC	References
Capsule, liquid	L. sporogenes, L. bifidum, L. bulgaricus, L. thermophilus, L. acidophilus, L. casei, L. rhamnosus.	Increased salivary counts of lactobacilli without significant Decrease in S. mutans counts.	Montalto et al (2004).
Yogurt drink	L. rhamnosus GG	Temporary oral cavity colonization.	Yli-Knuutila et al (2006).

Conclusion

The use of probiotics is an interesting emerging and not to be neglected field in general and oral healthcare. Based on the currently available clinical data, it seems that dietary probiotics do not confer a major risk for oral health. No negative effects of probiotic use on oral health have been reported to date. This can probably be attributed to the only temporary oral colonization and the vehicle (milk, yoghurt) in which most of the probiotics are consumed. The possibilities of applying probiotic therapy for other medical conditions are being investigated, including recovery from haemorrhagic shock, recovery from burn injury, cholesterol reduction and protection from coronary heart disease, effects on breast cancer cells, enhancement of tolerance of food allergens, protection from respiratory tract infections, liver conditions, skin infections, enhancement of bone health and reduction of obesity.

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