

PROBIOTICS AND PREBIOTICS IN PERIODONTICS

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Abstract

Recently, probiotics have attracted the attention of researchers. It is now appropriate to change the therapeutic paradigm from the removal of certain bacteria to the modification of microbial ecology by probiotics. Some significant diseases have developed resistance to a variety of antibiotics, raising the potential of a return to the pre-antibiotic dark ages. Probiotics offer an efficient, inexpensive, and natural approach to treat periodontal disease in this situation. Thus, adding probiotic foods to the diet alone may stop, slow down, or even dramatically postpone the etiology of periodontal illnesses, encouraging healthy habits to fend off periodontal infections.

INTRODUCTION:-

In recent times, there have been significant changes with respect to the effectiveness of, and attitude towards, conventional anti-microbial therapy to combat disease. With the threat of widespread antibiotic resistance rendering many antibiotics useless against important diseases, there is an increased necessity not only to minimize antibiotic use and develop novel non-antibiotic based treatments, but also to raise the profile of disease prevention¹.

Probiotics are live micro-organisms administered in adequate amounts with beneficial health effects on the host. They repopulate the beneficial bacteria, which can help kill pathogenic bacteria and fight against infection. Probiotics administered orally, may benefit oral health by preventing the growth of harmful microbiota or by modulating mucosal immunity in the oral cavity¹. It poses great potential within the arena of periodontics in terms of plaque modification,

halitosis management, altering anaerobic bacteria colonization, improvement of pocket depth and clinical attachment loss. Probiotics are broadly categorised into two genera **Lactobacillus and Bifidobacterium**. These species are commonly used in probiotics².

They colonise and are found even in fermented the alimentary canal soon after birth. Due to the emergence of antibiotic resistance and

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trecolonization treated sites with pathogenic bacteria,there was a need for a new treatment paradigm to beintroduced for periodontal disease.

The need wasfulfilled by the introduction of probiotics².

Probiotic food cultures have become popular due to appreciation of their contribution to good health .in probiotic therapy, these beneficial microorganisms are ingested and thereby introduced to the intestinal microflora intentionally. This results in high numbers of beneficial bacteria to participate in competition for nutrients with and starving off harmful bacteria .the probiotics takes part in a number of positive health promoting activities in human physiology.

The possibilities of applying probiotic therapy for other medical conditions are being investigated, including recovery from hemorrhagic shock, cholesterol reduction, protection from coronary heart disease, effects on breast cancer cells, liver conditions, skin infections, enhancement of bone health, and reduction of obesity².

TERMINOLOGIES :-

PROBIOTICS :-

Lilley and Stillwell were the first to coin the term “Probiotics.” Fuller defined probiotics as “A live microbial feed supplement which beneficially affects the host animal by improving its intestinal microbial balance.”¹

PREBIOTICS:-

These have been defined as non-digestible oligosaccharides that affect the proliferation of resident commensal bacteria, which may exert beneficial effects on the host. Some examples of prebiotics are insulin-type fructans, maltodextrin, fructo-oligosaccharides, and galactosaccharides¹.

DYSBIOSIS :-

Dysbiosis occurs when there is an alteration in the normal balance of the micro-flora or organisms of the gastrointestinal (GI) tract. A pathogenic, disordered, or dysfunctional micro-flora ecosystem occurs that alters the metabolic or immunologic responses of the body. Dysbiosis can develop not only in the GI tract, but also in the oral and vaginal cavities. The common causes of dysbiosis are antibiotics, hypochlorhydria, and achlorhydria, high carbohydrate diet, food-borne pathogens, lifestyle changes, and stress. The fact that much more than the GI tract is affected cannot be ruled out. Detrimental effects of dysbiosis can affect

all body systems and organs. Halitosis, adrenal stress, diarrhoea, candidiasis, leaky gut syndrome, colon cancer, and breast cancer are just some of the consequences of dysbiosis. Thus, it becomes imperative to control dysbiosis by simply fortifying the GI tract with “good bacteria”, known as probiotics².

SYMBIOTIC :-

A mixture of probiotics and prebiotics that beneficially affects the host by improving the survival and implantation of live microbial dietary supplements, and thus improving host health and well-being³

MECHANISM OF ACTION :-

The mechanism of action varies from specific strains or combination of strains used, the presence of prebiotics and therefore the condition that being treated, as well as the stage of disease process during which the probiotics is administered.

1. Hindrance of pathogen attachment, colonization, and biofilm formation.
2. Induction of expression of cyto -protective protein on host cell surfaces.
3. Inhibition of collagenases and reduction of inflammation-associated molecules.
4. Stimulation and modulation of the host immune system.
5. Modulation of cell proliferation and apoptosis.
6. Killing or inhibition of growth of pathogens through the production of bacteriocins or other products like acid or peroxide, which are antagonistic towards the pathogenic bacteria.
7. Probiotics also can modify the encompassing environment by modulating the pH and/or the

oxidation- reduction potential which may compromise the ability of pathogens to become established⁴.

PROBIOTICS IN GENERAL USE:

Proven Indication

1. Rotavirus diarrhea
2. Reduction in antibiotic-associated side effects⁵

Possible Indication

1. Dental caries and periodontal health
2. Food allergies and lactase deficiency
3. Atopic dermatitis
4. Prevention of vaginitis
5. Urogenital infection
6. Irritable bowel disease
7. Cystic fibrosis
8. Traveler's diarrhea
9. Enhance oral vaccine administration
10. Helicobacter pylori infection
11. Various cancer⁶

Probiotics In Prevention Of Halitosis:

Halitosis has many causes (including consumption of particular food, metabolic disorder, respiratory tract infections), but in most cases, it is related to an imbalance of the commensal microflora of the mouth. Halitosis is the consequences of the activity of anaerobic bacteria that degrades the salivary and food proteins to produce amino acids, which are in turn transformed into volatile sulfur compounds, including hydrogen sulfide and methyl mercaptan, and dimethyl sulfide^{7,8,9}.

Periodontal Pocket Recolonization:

(Bacterial Therapy) :-

In periodontics “Replacement therapy” is also referred as “probiotics therapy”. The subgingival

application of a bacterial mixture including streptococcus sanguis, S.salivarius, and streptococcus mitis after scaling and root planing significantly suppressed the recolonization of porphyromonasgulae and P.intermedia. the subgingival application of beneficial oral bacteria delays recolonization by periodontal pathogens, reduce inflammation and improve bone density and bone levels in a beagle dog model^{10,11,12,13}.

Prevention Of Periodontal Disease:

Periodontal Disease Is Classified Into 2 Types:

- Gingivitis
- Periodontitis

Gingivitis may be characterized by inflammation limited to the gingiva, whereas periodontitis may be progressive, destructive disease that affects all supporting tissues of the teeth, including the alveolar bone. The main pathogenic agents that are related to periodontitis are P.gingivalis, Treponemadenticola, Tannerella forsythias, and aggregate ibacteractin omycetemcomitans. These bacteria have a variety of virulent characteristics allowing them to colonize the subgingival sites, escape the host’s defense system and cause tissue damage. The persistence of the host’s immune reaction also constitutes a determining factor in the progression of the disease¹⁴.

- Numerous mechanisms of preventing periodontitis have been proposed including the following:
 - Prevention of adhesion of pathogen to host tissues.
 - Stimulation and modulation of the mucosal immune system by reducing the production of pro-inflammatory^{15,16,17,18}

- cytokines through action on NFκB pathways, increasing the production of anti-inflammatory cytokines such as
- IL-10, and also by enhancing IGA defenses and influencing dendritic cell maturation
 - Improvement of intestinal barrier integrity and upregulation of mucin production.

Mechanism of action

- Enhance the growth of resident commensal gut bacteria particularly bifidobacteria and lactobacilli¹⁷.
- Cellobiose has the additional property of down regulating virulence factors of *Listeria monocytogenes*¹⁸.
- They may also exert a direct effect on the host by stimulating expression of IL-10, Interferon γ, enhancement of IGA secretion, and modulation of inflammatory responses in pathogens⁷.

DELIVERY MODE :-

Diet and dietary supplements eg- yoghurts, fermented milk

Capsules

Chewing gums

Lozenges

Mouth rinses

Powders

Tablets

TYPES:-

The commonly used probiotic bacteria belong to the genera *Lactobacillus*, *Streptococcus* and *Bifidobacterium*. A microorganism that should

demonstrate the following characteristic to be classified to be oral probiotic :-

- It should have beneficial physiologic effects
- It is of human origin
- It attaches, adheres, to and colonizes dental tissues
- It is stable in the oral environment – maintain
- It has genetic stability
- It produces anti- microbial substances
- It competes with pathogens for binding sites
- It enhances the non- specific and specific immune response of the host
- It should not ferment sugars
- It can be a resident probiotic of the oral cavity

CONCLUSION:

The utilization of probiotics for use in oral care application is gaining momentum. There is increasing evidence that the utilization of probiotics or prebiotics, finally, it will be essential to develop an understanding of the broad ecological changes induced within the mouth by their ingestion on the long-term ecological use in oral health and disease.

The use of probiotics in oral care applications is gaining momentum.

In today's tech-savvy world, it would be the right time to change the way bacteria are treated. There is increasing evidence that the use of existing probiotic strains can deliver oral health benefits.

Further work will be needed to fully optimize and quantify the extent of this benefit. Systematic studies and randomized controlled trials are needed to find out the best probiotic/prebiotic strains and means of their administration in different oral health conditions.

Whether considering probiotics or prebiotics, finally, it will be essential to develop an understanding of the broad ecological changes induced in the mouth by their ingestion and the long-term consequences of their use in oral health and disease¹⁸.

Gruner et al 2016 in a systematic review studying the beneficial effects of probiotics to prevent or treat the caries, gingivitis and periodontitis found that current evidence is supportive towards the use of probiotics in managing gingivitis and periodontitis.¹⁹

In another review, Martin – Cabezas et al 2016 studied the clinical influence of probiotics as an adjunctive therapy of scaling and root planning in the treatment of chronic periodontitis.²⁰

Hence, they concluded that probiotic therapy could be used for managing periodontal disease.

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