How healthy the gingivae are largely depends on the balance of the oral microbiome. According to a review by Kilian et al. in the British Dental Journal, our oral microbiome encompasses no less than 700 distinct bacterial species that cover the teeth and oral mucosa and are attached to these surfaces as part of the oral biofilm. Ideally, this microbiome is naturally in a state of balance—symbiosis—protecting our mouths from the over-proliferation of disease-promoting bacteria. However, the ingestion of fermentable sugars, smoking, stress, physiological changes like pregnancy, or the frequent use of antibiotics and antimicrobials can create an imbalance in the oral microbiome—dysbiosis—that in turn can lead to diseases such as caries, gingivitis and periodontitis.

Toothpaste—The helpful assistant

Maintaining a healthy oral microbiome is clearly essential to good gingival health, but what measures can we take to achieve this? According to Mogens Kilian, Professor of Medical Microbiology at Aarhus University, as well as Affiliate Professor of Bacterial population genetics at the University of Copenhagen, “The balance that has been lost as a result of modern lifestyles can, in most cases, be restored by improved oral hygiene, including the use of toothpastes containing not only fluoride but also other beneficial compounds, such as enzymes and proteins occurring naturally in saliva.”

Fluoride in toothpaste

Fluoride, firstly, has been proven to provide effective protection against the development of caries by hardening and remineralising tooth enamel. It also exerts an antibacterial effect. “The most dramatic success of dental research is the discovery of the protective effects of fluoride,” said Kilian. “Virtually every commercial toothpaste includes fluoride, which increases the resistance of tooth enamel against caries. In this way an imbalanced oral microbiome can be restored in spite of the negative effects of modern life.”

Enzymes and proteins—Natural salivary components

Enzymes and proteins are naturally present in saliva and are key to a healthy mouth. Each person produces over one litre of saliva per day on average. Made up of 99.4 per cent water, saliva keeps the mouth lubricated and comfortable, allowing one to speak, chew, taste and swallow. The remaining 0.6 per cent of saliva is made up of minerals, proteins and enzymes, which all perform an integral role in protecting and repairing the oral cavity. These salivary components are essential for maintaining good oral health, since they protect the enamel of the teeth, thereby helping to prevent dental caries and ensure gingival health.

Saliva is also important in the formation of the pellicle, the thin acellular organic film that forms on oral surfaces after exposure to saliva. The pellicle is a mostly bacteria-free protective film consisting of protein, glycoprotein, lipids and salivary enzymes that forms on...
the teeth, gingivae and oral mucosa. Inevitably, a build-up of microorganisms, biofilm, can form on the pellicle and threaten the enamel. The enzymes and proteins in saliva, however, are able to act extremely effectively against unwanted bacteria, fungi and viruses, by restricting their formation and breaking down potentially harmful sugars.

Zendium studies

A 2017 study by Adams, published in *Scientific Reports*, showed how a toothpaste containing certain enzymes and proteins can significantly shift the ecology of the plaque microbiome at species level, resulting in a community with a stronger association with gingival health. That year, two other studies, presented at the oral health research congress of the Continental European and Scandinavian divisions of the International Association for Dental Research in Vienna in Austria, shed light on how a toothpaste containing enzymes and proteins naturally present in saliva positively affects gingival health. The two different teams of scientists compared Zendium (Unilever), a commercial toothpaste that, in addition to fluoride, contains these natural salivary components, with control fluoride toothpastes. One team did so in an epidemiological setting, and the other in a clinical trial.

Epidemiological setting

An epidemiology study at the University of Copenhagen led by Prof. Anne Marie Lynge Pedersen, head of the university’s Department of Odontology, examined 305 people regarding the long-term effects of their personal choice of toothpaste on their gingival health. Long-term Zendium users were found to have significantly better gingival health than those who used regular, fluoride-only toothpastes. These results were irrespective of diet and brushing or smoking habits. This landmark study showed for the first time that long-term everyday use of a toothpaste that contains enzymes and proteins positively affects gingival health.

Clinical trial

A study in the UK at the Bristol Dental School’s Clinical Trials Unit found similar results. Prof. Nicola West and her colleagues examined the gingival health of 229 participants regarding plaque, inflammation and bleeding. After 13 weeks, the participants who had been brushing twice a day with Zendium had significantly better gingival health on all three parameters than the group that had been brushing with a fluoride control toothpaste. Moreover, 83 per cent of the Zendium users had improved gingival health. Speaking at the congress in Vienna, West said, “It is very exciting to see two studies demonstrating the benefits brushing with Zendium can bring to gingival health.”

Prevention and the microbiome

Consistent with the findings of the Adams investigation, the two studies present evidence that a toothpaste containing enzymes and proteins enhances the effects of the innate immune factors in the oral cavity. The result is a shift of the oral microbiome towards healthy symbiosis and improved gingival health. The number of bacteria associated with gingival health increases, and the number of bacteria associated with periodontal disease decreases. “With the new information that has become available, it is clear that oral disease is the result of dysbiosis,” said Kilian. “Prevention is a crucial part of dentistry, prevention aimed at restoring the balance within our oral microbiome and between the microbiome and us.”

*Editorial note: A list of references can be obtained from the publisher.*