

Interview: The natural oral microbiome is not associated with oral disease

By Kristin Hübner, DTI

As Professor of Oral Microbiology at the University of Leeds, Philip Marsh has received national and international awards for his research in the field and is a regular conference speaker. At the Australian Dental Congress, where he recently presented three lectures on the topics of dental biofilms and oral microbial ecology, Dental Tribune had the opportunity to speak with him about the relationship between lifestyle factors and the microbial composition and how to best maintain a healthy bacterial balance in the mouth.

The microbial balance of the oral cavity is essential for dental (and overall) health. Could you briefly explain this relationship?

Humans and micro-organisms have evolved to have a close and important symbiotic relationship, to the extent that we are 50 per cent microbial! These micro-organisms [the human microbiome] are natural and deliver essential health benefits. In



ADC speaker Prof. Philip Marsh. (Photograph: Australian Dental Association)

the mouth, the normal oral microbiome prevents colonisation by external microbes—some of which would be potentially pathogenic—and contributes to the development of our host defences and cardiovascular system. The natural oral microbiome

is closely linked to oral health and is not associated with oral disease.

The oral microbiota is vulnerable to disruption by lifestyle and environmental changes.

What exactly can cause a shift and what are potential consequences?

The symbiotic relationship between the oral microbiota and the host is dynamic and can alter if the oral environment undergoes a substantial change, often as a consequence of an altered lifestyle. A clear example is when salivary flow is reduced or when an individual more regularly consumes sugar-containing foods and beverages. In this situation, the dental biofilm spends more time at an acidic pH.

This leads to an enrichment of acid-producing and -tolerating bacteria at the expense of beneficial organisms and increases the risk of dental caries. Similarly, the host mounts an inflammatory response if biofilm accumulates around the gingival margin. If this fails to reduce the microbial load, then the protein-rich gingival exudate that delivers the host defences inadvertently acts as a novel supply of nutrients for the proteolytic and obligately anaerobic bacteria in subgingival biofilms. These bacteria subvert the host response and continue to drive inflammation; this exaggerated response is responsible for host tissue damage.

Is the composition of the oral microbiota mainly based on heredity or can it be managed through external factors?

Some elements of the make-up of the oral microbiota are linked to heredity, but the general composition and activity of these microbes can be managed by effective oral hygiene and an appropriate lifestyle, for example reducing the amount and frequency of intake of fermentable sugars in the diet, avoidance of tobacco-smoking, etc. An unintended side-effect of some medications can be a reduction of salivary flow; this would disturb the natural balance of the oral microbiota and increase the risk of dental caries.

Dental care products aim to reduce harmful bacteria while maintaining the good ones. Is there a danger of using too much product and thereby destroying the oral flora?

The oral microbiota is natural and beneficial and therefore needs to be managed and maintained at levels compatible with oral health. Oral care products are designed and evaluated to support the patient in maintaining an appropriate level of oral micro-organisms, so if they are used as intended, there is little danger of negatively disrupting the oral microbiota. In contrast, the long-term use of broad-spectrum antibiotics can lead to the suppression of significant numbers and types of beneficial oral bacteria, and this can result in overgrowth by yeasts or environmental microbes.

Bacteria play an important role in the development of diseases such as periodontitis or caries. Are there ways to manage harmful colonisation other than with dental hygiene measures, for example with vaccines, or will there be in the future? New strategies to promote beneficial oral bacteria and/or to suppress the likelihood of disease are being developed. These strategies include the development of oral probiotic bacteria to prevent dental disease and the use of prebiotics, which are supplements designed to boost the growth of beneficial bacteria. Novel anti-inflammatory agents are being evaluated that would promote wound healing and reduce the tissue damage caused by a subverted host response to subgingival dental biofilms. Molecules that reduce biofilm formation or inhibit species implicated in dental disease are under active investigation. Some snack foods and drinks contain sweeteners that cannot be metabolised into acid by oral bacteria.

Is dentistry experiencing greater challenges with regard to biofilms and bacterial shifts today than in the past, and if so, why?

The main differences today compared with the past probably surround the increased amounts of sugar in snack foods and drinks. Also, people are living longer and are retaining their teeth into later life, so the dentition is vulnerable to dental disease for longer, and this is coupled with the fact that a side-effect of many medications taken by the elderly is a reduction in salivary flow.

What strategies for keeping a healthy balance in the mouth can dentists teach patients?

The main strategies are for patients to practise effective oral hygiene and thereby reduce biofilm accumulation and to appreciate the impact of sugar in their diet on their risk of dental caries. It may be helpful if patients realise the relationship and direct link between their lifestyle, their oral microbiome, and their oral and general health and well-being. ¹⁰

Thank you very much for the interview.

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