

Higlighting the Role of Human Oral Microbiome and Their Relationship among Most Prevalent Human Oral Cavity Diseases Caused by Bacteria

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Introduction

The human oral cavity includes numbers of different habitats, such as teeth, tongue, cheeks, and hard and soft palates, and it is harbored by thousands of bacterial species [1]. The human microorganisms found in human oral cavity have been represented as the oral microflora, oral microbiota, or more lately as the oral microbiome. This term microbiome was presented by Joshua Lederberg who is an American geneticist and pioneer in the field of Bacterial genetics also he is one of the researchers involved in The NIH (Human Microbiome Project) [2]. The oral microbiome is extremely multifarious. The average adult harboring about fifty to one hundred billion bacteria

in the human oral cavity, which characterize about two hundred prevalent bacterial species. There are nearly about seven hundred prevalent taxa of which less than one third have not yet been cultured in vitro [3]. The oral cavity is the main entrance to the human body. The majority of oral microorganisms are commensal which plays a very significant role in sustaining the steadiness of the mouth ecosystem. In spite of this, some of these microorganisms shows an important role in some oral disease specifically dental caries and periodontitis as shown in Figure 1[4].

Each human body is composed of a specified microbiome that is crucial to maintain a good health but also able to elicit

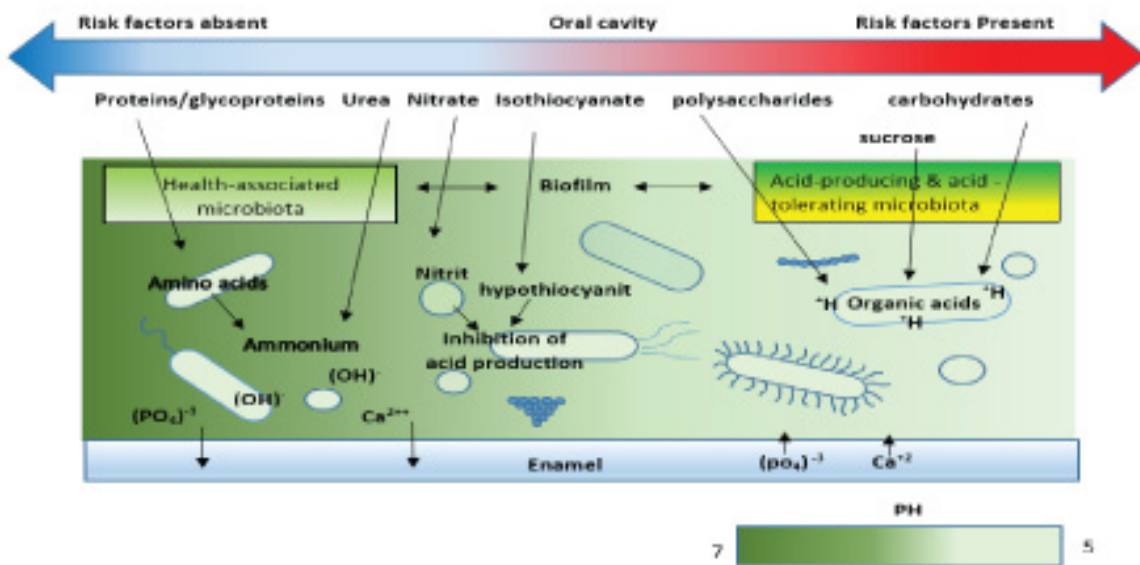


Figure 1: Model depicting host-microbe interactions in the pathogenesis of dental caries.

disease. The oral microbiome is especially imperative to health because it can cause both oral and systemic disease. The oral microbiome rests within biofilms throughout the mouth, forming an ecosystem that maintains health when in equilibrium. However, certain ecological shifts within the microbiome allow pathogens to manifest and cause disease. Severe sorts of oral disease may end in systemic disease at different body sites. Unlike most infectious diseases where a one causing agent are often found in charge for the infection, oral diseases appear to be the result of multiple microorganisms. In periodontitis, as an example, minimum of three bacterial organisms are found to be directly related with the occurrence of the disease. The mouth harbors an abundant and diverse microflora, which is usually found within biofilms attached to the varied soft- and hard-tissue surfaces. Recent studies using molecular methods have revealed previously unrecognized species within biofilms associated with health and several common oral diseases. These unrecognized species established an under-appreciated diversity within the flora, with new inquiries to be answered. Information regarding the composition of the oral microbiome associated with oral health, dental caries, periodontal disease [5].

Oral Microbiome Composition

The human oral cavity is composed of various microorganisms such as Bacteria, Viruses, Fungi and Archaea [6].

Bacteria

Bacteria account for the most portion of oral microorganisms, and the major knowledge of the composition of oral bacteria comes from past culture-dependent methods. Culture-dependent techniques led to the identification of specific microorganisms thought to possess a causative role in caries and periodontitis [7]. The oral bacterial community is dominated by the 6 major phyla, Bacteroidetes, Proteobacteria, Actinobacteria, Firmicutes, Fusobacteria and Spirochetes, which account for ninety four percent of the taxa detected. (<http://www.homd.org>).

Viruses

Most of the viruses in the mouth are related to diseases. Such as Herpes simplex Virus which causes primary herpetic gingivostomatitis (is the most common specific clinical appearance of primary herpes simplex infection in childhood) [8]. and recurrent lesions on the face and lips [9] another common mouth viruses is Epstein-Barr virus (EBV) And cytomegaloviruses(CMV) which are presented in a large majority of adults, but in utmost cases most likely

without ever causing any obvious disease. Both viruses however can cause mononucleosis; EBV being in charge for most of the cases. Mononucleosis is known as “kissing disease” signifying that the virus spread through the direct contact mouth-to-mouth [10].

Archaea

Archaea constitutes just a slight part of the oral microbiome and it is restricted to partial species. The founded species were Methanosarcina, Methanobrevibacter, Methanobacterium, Methanosphaera and Thermoplasmatales which all are methanogens [9,11].

Fungi

Fungi are presented extensively in the oral cavity. Not just as an opportunistic pathogen of the elderly and immune-compromised people, but also as part of the mouth ecosystem. The fungal species in the human oral cavity of each individual ranges between nine and twenty-three. The Candida species were the most common, pursued by Cladosporium, Aureobasidium, Saccharomyces, Aspergillus, Fusarium, and Cryptococcus [12].

Location of the Oral Microbiome

The oral ecosystem is extremely intricate because it has quite a few significantly different niches, including saliva, soft tissue surfaces of the oral mucosa and tongue, and hard tissue surfaces of teeth [13]. Since The tissue surfaces and biofilms of the oral cavity are continuously infiltrated with saliva, The salivary microorganisms mainly come from the shedding of the biofilm on the surface of the oral tissue [14] Therefore, the microbial profile of saliva is analogous there to that of the soft tissues, but saliva and soft tissue colonization differ obviously from that of dental plaque [15].

Oral Health

Relative amounts of the microbiome are influenced by factors related with modern daily life, such as general dieting patterns, sugar consumption, tobacco smoking, oral sanitization, consuming of antibiotics and other antimicrobials [16]. It is clear that the biofilms related with healthy teeth and gums is portrayed by a very limited commensal microflora ruled by the phylum Firmicutes, as well as a diverse group of streptococcal species. These microorganisms certainly have benefits to the host by interacting with the colonization of exogenous pathogens. This occurs through the inhibition of adhesion of pathogens by commensals or by the production of toxic products such as (bacteriocins, hydrogen peroxide, etc.) to inhibit the growth of pathogens [17].

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Oral Disease

Since The oral microorganisms plays a significant role in the health condition of the host and it is an important component in a various oral and non-oral diseases. such as Dental Caries, Periodontal Diseases, and Endodontic Infections.

Dental caries

Dental caries is one of the most frequent chronic infectious diseases worldwide and threatens humans throughout their life, not only during childhood or adolescence. It is also the most common cause of tooth loss and pain in the oral cavity [18,19].it is defined as the physical and chemical processes of demineralization and remineralization occurring on the surface of the tooth [20].

Periodontal diseases

Periodontal diseases are acute, infectious, inflammatory diseases that have a multifactorial character in terms of etiology and pathogenesis. Periodontal diseases are divided into two major categories as gingivitis and periodontitis both of which are chronic infectious and inflammatory diseases. Microorganisms and/or their virulence factors trigger the host response and the activated immune cells cause periodontal tissue destruction [21].

Endodontic Infections

in its healthy and intact state, the root canal system is free of infections. Unlike the mouth, the basis canal system has no commensal microbiota, and any microorganism detected here are often considered a possible pathogen. Once microorganisms find their way into the basis canal system, the results may vary from an easy reversible pulpitis to the necrosis of pulpal tissue and in the end to formation of a periapical lesion: apical periodontitis. Pulpal necrosis on its own, when no microorganisms are involved, doesn't necessarily cause apical periodontitis [22,23].

Conclusion

Based on various researches oral microbiome is proven to be very crucial aspect in oral diseases and general health of humans, keeping a good oral hygiene and good diet is an important thing to prevent some serious oral disease. More research on the oral microbiome should be done to get the overall picture of the whole microbial community inhabiting the human oral cavity.

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DOI: 10.46718/JBGR.2020.03.000085