



PROBIOTICS IN PERIODONTICS – A REVIEW

Dental Science

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ABSTRACT

Probiotics in recent times has gained a lost of interest in the field of medicine after its ability to aid in treating various systemic disease. Studies have shown Probiotics have a beneficial effects in dentistry in treating various periodontal problems. This review article aims in understanding the usage of probiotics in periodontics.

KEYWORDS

INTRODUCTION

Probiotics are living microbes, or a food ingredient containing living microbes, principally bacteria when used in adequate numbers have beneficial effects on human health. The term probiotics was first introduced by Werner Kollath in 1953. Earlier probiotics was 'antonym of antibiotics'. The term probiotics is derived from latin preposition 'pro' and greek adjective 'biotic' meaning 'for life'.⁽¹⁾ The term probiotic is currently used to name bacteria with beneficial effects on host. First probiotic species introduced was *Lactobacillus acidophilus* by Hull et al in 1984 and *Bifidobacterium bifidium* by Holocombh et al in 1991.⁽²⁾ Other common probiotics are streptococcus(LAB), *Bacillus* and propionibacterium(Non LAB), *Saccharomyces* (non pathogenic yeasts). Bonifait et al in 2009, says that beneficial micro organisms commonly known as probiotics are being added during the processing of foods such as sausages, cheese, yoghurt, and fermented milk to render health benefits'. Prebiotics are non digestible carbohydrates , they act as nutrient source for probiotics in gut. Probiotics and prebiotics form a symbiotic combination known as symbiotic. Teughels et al in 2008 says symbiotics enhance the survival and implantation of live microbial dietary supplements in GIT of host. Probiotics can be helpful in treating various systemic and infectious diseases and also oral conditions like dental caries , periodontal disease and halitosis.

DEFINITIONS

LILLY AND STILLWELL IN 1965, introduced the term probiotics as substances produced by micro organisms which promote the growth of other micro organisms.⁽³⁾

FULLER IN 1989 emphasized the importance of living cells in probiotics and he defined probiotics as a living microbial feed supplement which beneficially affects the host animals by improving its intestinal microbial balance⁽³⁾

THE WHO AND THE FAO OF US IN 2001 defined probiotics as live micro organisms when administered in adequate amounts confer a health benefit on host – commonly used⁽⁴⁾.

MECHANISMOFACTION

Probiotics act through various mechanism like direct interaction, competitive exclusion and by modulation of host immune response

DIRECT INTERACTION

Probiotics sticks to tooth surface where pathogenic bacteria reside co aggregate and compete with bacteria for adhesion sites on mucosa adhere to microbes present in oral biofilm and thereby, affects the pathogenic potential of bacterial species by producing antimicrobial substances like organic acids, hydrogen peroxide, bacteriocin^(6,7)

INDIRECT INTERACTION

Probiotics modify the surrounding environment by lowering pH, and/or by oxidation reduction potential thereby compromising the ability of pathogen to be established. They by neutralizing free radicals needed for mineral formation act as antioxidant and prevent plaque formation. By changing toxic gases to gases needed for metabolism,

they breakdown putrescence odours⁽⁵⁾.

ALTERING HOST IMMUNE RESPONSE

Probiotics inhibit collagenase production .They induce cytoprotective proteins on host cell surface. They modulate pathogen induced proinflammatory pathways. They prevent cytokine induced apoptosis. They provide beneficial effects by modulating humoral and cellular immune response^(6,7).

Lactobacillus prevent adherence of pathogenic bacteria by modifying protein composition of salivary pellicle. *W.cibaria* produce substances like bacteriocin and hydrogen peroxide against gram positive bacteria and also adhere to epithelial cells by coaggregating with *Fusobacterium nucleatum*.

Probiotics are used to treat various systemic diseases like inflammatory bowel disease, gastro intestinal disorders, delays the onset of cancer, lactose intolerance, elevated cholesterol, alcoholic liver disease,ulcerative colitis, asthma, hepatic encephalopathy, juvenile chronic arthritis, hypertension, urogenital infections.⁽⁸⁾

PROBIOTICS IN GINGIVITIS

S.oralis and *S.uberis* are commonly found in healthy gingiva. Krasse et al in 2006 describes *Lactobacillus reuteri* and *Lactobacillus brevis* as specific markers for periodontal disease. 14 days intake of *L.reuteri* strains show significant reduction in gingivitis and plaque index. Krasse et al study shows lower scores in plaque and gingival index, reduction in moderate to severe gingivitis when treated with *L. reuteri* incorporated chewing gums⁽⁹⁾. *Lactobacillus salivarius* WB21 tablet when taken orally shows insignificant reduction in plaque index and periodontal pocket depth among smokers.⁽¹⁰⁾ Staab et al study shows decrease in MMP-3 and elastase enzyme in plaque induced gingivitis after consuming *L.casei* containing milk for 8 weeks⁽¹¹⁾

PROBIOTICS IN PERIODONTAL HEALTH

Periodontopathogens include *P.gingivalis*, *T.denticola*, *Tannerella forsythia*, *A.actinomycetamcomitans*. Koll-Klais et al study in 2005, shows *L.gasseri* and *L.fermentum* are found greater in healthy patients than chronic periodontitis patients and they inhibit periodontal pathogens and maintain oral ecological balance.⁽¹²⁾ Intake of *L.casei* 37 shows reduction in periodontal pathogens. Intake of *L.salivarius* T12711 for 4 to 8 weeks inhibit *P.gingivalis*. Riccia et al studied the anti inflammatory effects of *Lactobacillus brevis* lozenges in chronic periodontitis patients found that there is a marked reduction in salivary levels of PGE2 and MMPs and also suggests their ability to prevent production of nitric oxide⁽¹³⁾. Shimazaki et al epidemiological study shows marked reduction in periodontal pocket depth and clinical attachment loss among non smokers who took yoghurt or beverage with lactic acid in their diet⁽¹⁴⁾. Teughels et al in his hypothesis says probiotics when used as an adjunct to scaling and root planning can inhibit periodontopathogen recolonization of periodontal pockets⁽¹⁵⁾. Gum periobalance is a combination of two strains of *L. reuteri* which is specially formulated to fight against periodontal disease. This lozenge is used every day after meals or after brushing in evening for their wide spread in oral cavity and to adhere to tooth surfaces⁽¹⁶⁾. Periobiotic is a

natural fluoride tooth paste containing *L.paracasei* probiotic which is not found in any other tooth paste⁽¹⁷⁾.

GUIDED POCKET RECOLONIZATION

Concept of replacing pathogenic bacteria with beneficial bacteria in gingival sulcus is known as guided pocket recolonization. Teughels et al reported subgingival application of bacterial mixture of *S.mitis*, *S.sanguis*, *S.salivarius* after scaling and root planning suppressed the recolonization of periodontal pathogens in a beagle dog model. This novel approach of guided pocket recolonization may provide valuable alternative to treat periodontitis⁽¹⁵⁾, there was delay in recolonization, reduction in inflammation and improvement in bone level and bone density was observed by Nackaerts.

PROBIOTICS IN HALITOSIS

Gram negative anaerobic bacteria like *Bacteriodes*, *T. denticola*, *P.gingivalis*, *T. forsythia* are most commonly associated with halitosis. Salivary and food proteins degrade in presence of anaerobic bacteria to produce amino acids which in turn transferred as volatile sulphur compounds including hydrogen sulphide and methanethiol. Other gases such as indole, skatole, putrescine, acetone are dominant cause of halitosis, although their substantivity is much lower. 85% of pathology causing halitosis lies in oropharynx (tongue coating, gingivitis, periodontitis, tonsillitis). Kanj et al were the first to use a more scientific approach for treatment or prevention of halitosis. In children after gargling with *W.cibaria* containing rinse there was marked reduction in halitosis. Kazor et al reported that *L.salivarius* is predominant species among healthy individuals and present in only one subject subsequently in lower level with halitosis⁽¹⁸⁾. *Weissella cibaria* inhibit volatile sulphur compounds both invitro and invivo. This is because of its ability to co-aggregate with VSC producing species like *F. nucleatum*, thereby, reducing the source for malodorous compounds in oral cavity and also by producing hydrogen peroxide which inhibit *F.nucleatum* as reported by Kang et al⁽¹⁹⁾. Probiotic placement of *S. salivarius* can prevent the colonisation of certain periodontal pathogens and limit their ability to produce volatile sulphur compounds by secreting bacteriocins. *S.salivarius* k12 taken in lozenge after mouthwash shows reduced volatile sulphur compound levels in 85% test group according to study by Burton et al⁽²⁰⁾.

CONCLUSION

The use of probiotics is under long term research. There are evidences for both their beneficial and harmful effects. Probiotics seems to have an beneficial effect on periodontal conditions. Further studies are necessary to evaluate the beneficial effect of probiotics.

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