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Oral probiotics: the beneficial microbes for dental & periodontal health

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Abstract

Probiotics or health-beneficial bacteria have only recently been introduced in dentistry and oral medicine after years of successful use in mainly gastro-intestinal disorders. The concept of bacteriotherapy and use of health-beneficial micro-organism to heal diseases or support immune function was first introduced in the beginning of the 20th century. Later the concept lead to the development of modern dairy industry and even today most probiotic strains are lactobacilli or bifidobacterium used in milk fermentation. 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 substances, bacteriocins, and adhesion inhibitors, which also affect oral microflora. However, data is still sparse on the probiotic action in the oral cavity. More information is needed on the colonization of probiotics in the mouth and their possible effect on and within oral biofilms. There is every reason to believe that the putative probiotic mechanisms of action are the same in the mouth as they are in other parts of the gastrointestinal tract. Because of the increasing global problem with antimicrobial drug resistance, the concept of probiotic therapy is interesting and pertinent, and merits further research in the fields of oral medicine and dentistry.

Key words Probiotics, Microorganisms, Dental, Periodontal

Introduction

Probiotics literally means *"for life".* Probiotics are live microorganisms (in most cases, bacteria) that are similar to beneficial microorganisms found in the human gut. They are also called "friendly bacteria" or "good bacteria." The world is full of microorganisms (including bacteria), and so are people's bodies—in and on the skin, in the gut, and in other orifices. Friendly bacteria are vital to proper development of the immune system, to protection against microorganisms that could cause disease, and to the digestion and absorption of food and nutrients. Each person's mix of bacteria varies. Interactions between a person and the microorganisms in his body, and among the microorganisms themselves, can be crucial to the person's health and well-being. This bacterial "balancing act" can be thrown off in two major ways: First by antibiotics, when they kill friendly bacteria in the gut along with unfriendly bacteria. Some people use probiotics to try to offset side effects from antibiotics like

gas, cramping, or diarrhea. Secondly "Unfriendly" microorganisms such as disease-causing bacteria, yeasts, fungi, and parasites can also upset the balance. Researchers are exploring whether probiotics could halt these unfriendly agents in the first place and/or suppress their growth and activity. Another part of the interest in probiotics stems from the fact there are cells in the digestive tract connected with the immune system. One theory is that if you alter the microorganisms in a person's intestinal tract (as by introducing probiotic bacteria), you can affect the immune system's defenses.

What probiotics are?

Experts have debated how to define probiotics. One widely used definition, developed by the World Health Organization (WHO) and the Food and Agriculture Organization (FAO) of the United Nations, is that probiotics are "live microorganisms, which, when administered in adequate amounts, confer a health benefit on the host" (Microorganisms are tiny living organisms—such as bacteria, viruses, and yeasts—that can be seen only under a microscope).

Mechanism of action

1. Direct interaction*:-*
   Probiotics interact directly with the disease causing microbes, making it harder for them to cause the disease.
2. *Competitive exclusion:-*
   Beneficial microbes directly compete with the disease developing microbes for nutrition or enterocyte adhesion sites[1].
3. *Modulation of host immune response:-*
   Probiotics interact with and strengthen the immune system and help prevent disease.

Role of probiotics in dental & periodontal health

1. *Probiotics, oral biofilm & microflora*:-
   Probiotics may act by direct or indirect interaction on
   oral biofilm and microflora and vice-versa .
   Direct interaction may include:

I. Involvement in binding of oral microorganism to proteins (biofilm formation).
II. Action on plaque formation and on its complex ecosystem by compromising and intervening
   with bacteria to bacterial attachments.
III. Involvement in metabolism of substrate (competing with oral microorganisms of substrate
   available).
IV. Production of chemicals that inhibit oral bacteria (antimicrobial substances).

Indirect interactions may include: Modulating systemic immune function selection pressure
on developing oral microflora towards colonization by less pathogenic species.

2. *Probiotics & tooth demineralization*:- It should be noted as most probiotics are in dairy form
   be containing high calcium possible demineralization of teeth would be reduced.
3. *Probiotics & caries reduction*:- *In vitro* study suggest that *Lactobacillus rhamnosus GG*(LGG)
   can inhibit the colonization of *Streptococci* caries pathogens and thus can reduced the incidence of caries in children [2]. In a swiss study, bacterial strains with potential properties as oral probiotics, were searched for the prevention of dental careis. *Streptococcus thermophilus* NCC1561 and *Lactococcus lactis* NCC2211 were

successfully incorporated into a biofilm mimicking the dental plaque.

4. *Probiotics & endodontics*:- Recently it has been showed experimentally that probiotics against *Enterococcus faecalis* led to reduction of bacterial vitality in root canals infected with inactivated or modified bacteria which might contain beneficial characteristics is attractive and merits further investigation.
5. *Probiotics & oral malodour*:- JP Burton *et al.,* [3] believed that *Streptococcus salivarious* strains (bacteriocin producing by K12 strain) have great potential for the control of halitosis and for the prevention of oral bacterial infections.The bacteriocins produced by strain K12 may have prevented re-growth of keymicrobial particulates in the halitosis associated ecosystem. Recent data indicates that bacteriocin produced by strain K12 are autoinducible and that they can cross stimulate bacteriocin production by other genous S.salivarious and related species[IV]. It has been shown to have a definite inhibitory effect on the production of volatile sulphur compounds (VSC) by F. nucleatum after ingestion of Weissella cibaria both in vitro and in vivo. The possible mechanism in the VSC reduction is the hydrogen peroxide generation by W. cibaria that inhibits the proliferation of F. nucleatum.
6. *Probiotics & periodontal health*:- Very recently Miyangi et al[V] reported the effects of probiotics on periodontal pathogens.Their report stated that oral administration of probiotic tablets containing Lactobacillus salivarius WB21 to healthy volunteers significantly reduced the number of P.gingivalis in the saliva and subgingival plaque , although no significant change was observed in the placebo group.Streptococcus oralis and Streptococcus uberis have been shown to inhibit the growth of pathogens both in the laboratory and animal models. Presence of S. oralis and S. uberis provided a good indication of health of periodontium. When these bacteria are absent from sites in the periodontal tissues, those sites are more prone to disease[VI] Koll et al[VII] characterized 22 strains of orally isolated lactobacilli with regard to antimicrobial activities on oral pathogens including periodontopathic bacteria and tolerance to environmental stress in vitro. The majority of strains including Lactobacillus salivarius were shown to suppress the growth of Aggregatibacter actinomycetemcomitans , Porphyromonas gingivalis , and Prevotella intermedia , suggesting a potential for oral lactobacilli to be used as probiotics for periodontal health.
7. *Probiotics & gingivitis*:- Krasse et al[VIII] showed decreased gingival bleeding and reduced gingivitis after the administration of probiotic Lactibacillus reuteri.
8. *Probiotics & periodontitis*:- Teughels et al. [IX] reported that the sub-gingival application of a bacterial mixture including Streptococcus sanguinis , S. salivarius , and S. mitis after scaling and root planing significantly suppressed the re-colonization of Porphyromonas gulae and Prevotella intermedia in a beagle dog model .Therefore , more research is needed to identify

appropriate effector strains for oral probiotics specifically designed to prevent and treat periodontal diseases.

9. *Probiotics & guided pocket recolonization(GPR):-* It has been showed that application of beneficial bacteria as an adjunct to traditional therapy may become a valid, non-antibiotic treatment approach for peridontitis. In this small scale animal study , researchers applied the mixture of beneficial bacteria after scaling and root planing , a concept called Guided Pocket Recolonization , or GPR , repopulation by bacteria associated with gum disease was delayed and reduced , as was the degree of inflammation , at a clinically significant level. With the emergence of resistance and the lack of non-antibiotic treatment options, this GPR approach may provide valuable addition of alternative to treatment option for periodontitis [IX] .
10. *Probiotics and periodontal vaccine*- Pasive immunization of humans using Porphyromonas gingivalis monoclonal antibodies temporarily prevents colonization of P. gingivalis. Probiotic therapy may be an alternative approach, but regulatory and safety issues for human periodontal vaccine trials must be considered.
11. *Oral probiotics mouthrinse*:- Lot of research has been carried out to develop probiotics mouthrinse. Recently a trial was designed by Oragenics to determine safety and the

to foods to fix the doses and schedules of administration of probiotics. Hence systemic studies and randomized controlled trials are needed to find out the best probiotic strain and means of their administration in different oral effectiveness of the mouth rinse against baseline levels of diseases-causing bacteria in the mouth. Daily mouth rinsing with Probiora3(TM) resulted in substantial reduction in the numbers of the bacterium, Streptococcus mutans, which attacks teeth, as well as two target periodontal strains, P. gingivalis and C. rectus, associated with gum disease and bad breath. The product was well tolerated by the subjects and no safety issues were identified with the twice daily use of product over a two-month period.

12. *Probiotic periodontal dressing:-*.A majority of strains including L.salivarius were shown to suppress the growth Aggregatibacter actinomycetemcomitans, P. gingivalis & P. intermedia.
    Probiotics strain included in periodontal dressing at optimal concentration of 10^8 $_{CFU/ml}$ were shown to diminished the number of most frequently isolated periodontal pathogens, Bacteroides sps, Actinomyces sps., S. intermedius & C. albicans.

Conclusion

Probiotics play an important role in combating issues with the overuse of antibiotics and antimicrobial resistance. Today's new technological era would be the right time to change the way bacteria are treated. Further, studies to understand the ability of probiotics bacteria to survive grow and have therapeutic effect when used for treatment or when added health conditions. Finally, possibilities to genetically modify or engineer potential probiotic strain may offer all new visions. Better scientific understanding and extended research of these tiny forms of life and their effect on

humans in the treatment of periodontal diseases might further broaden the field of potential application.

References

1. JK,Collin, L. Murphy, L. Omahony ,Infect Immuno, 199,65,4156-4172.
2. JH Meurman, H .Antila, A.Korhoren,, Eur J Oral Sci., 1995,69,53-56.
3. JP Burton, CN Chilcott, CJ Moore, G. Speicer, JR. Tagg, J Appl Microbio,2006 April,100(4),754-64.
4. JH Meurman , I. Stamatova, Oral diseases, 2007,13,443-451.
5. G. Mayangi , M.Kimora , S.Nakaya, J of Clin Periodontol, June 2009, 36(6), 506-513.
6. JD Hillman, SS Socransky,M. Shivers,Arch Oral Biol, 1985,30,791-795.S
7. P.Koll.,R.Ma”ndar., H .Marcotte., E.Leibur,M.Mikelsaar, L. Hammarstrom ,Oral Microbiol Immunol ,2008,23,139-147.
8. P.Krasse ,B. Carlsson ,C.Dahl , A.Paulsson , A.Nilsson G. Sinkiewicz, Swed Dent Journal, 2006,30,55-60.
9. W.Teughels, MG Newman.,W Coucke, Journal of Dental Research, 2007,86,1078-1082.