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Review Article

DENTAL CARIES AND PROBIOTICS – A REVIEW ARTICLE

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ABSTRACT

The definition of Probiotics, describes them as live microorganisms which when administered in adequate amounts confer health benefits on the host. Commonly, most of the species ascribed as having probiotic properties belong to the genera *Lactobacillus* and *Bifidobacterium.* They are administered in different quantitates that allow for colon colonization. These products help in stimulating health by promoting flora and also suppressing the pathologic colonization and disease spread. Initially, probiotics were used for the management of intestinal tract problems. But, nowadays its use has been proved in strengthening the immune system to combat allergies, stress, exposure to toxic substances and other diseases.

Key words:- Probiotics, commensal, immune strengthening

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INTRODUCTION

Probiotics are dietary supplements containing potentially beneficial bacteria or yeasts. They are administered in different quantitates that allow for colon colonization. These products help in stimulating health by promoting flora and also suppressing the pathologic colonization and disease spread. Initially, probiotics were used for the management of intestinal tract problems. But, nowadays its use has been proved in strengthening the immune system to combat allergies, stress, exposure to toxic substances and other diseases. There are few studies that reported ant cariogenic effects of probiotics and their use in the treatment of periodontal diseases and halitosis. It has been estimated that over 1000 bacterial species are present in the oral cavity. [1]

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The species most often found in saliva are belong to Lactobacillus such as Lactobacillus acidophilus, Lactobacillus casei, Lactobacillus fermentum, Lactobacillus plantarum, Lactobacillus rhamnosus and Lactobacillus salivarius. The bacteria which causes the commonest oral problem includes Streptococcus mutans, Fusobacterium periodonticum, Porphyromonas gingivalis can lead to various oral health problems including dental caries, periodontitis and halitosis. [2]

PROBIOTICS

The definition of Probiotics, describes them as live microorganisms which when administered in adequate amounts confer health benefits on the host. Commonly, most of the species ascribed as having probiotic properties belong to the genera Lactobacillus and Bifidobacterium.

Metchnikoff was the first one to suggest the posiibilty to modify the gut microflora by replacing the harmful microbes with the useful microbes. Metchnikoff proposed that consumption of fermented milk would 'seed' the intestine with harmless Lactobacilli, decreases the intestinal pH thereby suppresses the growth of pathogenic bacteria.

Prebiotics are nutrients that feed probiotic bacteria. They are non digestable food ingredients that stimulate the growth and activity of beneficial bacteria in the body. The term Synbiotic refers to the preparation having the combination of probiotics and prebiotics.

Use of certain probiotics in the treatment of infectious diseases, indigestion, irritable bowel syndrome, inflammatory bowel disease and lactose intolerance. [3]

Considering the particular activities of probiotics and their inhibitory effect on the growth of pathogens, research interest has been extended to the oral cavity where probiotics may also exert their therapeutic or preventive effect on the development and progression of common oral diseases.

Probiotics may also prove useful in addressing problems arising from the excessive use of antibiotics such as antibiotic associated dysbiosis.

Probiotic bacteria guard the oral health by competing with the oral pathogens for nutrients, growth factors and site of adhesion. Once adhered to the oral cavity, probiotic bacteria aggregate and inhibit the adhesion of the harmful microorganisms by producing bacteriocins such as peroxides. Probitics can also activate and modulate the immune system.

Probiotics help to prevent the inflammation of oral cavity and the oral tissue destruction caused by oral pathogens.

PROBIOTICS

- -Binding in oral cavity - Compete with pathogens for adhesion sites and Compete with pathogens for nutrients.
- -Modify Oral Conditions - Modification of oxidation and reduction Potential
- -Production of antimicrobial Substances - Hydrogen Peroxide
- -Immunomodulatory - Stimulate non specific immunity, Modulate humoral and cellular immune response.

Dental Caries (Tooth Decay) is a disease where bacterial processes cause damage to the hard structure, characterized by demineralization of tooth enamel. This leads to the formation of cavities on the surface of the tooth. Changes to the microflora within the oral cavity result in an overgrowth of various bacteria including; Streptococcus sorbinus, Streptococcus mutans and Porphyromonas gingivalis which are recognized as the primary caus of dental caries.

Consumption of yogurt containing Lactobacilli over a period of 2 weeks reduced the concentration of S. mutans in the saliva up to 80%. Comparable results were obtained by incorporating probiotics into chewing gum or lozenges. [4]

Riccia et al. used lozenges incorporated with Lactobacilli to study its anti-inflammatory effects in a group of patients with chronic periodontitis. The study showed significant improvement not only in the plaque - index, gingival – index and bleeding on probing for all patients but also a significant reduction in salivary levels of prostaglandin E2 and matrix metalloproteinases.

Although there are various reasons for halitosis like respiratory tract infections, metabolic disorders and consumption of some particular foods but the most common reason for halitosis is the imbalance of the normal microflora of the oral cavity.

Hence replacement of the bacteria implicated in halitosis by colonization with probiotic may have potential application in the prevention and treatment of halitosis. The administration of probiotic have been found to suppress the odor producing bacteria, resulting in a decrease in the foul smelling gases arising in the mouth. A study on the patients of halitosis reported reduced levels of VSC by 85% after consumption of probiotic gum or lozenges.

Candida albicans, a normal inhabitant of the oral cavity, is the most common cause of oral fungal infections. Age, Genetic, Harmonal, Systemic and Local Factors predispose clinical manifestations of the disease. Probiotic Applications in the oral cavity alleviate symptoms and reduce pathogenic potential of Candida species. Hasslof et al. investigated the inhibitory action of those Lactobacilli strains on the growth of oral Streptococci mutans and Candida albicans by agar overlay methods.

All Lactobacilli strains inhibited the growth of the Streptococci mutans completely with the exception of L. acidophilus. A 16 – week probiotic intervention study demonstrated a significant reduction by 75% of high yeast counts in the elderly. [5]

Pulpitis may lead to infection, in which abscess develops at the root of the tooth. An untreated infection

in a tooth may spread to the jaw or to other areas of the body. Depending upon the severity of Pulpitis, the decay or the pulp is removed via root canal treatment.

While antibiotics such as Amoxicillin help to clear off the infection, they also eradicate the beneficial bacteria in the oral cavity. In addition, these antibiotics may also cause dysbiosis in the gut leading to diarrhea. Probiotics prove useful in addressing problems arising from the use of antibiotics such as antibiotic assosciated dysbiosis and helps to restore the normal microbiota in the oral cavity.

Fixed orthodontic appliances are considered to jeopardize dental health due to accumulation of microorganisms that may cause enamel demineralization clinically visible as white spot lesions. Furthermore, the complex design of orthodontic bands and brackets may create an ecological environment that facilitates the establishment and growth of cariogenic Streptococci mutans which causes gum inflammation and dental caries. Hence it is important to have good dental hygiene to prevent / minimize the inflammation in the gum and dental caries during the orthodontic treatment.

Studies have documentated that the administration of probiotics help to reduce the level of S. mutans and the risk of dental caries and also the gum inflammation.

In BIFILAC Lozenges, a unique tooth friendly, non-cariogenic, sweet tasting Isomalt is used as base. This sugar free probiotic lozenge is developed based on unique technology transfer of our collaborator, TOA Pharmaceuticals, Japan.

- Indications:
- Dental Caries
- Gingivitis
- Apthous Ulcers
- Periodontitis
- Halitosis
- Orthodontic Brace Inflammation

Usage: 1 Lozenege twice or thrice a day for optimum Oral Health.

Duration: As directed by physician]

The probiotics in BIFILAC Lozenges binds to dental surfaces and forms biofilm which creates a physical barrier for pathogens. In addition it produces antimicrobial substances and modulates the immune response. All these actions helps to inhibit oral pathogens and restore the flora in the oral cavity.

The various ways by ehich BIFILAC Lozenges acts are summarized as under:

- Binds to dental surfaces as part of biofilm
- Creates a physical barrier for pathogens
- Produces antimicrobial substances & Inhibits Oral Pathogens
- Decreases the Inflammatory response
- Increases the immune response
- Restores Oral Flora

The Oral Cavity is a rather intricate habitat providing the establishment of diverse microbial species. Each environment within the mouth supports distinct yet overlapping communities of hundreds of species. The balance of the microorganisms present in the oral cavity can easily be disturbed and can lead to various oral health problems including dental caries, periodontitis and halitosis. Also usage of broad spectrum antibiotics results in a downfall in host's health as they do not distinguish between beneficial and harmful bacteria and alter the natural microbiota in the oral cavity.

Importance of maintain the natural balance of oral microbiota to combat various dental disorders such as dental caries, gingivitis, periodontitis etc., Probiotics has gained interest over recent years for the use in oral applications. In addition, Probiotics may also prove useful in addressing problems arising from the excessive use of antibiotics such as antibiotic associated dysbiosis.

Probiotics guard the oral health by competing with the oral pathogens for nutrients, and for the adhesion site. In addition, probiotics produce bacteriocins such as peroxides and inhibit the growth of harmful pathogens in the oral cavity. Probiotics also activate and modulate the immune system.

Thus pre and Probiotics is an promising option to restore oral health and to combat dental caries, gingivitis, periodontits, halitosis and other dental disorders. Numerous clinical studies have shown promising results with usage of probiotics in dental disorders like dental caries, gingivitis, periodontitis, halitosis and apthous ulcer.

Probiotics are dietary supplements containing potentially beneficial bacteria or yeasts. Probiotics are live microorganisms thought to be beneficial to the host organism and, when administered in adequate amounts, confer a health benefit on the host. Lactic acid bacteria and bifidobacteria are the most common types of microbes used as probiotics. Probiotics strengthen the immune system to combat allergies, stress, exposure to toxic substances and other diseases.

For some decades now, bacteria known as probiotics have been added to various foods because of their beneficial effects for human health. The mechanism of action of probiotics is related to their ability to compete with pathogenic microorganisms for adhesion sites, to antagonize these pathogens or to modulate the host's immune response. [6]

These also have been a change in understanding of the oral disease process because of better understanding of ecology and microbiology of oral cavity. Very encouraging studies have come up in recent past exploring probiotics in field of caries, periodontal

diseases and few other areas and the result tends to suggest beneficial effects effects of probiotics on oral health and on whole body in general.

The increased popularity of using probiotic bacteria and / or prebiotic supplements to improve gastrointestinal health has prompted interest in the utility of this approach for oral applications. Evidence now suggests that probiotics may function not only by direct inhibition of, or enhanced competition with, pathogenic micro-organisms, but also by more subtle mechanisms including modulation of the mucosal immune system. Similarly, prebiotics could promote the growth of beneficial micro-organisms that compromise part of the resident microbiota.

Probiotics are those viable microorganisms which are constituents of natural microflora of human body. Probiotic therapy decreases the risk of colonization by oral pathogens without depleting the friendly microflora. Probiotics resembles the human body microbiota and are readily incorporated in the natural microflora of the human body.

Probiotics have been successfukky used to control gasto-intestinal diseases. They also appear to alleviate symptoms of allergy and diseases with immunological pathology. The mechanisms of probiotic action appear to link with colonization resistance and immune modulation. Lactic acid bacteria can produce different antimicrobial components such as organic acids, hydrogen peroxide, carbon peroxide, diacetyl, low molecular weight antimicrobial substancs, bacteriocins, and adhesion inhibitors, which also affect oral microflora.

The Lactobacillus species help in synthesis of Vitamin B, Vitamin K, and also helps in the breakdown of bile salts. They help in enhancing innate and acquired immunity as well as help in inhibition of inflammatory mediators. The mechanism of action of probiotic by which they exert their effects may involve from modifying pH, antagonizing pathogens through production of antimicrobial compounds, competing for pathogen binding and receptor sites, stimulating immune modulatory cells to production of lactase. The epithelial lining of the oral cavity despite its function as a physical barrier, actively participates in the immune response. It has been shown that probiotic bacteria can stimulate local immunity and modulate the inflammatory response.

Another probiotic species, Lactobacillus helveticus, produces short peptides during fermentation of milk that act on osteoblasts and increase osteoblasts activity in bone formation. These bioactive peptides could thereby contribute to reducing the bone resorption associated. Patients having the immunocompromised condition should be cautious with the administration of probiotics as it leads to blood sepsis in such patients. However, in some case patients have developed septic shock too. Many lactobacilli Probiotic bacteria like Escherichia coli if colonized early in newborn; they may stimulate the mucosal immune system to produce antibodies and immunoglobulins. Preventive approaches based upon the restoration of the microbial ecological balance, rather than elimination of the disease associated species, have been proposed. These include the use of prebiotics to promote health-associated bacterial growth or the use of probiotic bacteria with associated benefits.

CONCLUSION

Caries is one of the most common infectious diseases in the world. In this respect, some bacteria are considered more caries-promoting than others, as an example Streptococcus mutans. A common feature for caries-promoting bacteria is that they are acidogenic and aciduric. There are only a few studies in which occurrence of caries has been studied in connection with consumption of probiotics. Clearly, long-term clinical studies with the disease occurrence as the primary outcome measure are needed to establish beneficial versus adverse effects of probiotics on oral health. Optimally, ‘old’ probiotics with proven benefits for general health could be also be used to benefit dental health.

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