MINI REVIEW

Oral microbiome: Understanding oral biofilm

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ABSTRACT

In the formation and preservation of dental health, the oral microbiome is extremely important. Oral disorders may arise as a result of significant disruptions in the interactions between the host, this microbiome, and the milieu. Biofilm-dwelling organisms are a major contributor to the majority of infectious illnesses that impact people.

Major health issues are caused by oral infectious illnesses like dental caries, periodontal disease, endodontic infections, oral candidiasis, and peri-implantitis over the world. These infectious illnesses are all linked Oral microbiome: Understanding oral biofilm to the oral infections' biofilm development mechanism. In the past, researchers have frequently attempted to investigate the relationship between specific dental diseases and a single pathogen, as in the cases of Streptococcus mutans, the causative agent of dental caries, and the so-called "red-complex" bacteria, the causative agent of periodontal disease. However, with the recent development of OMICS biology tools like genomics, transcriptomics, and proteomics, it is now possible to learn more about the structure and makeup of microbial communities in the oral cavity as well as the interactions between hosts and microbes.

Key Words: *Endodontic Infections, Dental Caries, Periodontal Disease, Oral Biofilms, Mouth Cavity*

INTRODUCTION

A significant global health burden is caused by oral illnesses. The human population frequently experiences a wide range of oral ailments. According to the World Health Organization, 60%–90% of students and almost 100% of adults have dental caries. At least 15% to 20% of the adult population is affected by severe types of periodontal disease, one of the most prevalent dental disorders in people [1]. In the world, 30% of those 65 years to 74 years old lack their original teeth [2]. One of the most common types of cancer in South-East Asia (SEA) is oral cancer. Additionally, a variety of patient populations frequently experience oral mucosal diseases, infections of the salivary glands, and systemic consequences from oral infections.

PROPERTIES OF MICROBIAL BIOFILMS

Although there may be minor differences between various species and strains, the pattern of biofilm production for microbial species is generally consistent [3,4]. When in close contact with biotic or abiotic surfaces, microbes in the free-floating or "planktonic" state experience both attracting and repulsive forces. These include van der Waals forces, temperature, hydrodynamic forces, steric hindrance, electrostatic and hydrophobic interactions, and hydrophobic interactions. In addition to the characteristics of the microbial cell wall, the attachment of microbes to a specific surface is also influenced by surface characteristics such as surface charge, roughness, hydrophobicity, configuration topography, and surface free energy.

ORAL BIOFILMS

The term "biofilm" was first used in 1978 and is now understood to refer to a sessile microbial population made up of cells that are permanently attached to a surface, to an interface, or between two surfaces, enclosed in a matrix of extracellular polymeric substances (EPS) that they have produced, and that exhibit altered growth patterns and gene transcription [5,6]. In addition to serving as a source of nutrients, EPS affects the characteristics of microbial communities, including mass transfer, surface properties, adsorption capacity, and stability [6]. Bacteria can form biofilms on a variety of surfaces, which are thought of as a separate growth phase from planktonic cells [6]. The resident microorganisms are shielded from exogenous, potentially hazardous elements by the biofilm, which also allows cooperative interactions between cells of the same or different species. In addition, bacteria can become resistant to bacteriophages, host immunological responses, medications, and mechanical removal when they form biofilms.

Various microbial populations invariably inhabit human body surfaces exposed to external surroundings, such as the conjunctiva, mouth cavity, respiratory system, gastrointestinal tract, and genital

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organs, which result in the creation of distinct niches [7]. The mouth cavity offers both hard and soft surfaces for microbial colonization, which is an intriguing trait. As a result, the microbial communities that develop on a dental plaque or tooth surfaces differ from those that develop on oral mucosal surfaces. Both exogenous transitory microorganisms and bacteria from different oral environments can be found in saliva. An example of a typical biofilm is dental plaque [8]. Evaluation of the oral biofilm population dynamics may aid in the diagnosis and evaluation of a variety of oral diseases.

ORAL MICROBIOMICS

It is now possible to investigate the entire microbial community in both health and sickness because of the use of high-throughput sequencing techniques [10]. Researchers are interested in learning more about the origin of diseases, diagnostic and prognostic biomarkers, as well as therapeutic approaches. The majority of studies connected to oral disorders in the past were hypothesis-driven. The analysis of the microbial composition and community structure of dental plaque or saliva samples from the study population is one of the frequently employed methods in oral microbiomics. Adenine, Guanine, Cytosine, and Thymine are the four nucleotides that exist in a strand of DNA. DNA sequencing entails precisely determining their order. The first DNA sequencing techniques were invented by Gilbert and Sanger [10,11].

PERIODONTOPATHOGENIC BIOFILM

With a wide range of clinical symptoms, from moderate gingivitis to severe forms of periodontitis, periodontal diseases are chronic oral conditions that are extremely common around the world [12,13]. Dental biofilm causes chronic gingivitis, which is characterized by marginal gingival irritation but no signs of periodontal attachment loss on clinical examination or radiographs. It is an easily treatable and preventable illness that is reversible. In periodontitis, the junctional epithelium migrates apically over the root surface, causing gingival inflammation. This is followed by attachment loss and alveolar bone resorption. Chronic or aggressive periodontitis are the two basic subtypes of periodontitis.

CONCLUSION

Microorganisms create complex structures called oral biofilms to help them survive, and pathogenicity typically rises in these well-organized groups. Different biofilms may, however, be more or less harmful. Currently, it is acknowledged that complex multispecies biofilms, rather than a single pathogen, are what cause oral illnesses. Furthermore, it stands to reason that oral disorders arise from an imbalance in the dynamic interactions between the biofilm, host, and microenvironment.

REFERENCES

1. Jin LJ, Lamster IB, Greenspan JS, et al. Global burden of oral diseases: emerging concepts, management and interplay with systemic health. Oral Dis. 2016;22(7):609-19.
2. Meier T, Deumelandt P, Christen O, et al. Global Burden of SugarRelated Dental Diseases in 168 Countries and Corresponding Health Care Costs. J Dent Res. 2017;96(8):845-54.
3. Donlan RM, Costerton JW. Biofilms: survival mechanisms of clinically relevant microorganisms. Clin Microbiol Rev.2002;15(2):167-93.
4. Seneviratne CJ, Jin L, Samaranayake LP. Biofilm lifestyle of Candida: a mini review. Oral Dis. 2008;14(7):582-90.
5. Costerton JW, Geesey GG, Cheng KJ. How bacteria stick. Sci Am. 1978;238:86–95.
6. Flemming HC, Wingender J. Relevance of microbial extracellular polymeric substances (EPSs)-Part I: Structural and ecological aspects. Water Sci Technol. 2001;43(6):1-8.
7. Weinstock GM. Genomic approaches to studying the human microbiota. Nature. 2012;489(7415):250-6.
8. Marsh PD, Moter A, Devine DA. Dental plaque biofilms: communities, conflict and control. Periodontol 2000. 2011;55(1):16-35.
9. Ahn J, Chen CY, Hayes RB. Oral microbiome and oral and gastrointestinal cancer risk. Cancer Causes Control. 2012;23(3):399-404.
10. Selwitz RH, Ismail AI, Pitts NB. Dental caries. Lancet. 2007;369:51–9.
11. Bagramian RA, Garcia-Godoy F, Volpe AR. The global increase in dental caries: a pending public health crisis. Am J Dent. 2009;22:3–8.
12. Armitage GC. Development of a classification system for periodontal diseases and conditions. Ann Periodontol. 1999;4:1–6.
13. Marcenes W, Kassebaum NJ, Bernabé E, et al. Global burden of oral conditions in 1990-2010: a systematic analysis. J Dent Res. 2013;92(7):592–7.