



Opinion Article

Oral Health in a Context of Oral Microbiome

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Many etiological factors have already been clearly identified in some oral conditions. A strong association with floral dysbiosis has been documented. However, much remains uncertain and yet to be explained. Continued research into the pathophysiology of oral diseases (and especially the role of microbiota in health and sickness), the implementation of knowledge already gained on disease prevention should be intensified if the burden of oral diseases worldwide is to decline in the future.

Disease of the oral cavity impact quality of life, significantly decrease one's capacity to function and even jeopardize a person's life if severe. However, primary oral diseases, with the exception of oral cancer, are rarely deadly. It is also worth mentioning that oral health, apart from being a determinant of general health and quality of life, is also strongly correlated with certain systemic conditions, sometime proposed to be a causing factor, a modifying factor or as an outcome thereof.

Notable topics which are commonly dealt with under the branch of oral health are proper hygiene practices, role of oral microbial flora in health and sickness (both localized and systemic), caries, chronic periodontal conditions and oral carcinoma.

The oral microbiome, a term collectively used to refer to the diverse populations of microorganisms harbored within the mouth, is somewhat on the intersection of intrinsic and extrinsic risk factors as it is significantly modulated by the environmental factors within the host, and at the same time, it influences the host's internal environment. All humans have a shared basal microbiome; made up of flora which colonies various body parts under normal conditions. In addition, a proportion of the overall microbiota is composed of individual variations that are unique to every person and stem from their particular genetic make-up and way of life, "the variable microbiome". And even within one person's mouth - the microbiota is incredibly dynamic and keeps evolving as its host ages or undergoes different physiological or pathological processes. The implications of that are very promising

and can be illustrated by the new understanding of intestinal flora development. Modulation of the microbial colonies may have preventative and therapeutic in many systemic diseases.

In turn, the flora affects the human organism, establishing a bidirectional relationship. Some of the ways in which this resident population affects the human body include the production of vital compounds such as vitamin K for the host, digesting food products in the lumen of the gut and influencing the release of signaling molecules in the GIT [1]. When both parties benefit from this relationship, it is termed symbiosis. Caries is caused by acid-producing microorganisms that reside in form of a plaque. The delicate balance between demineralisation and remineralisation of enamel can be disturbed – leading to dental caries. Many studies have been conducted to explore the mysterious involvement of flora in the development of this condition. Recent publications illustrate the importance of further research into specific organisms that have been abundantly found in caries, such as *Niesseria* and *Corynebacterium* [2,3]. Others suggest that it is perhaps the relative composition of the microbiota and not just any predominating organism that can be served as a predictor of caries development in children [4]. In addition, a review from 2020 illustrated that supplementation of probiotics have reduced the risk for developing tooth decay [5], further emphasizing the important clinical applications of better insight into the factors that govern the microbiome.

There is a way to prevent or slow down the development of the mature plaque potentially preventing caries development, by frequently disrupting the biofilm, which precedes it. A simple methods of GIFTS (Gum and tooth rubbing with Index Finger, Tongue cleaning and water Swishing) after consuming anything whatsoever has the potential to modify the microbiome proportions [from salivary samples] by frequently and effectively preventing plaque formation [6]. This method reduced total bacteria in saliva and substantially reduced streptococcus species compared to

other cleaning modalities. This finding highlights the undeniable relevance and importance of hygiene practices in oral care - as well as identifying new techniques to better prevention.

The current hypothesis for the chronic periodontitis pathogenesis is the ecological hypothesis: a site of dysbiosis – where there is a significant modification to flora, is predisposed for overgrowth of pathogenic genera – leading to initiation of disease. In 2020, an integrated hypothesis was suggested, anchoring these diseases' pathophysiology in the dietary effects on the microbiome [7], which relates to hyperglycaemia from high sugar diet (modifying the saliva composition, which serves as the main nutrient source of the oral flora). However, the question not answered in the paper is the extent to which controlling blood sugar levels could halt disease progression or potentially be used in curative intent. Lastly, but substantially significant is one's immunity status, conferring the ability to keep cancerous developments at bay if functional [8].

The association between oral cancers and the residing microbiome is an interesting new direction being explored. Periodontitis has been linked by multiple studies to the development of oral squamous cell carcinoma. More interestingly, microbial dysbiosis seems to be implicated in other cancers beyond the oral cavity, such as oesophageal, pancreatic, breast and colorectal. In addition, some researches have suggested the use of distinct patterns as a biological marker for different cancers [9,10], whereas others suggest the microbiota be target for modulation, through which cancer progression could be indirectly affected [11].

Conclusion

Extensive research into the oral microbiome has paved a path into potentially better understanding of some important disease mechanisms but still are far from full. Unveiling the intricacies of those relationships can have a positive effect on dental caries, chronic periodontitis and oral squamous cell carcinoma understanding, diagnosis and perhaps even treatment.

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