

## Probiotics In Dentistry- A Review

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### Abstract

Early childhood caries is of great concern to a dentist and its early management is necessary to prevent further loss. Probiotics are considered as a healthy bacteria which previously was used only to treat diseases related to gastrointestinal tract but, now a days with emerging trends, their use has now been recommended for oral diseases including early childhood caries. They are also considered as safe to use in infants and toddlers. The beneficial effect of probiotics in preventing overuse of antibiotics and antimicrobial resistance in an individual have made a great interest in its use.

**Keywords:** Early Childhood Caries, Probiotics, Dental Caries, Periodontitis

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### I. INTRODUCTION

In 1960s, a Greek work "PROBIOTIC" was firstly developed which means 'for life'. Food and agriculture organization along with WHO (World Health Organization) defines Probiotics in 2001 as 'the live microorganisms which, when administered in adequate amounts, confer a health benefit to the host'.<sup>1</sup> There are several characteristics that enables the understanding of Probiotics are:<sup>2</sup>

- safe for intended use
- sufficiently characterized
- supported by minimum one positive human clinical trial which is conducted according to generally accepted scientific standards or as per recommendations and provisions of local or national authorities if applicable
- must be active in the product throughout the shelf life at efficacious dose.

As suggested earlier in 20<sup>th</sup> century, due to the specific properties of probiotic bacteria, it was initially used for the replacement of harmful microbes from the gut flora, treating obesity, diabetes mellitus and sometimes to deal with osteoporosis also.<sup>1</sup>

It has been seen that there are >500 bacterial species present in gastrointestinal tract of adult, out of which some have beneficial effect whereas some are proven to be harmful for human body. Hence, the balance must be maintained to live a healthy human life. The excessive use of antibiotics, immunosuppressive medications or cytotoxic drugs are proven to alter this homeostasis by increasing the number of pathogenic bacteria in the body.<sup>3</sup> This disturbance in the balance of microbes in the body besides systemic diseases, can also cause many dental problems such as dental caries, periodontitis, gingivitis or periimplantitis. Therefore, to overcome this problem majority of researchers have suggested the use of probiotics in daily life.<sup>4</sup>

### II. MECHANISM OF ACTION

It is believed that some part of mechanism of probiotics begins from mouth because it represents the initiation of gastrointestinal tract.<sup>4</sup> There are two types of mechanism of action of probiotics that can possibly occur are: systemic and local mechanism which includes-

- a) ability of probiotic bacteria to inhibit or eliminate the other pathogens
- b) local and systemic effects occurring due to host immune response modulation
- c) the function of the intestinal epithelial barrier is influenced

Local effects are thought to occur when the microorganisms in the biofilm interacts with other bacterias and produce organic acids, hydrogen peroxide and bacteriocins that interferes with their growth. Systemic effects occurs through immunological pathways.<sup>5</sup>

Each probiotic species contains a specific strain that exerts different effects and have a competing action for example, streptococcus A12 strain increases the pH of plaque, colonizes the tooth surface and produces a challisin like protease by competing with streptococcus mutans that inhibits the production of bacteriocin by the bacteria and inhibits its growth. Similarly, ability of soft tissue colonization of streptococcus salivarius inhibits the formation of dental plaque. Strain M18 of streptococcus salivarius have seemed to decrease the dental plaque scores and S. mutans count if it is consumed by the children in adequate amount.<sup>6,7</sup>

Therefore, probiotics inhibits the formation of dental plaque and caries with their competing action with harmful pathogens and colonization in the oral cavity.

### **PROBIOTIC PROPERTIES**

A Probiotic must contain the following properties for its ideal preparation<sup>8</sup>:

- 1) must originate from human origin
- 2) If a Probiotic cannot colonise the gut, the ability to remain in intestine must be maintained
- 3) Interaction and ability to send signals to immune cells
- 4) It must have a high viability of cell
- 5) Non pathogenic
- 6) Good shelf life
- 7) local metabolic activity influence capacity

### **III. ROLE OF PROBIOTICS IN CONTROLLING ORAL THREATS<sup>9</sup>**

#### **PREVENTION OF ORAL HEALTH DISEASE**

After a long research, Probiotics are now recommended to treat the diseases of oral cavity due to its mechanism of action to adhere with the biofilm and act as a defensive system by preventing the colonization of harmful pathogens.<sup>9</sup> The oral diseases that can be prevented by use of probiotics are: dental caries, periodontitis, gingivitis, halitosis and some kind of oral cancers also.

#### **a) Prevention of Halitosis**

Halitosis is produced when there is an imbalance of healthy and harmful microbes occur in the oral cavity where harmful bacteria (anaerobic bacteria) increase in number producing a foul smelling gas causing odor. Probiotic administration causes a decrease in the production of foul smelling gases by inhibiting the growth of harmful pathogens and prevents Halitosis.

#### **b) Role In Endodontics**

The most common pathogens which are seen most frequently in root canal treated teeth that are difficult to treat are enterococcus faecalis and candida albicans. These are known to cause acute as well as chronic periapical inflammation. It has been seen that the growth of E. faecalis can possible be reduced with the help of L. rhamnosus irrigant.

#### **c) Role In Orthodontics**

In patients with fixed orthodontic therapy, streptococcus mutans levels are increased near bracket area causing more plaque accumulation and dental caries. This process starts as the white spot lesion which, according to research, can be reduced by the daily use of yogurt (probiotic) every day that contains Lactis DN-173010 (a subspecies of Bifidobacterium animalis) known to reduce S. mutans level in saliva in orthodontic patients.

#### **d) Relationship of Probiotics with Pediatrics**

There is a significant reduction in early childhood caries seen in pediatric patients after the use of probiotic strains such as Lactobacillus reutri during first year of life. Hence, probiotics can be beneficial in preventing early childhood caries.

#### **e) Role In Fungal Infection**

The fungal infection that infects the oral cavity is Candida albicans. In elderly, it has been noted that the use of probiotic cheese containing L. rhamnosus have greatly reduced the prevalence of C. albicans.

#### **f) Role In Prevention of Radiation Induced Mucositis**

The use of probiotic lozenges are known to decrease the rate of mucositis induced by anticancer therapy grade III and IV.

**g) Role In Periodontitis**

Plaque accumulation in the oral cavity for longer period of time results in gingivitis and on later stages periodontitis if not treated on time. Only treatment modality is removing plaque by instrumentation, but the chances of recolonization is unpredictable. Various researchers have seen that probiotics with their anti-inflammatory action decreases this inflammatory process. *L. reuteri* administration possibly reduce the gum bleeding and gingivitis as seen by Krasse et al (2006)<sup>10</sup>.

**h) Role In Dental Caries**

*S. mutans* are the main causative factor for occurrence of dental caries in an individual. Many researchers have believed that the use of probiotics have significantly reduced the level of mutans streptococci with short term administration of strain TI 2711 of *Lactobacillus salivarius*. This has also proven to be effective in not only reducing the caries but also affects the salivary buffering capacity. There are many naturally available probiotics like non sweetened milk, cheese and yogurt that contains high amount of calcium and phosphate in them which helps in enhancing remineralization. This is the more economical alternative as compared to probiotics tablets or capsules. Some studies have also suggested the early use of probiotics in infancy to prevent early exposure to caries and need more research on it which is not widely mentioned in the literature. Only 2 out of 3 clinical successful trials have been noted on toddlers and preschool children on probiotic consumption.

**IV. DOSE SELECTION AND MODE OF PROBIOTIC DELIVERY**

Researchers have suggested the dose of probiotics according to the formulation used which is being collaborted in a table.

**V. RECOMMENDED DOSAGE OF PROBIOTICS**

Sr. no	Type of formulation	Dosage	Time period
1.	Chewing gum	108 CFU/ ml 2 times a day	3 weeks
2.	Probiotic cheese	1.9 x 10 <sup>7</sup> CFU/gm 1.2 x 10 <sup>7</sup> CFU/gm	3 weeks
3.	Yogurt	200 gm/ day	4 weeks
4.	Mouthwash	2 times a day	4 weeks
5.	Probiotic tablet	3 x 10 <sup>8</sup> cells/ tablet 3 times a day	2 weeks
6.	Probiotic drops	1 x 10 <sup>8</sup> CFU/gm 2 x 10 <sup>9</sup> CFU/gm	2 weeks
7.	Xylitol	Twice daily	24 months
8.	Fermented milk	65ml/ day	4 weeks
9.	Condensed milk	200ml/ day	4 weeks
10.	Milk with fluoride	5mg/ L Fluoride in 200ml milk per day	15 months

**VI. SAFETY, ADVERSE EFFECTS, AND INTERACTIONS**

Clinical trials by investigators have shown no such adverse effects of probiotics because they are ingested orally and well tolerated by the patients. Sometimes mild effects such as constipation, bloating and flatulence can be seen. On contrary, some researches have demonstrated a clinical concern where they said that, since probiotic are live bacteria, which can sometimes move from the gastrointestinal tract to cause systemic infections. These live organisms can also cause infections in severely ill or immunocompromised patients. Precaution must be taken not to administer lactobacillus containing probiotics in lactose intolerant individual and *S. boulardii* in yeast allergic patients. The only formulation which is considered safe and non toxic is bifidobacteria containing probiotics. No known interactions have been noted by investigators with any other drug.<sup>1</sup>

**VII. CONCLUSION**

Earlier the probiotics were used only to treat gut infections, but with more investigations after knowing the mechanism of probiotics it has been now recommended to treat oral diseases with use of probiotics. But due to lack of awareness in population these are not used frequently by the individuals. More clinical trials are required to produce an adequate probiotic therapeutic for combating oral diseases.

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