

The Use of Probiotics for Oral Health



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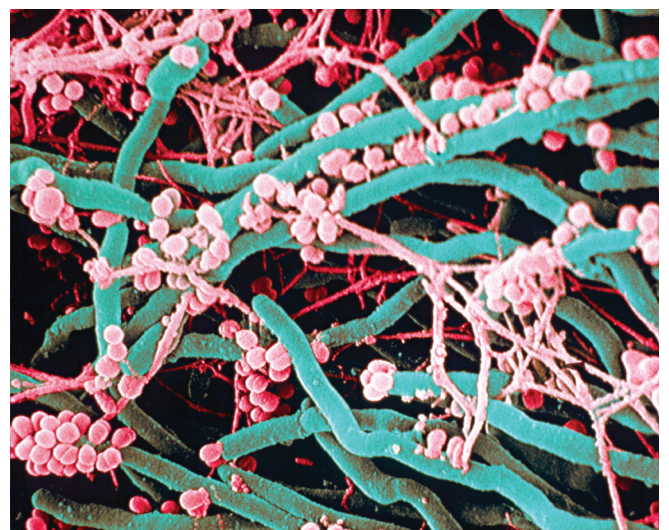
As we know, there is a lot of information now in the public domain on the use of probiotics to gain a beneficial effect within the digestive tract. In recent years, there has been a lot of interest in the use of probiotics in maintaining good oral health and treating oral infections. Few studies have been conducted to date, but those that have been completed show that there is another vital role for probiotics in the longevity and quality of life.

The oral cavity harbours a diverse array of bacterial species, with Kazor & team in 2003¹ reporting that there are more than 600 species that colonise the oral cavity. This includes a lot of organisms that are not commonly known to reside in the gastrointestinal (GI) tract, but also many that are more familiar; *Lactobacillus acidophilus*, *Lactobacillus casei*, *Lactobacillus fermentum*, *Lactobacillus plantarum*, *Lactobacillus rhamnosus* and *Lactobacillus salivarius*². The balance of all these microorganisms can easily be disturbed and a prevalence of pathogenic organisms can lead to various oral health problems including dental caries, periodontitis and halitosis.

Dental Caries

Dental caries (also known as tooth decay) is a disease where bacterial processes cause damage to the hard tooth structure, characterised by acid demineralisation of the tooth enamel³. 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 recognised as the primary cause of the dental caries^{4,5,6}.

Dental caries is one of the most common diseases in the world – second only to the common cold⁴ and can lead to pain, tooth loss, infection, and in severe cases even death. The formation of plaque on the surface of a tooth is a multi-step mechanism. Initial attachment of *S. mutans* is followed by its multiplication and accumulation, leading to a sessile community known as a biofilm. Biofilms are very stable communities that can tolerate low pH, antimicrobial products, and nutrient / oxygen deprivation. *S. mutans* also produces a bacteriocin, (mutacin), which is active against other streptococcal species and non-streptococcal gram-positive bacteria⁷.



Coloured scanning electron micrograph of *Streptococcus mutans* bacteria (pink) in dental plaque.

The production of mutacin leads to the efficient colonisation of this pathogenic microbe inside the oral cavity resulting in dental caries. *Streptococcus* species are acidogenic and create a low pH environment in dental plaque thus causing demineralisation of the tooth enamel.

Dental caries is a major problem in most industrialised countries, affecting the majority of adults and 60-90% of school children⁸. Sohn and colleagues⁹ found that there was a link between the consumption of carbonated drinks and the incidence of dental caries in children. This could be due to the *S. mutans* being able to ferment sugars found in fizzy drinks which further enhances their foothold in the oral cavity.

With the diversity of the oral microflora and the mechanisms of action of beneficial bacteria, it seems plausible that probiotics would have a favourable effect on the reduction of dental caries. Table 1 gives a brief overview of the studies conducted looking at the effect of oral probiotics on dental caries.

Periodontal Disease

Periodontal disease can be classed into two types; gingivitis – inflammation of the gingiva and periodontitis – progressive disease that affects all supporting tissues of the teeth. The main pathogenic agents linked with periodontitis are *P. gingivalis*, *Treponema denticola*, *Tannerella forsythia* and *Aggregatibacter actinomycetemcomitans*¹⁴.

The same researchers found that these pathogens have a complex advantage of possessing a variety of virulent factors that allow them to colonise the subgingival sites, escape the host's defence system and cause damage to the whole tooth structure¹⁴. Koll-Klais and team¹³ found a prevalence of *Lactobacillus gasseri* and *L. fermentum* in the oral cavity of healthy individuals compared to those with chronic periodontitis.

Further to this, the same researchers have found that lactobacilli inhibit the growth of periodontopathogens, demonstrating the influence of lactobacilli in the oral cavity of a healthy individual.

Another study¹⁵ found that the daily consumption of lactic acid bacteria in a drink reduces the probing depths and less loss of clinical attachment (gingiva to supporting bone) compared to individuals who consumed fewer of these dairy drinks. Another group who consumed daily cheese and milk products did not exert the same characteristics.

Halitosis

There are a number of reasons for the onset of halitosis (bad smelling breath) – consumption of particular foods, metabolic disorders and respiratory tract infections – but commonly it is associated with an imbalance of the commensal microflora of the oral cavity¹⁶.

Reference	Strain	Study
Náse <i>et al</i> , 2001 ¹⁰	<i>L. rhamnosus</i>	Supplementing 1-6 year old children with <i>L. rhamnosus</i> for 7 months significantly reduced the risk of dental caries.
Strahnic <i>et al</i> , 2007 ¹¹	<i>L. salivarius</i> & <i>L. fermentum</i>	Both strains showed antagonistic activity on the growth of <i>S. mutans</i> and <i>Streptococcus pneumoniae</i> . <i>L. salivarius</i> was able to survive an environment of low pH as that produced by a high number of <i>S. mutans</i> .
Chung <i>et al</i> , 2004 ¹²	<i>L. fermentum</i>	<i>L. fermentum</i> was found in the saliva of healthy children. This strain significantly inhibited the formation of the insoluble glucan produced by <i>S. mutans</i> . It did not affect the multiplication of this pathogenic strain, but it completely inhibited the adherence onto cuvette walls.
Stamatova <i>et al</i> , 2007 ⁶	<i>L. rhamnosus</i> & <i>Lactobacillus bulgaricus</i>	Inhibitory effects against <i>P. gingivalis</i> , <i>Fusobacterium nucleatum</i> & streptococcal spp.
Koll-Klais <i>et al</i> , 2005 ¹³	Various lactobacilli strains	69% of these strains inhibited <i>S. mutans</i> , 82% inhibited <i>P. gingivalis</i>

Table 1: A brief overview of some of the studies conducted looking at the effect of oral probiotics on dental caries.





Rotten teeth and receding gums of a patient suffering from dental caries and periodontal disease.

Although halitosis can be very embarrassing, and can affect personal relationships as well as general communication, it does not rank highly as a reason to visit the dentist. This is a condition that is thought to affect up to one third of the world's population¹.

An unbalanced oral microflora has been associated with the production of malodorous substances called volatile sulphur

compounds (VSCs). These are by-products of microbial degradation of proteins, blood, mucins found in saliva, and traces of food retained on oral surfaces¹.

Kazor and team¹ looked at the species of bacteria found on the tongue of patients suffering from halitosis and compared the findings with subjects who were considered healthy. The species found to be most associated with halitosis were *Atopobium parvulum*, *Eubacterium sulci*, *Fusobacterium periodonticum*. In the same study, *Streptococcus salivarius* was found to be the most prevalent in the healthy subjects, and this is thought to be due to the capability of *S. salivarius* to produce bacteriocins which could contribute to reducing the number of bacteria that produce VSCs⁵.

Conclusion

Current findings on the potential use of probiotics against oral conditions are very encouraging. Even though the evidence for periodontitis is less so than dental caries, if dental caries can be prevented then periodontitis is less likely to occur. More research is needed in this area, but the use of probiotics to manage the oral microflora is looking to be a very effective adjunct way to control oral conditions that affect so many people worldwide.

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Janine completed her degree in Animal Science at Writtle College, Essex in 2002. Janine originally came to Probiotics International as Territory Manager for the South East, selling the Veterinary range of Protexin products, and since 2007 has taken on the role of Technical Manager covering human, veterinary and animal health sectors, based at head office in Somerset.

Probiotics International Ltd is one of the largest manufacturers and suppliers of probiotic supplements for the healthcare, veterinary and animal health industry. Products are marketed under the brand name of Protexin.

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