Role Of Microbial Products In Dental Diseases: A Mini Review

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Abstract

The oral cavity being the centre of array of organisms, endorses the establishment of diverse microbial associations like on the mucosa and teeth. Metabolism of these living beings encourages the attachment and development of the ensuing colonisers. A fragile adjust is kept up within the microbial ecosystem, with these life form conferring to normal growth and defences. Nevertheless, any change or disturbance within the microbial outline by reason of either outward or inborn components results unfavourable shift towards pathogenic organisms provoking numerous diseases such as dental caries or periodontitis. Moreover, current exposures also reveal that these microbes induce systemic illnesses such as diabetes or artherosclerosis. This article is an endeavour to confer an overview of the changed flora ailing states.

Keywords: Ecosystem, Oral disease, Microbial flora, artherosclerosis, Pathogens.

Introduction

The project named "Human Microbiome Project"; begin in 2007 by US National Institutes of Health for exemplify the degree and diversity of microbes in human system [1]. The oral cavity which is one of the most heavily inhabited areas with microbes in all locations of body; possess indispensible component of the microbiota [2]. 800 or more species have been confined with the recently reported molecular strategies. The oral cavity which incorporates virus, fungi, mycoplasma, protozoa and bacterial flora is occupied by a miscellaneous microbiota in which bacteria is the leading group [3]. Discrete microbial associations are recognized in consequence of the environmental assortment in the oral cavity on mucosal exteriors of the tooth surfaces, tongue, buccal mucosa, gingival cervices and any simulated surfaces such as prostheses and appliances. The oral flora plays a significant role in the ordinary progress of the host instead of simply having an aloof connection. For instance, it facilitates the contribution in host defences and forestalls colonization by exogenous organisms [4]. The issue emerges when there is a disturbance of this inhabitant flora promotes several diseases such as dental caries or periodontitis. It is additionally conceivable that, by means of numerous physiological procedures, individuals of the normal or the healthy flora have the capability to alter the environment to make good and more favourable for the development and abundance of pathogenic organisms such as *Streptococcus mutans* or *Porphyromonas gingivalis.* Therefore, an amendment in this ecosystem, increasing the probability for pathogenicity promotes several oral diseases specifically the microorganisms-environment connections. The perceptive of this is critical and of supreme significance in developing novel preventive policies [5].

Role of dental plaque

There are several habitations for microbes in oral cavity such as the mucosal exterior (like the lips, cheek, sense of taste and tongue) and teeth which sustain the development of microbial associations [6]. Dental plaque originates on a tooth surface as a biofilm. Basically, this is the network of microbes. Plaque arrangement is an ordinary marvel which adds to the host's typical improvement and safeguards. Issues emerge because of disturbance in the homeostasis existing among microbial networks in the plaque. Two basic models clarifying this disparity are dental caries and periodontal disease. In the previous alteration in nutrient status like overabundance carbohydtrates (expanded supragingival plaque) brings about the equalization tilting toward increasingly aciduric and acidogenic microscopic organisms (for example *Streptococcus mutans*) to flourish, resulting in the infection. In the last mentioned, amassing of plaque, because of poor oral sanitation can bring about extending of pockets, making anaerobic situations, in this manner preferring the multiplication of pathogenic microscopic organisms (anaerobic species like *Fusobacterium*, *Prevotella*) prompting periodontal infection. Along these lines any adjustment in the elements inside this biological system can change the flora, amplify its potential pathogenicity and consequently begin and promotes oral infections [7].

Caries

Dental caries which is a chronic disease that develops slowly in most individuals and is categorized by localized demolition of the tooth subsequent long interaction or contact with acidic commodities results the bacterial fermentation of dietary sugars [8]. Dental caries is an excellent illustration of how an amendment in the microbiota can cause a disease. The normal microbiota generally contain non mutans streptococci such as the salivarius group on root exterior, mitis group in the pit and a small amount of mutans group [9, 10].

Periodontal Disease

Gingival cervicular fluid (GCF) infesting the subgingival cervice which generates a neutral or alkaline atmosphere because of the existence of some nitrogenous compounds like proteins, peptides and amino acids. This environment is established when the gingival sulcus get deeper and asaccharolytic and anaerobic or proteolytic bacteria i.e. *Fusobacterium*, *Eubacterium*, *Campylobacter*, *Prevotella* and *Porphyromonas* develops in these circumstances. Proteolytic bacteria have ability to mortify the nitrogenous compounds into small peptides and amino acids with cell membrane bound or extracellularly buried proteases, for successive use as metabolic substrates [11]. Though, these enzymes veiled by the microbes for mortifying the nitrogenous compounds persuade inflammation and immunoreactions. *P. intermedia* and *F. nucleatum* have capability to grow at acidic and neutral pH which is commonly present in supragingival plaque. They are also capable of counteracting the acidic environmental pH by altering the acid base stability through amino acid metabolism. *F. nucleatum* and *P. intermedia* inhabits a superficial gingival pocket (where the pH is uneven and from time to time becomes acidic) and then endorse the establishment of a neutral pH atmosphere. This tempts inflammation and enhance in GCF, persuades and upholds the development of more proteolytic bacteria such as *P. gingivalis* and improves the pathogenicity of *P. intermedia* during enhance in proteolytic action and cytotoxic end products [11, 12].

Vital Periodontal Pathogens

Porphyromonas Gingivalis

This is the major periodontal pathogen which is a Gram-negative rod and rigorously anaerobic. It has a few putative virulence components (counting proteases which mortify immunoglobulin, complement, cytotoxins, hyaluronic acid, adhesins, endotoxins and collagen fibers). This can cause periodontal disease specifically or bring forth host response consequential in gingival tissue and bone harm [13].

Fusobacterium nucleatum

This microbe plays a pivotal part within the starting of periodontal disease by creating proinflammatory cytokines and up regulating the inflammatory reaction. They moreover initiate the epithelial cells to emit different proteolytic proteins such as matrix metalloproteases MMPs [14].

Prevotella Intermedia

It is a dark pigmented gram negative microbe stands up to phagocytosis by ideals of its capsule. It is additionally a significant microbe involved in periodontal infection together with *P. gingivalis* and *Aggregatibacter actinomycetemcomitans* [13, 14].

Aggregatibacter Actinomycetemcomitans

It is a gram negative facultative non motile bacillus which exudes a protein toxin i.e. leukotoxin (LtxA) that facilitate the bacterium escape the host immune response throughout infection [14].

Endodontic infections

The microbiota of root canal have been considered broadly over a long time by utilizing diverse testing methods and detection techniques. Contemporary theories propose that the number of bacterial species in an infected root canal may change from one to more than 14 and the number of bacterial cells from <100 to >110 per sample. Micro-organisms which are generally found in endodontic infections are *B. forsythus*, *F. nucleatum*, *P. gingivalis*, *C. rectus*, *P. intermedia* and *T. denticola*. *Prevotella* and *Porphyromonas* species have significant role in endodontic infections. It is gram positive cocci, anaerobic rods, enteric microbes and *P. aeruginosa* are too found. *Prevotella* species like *P. intermedia* and *P. nigrescens* were more frequently found infected root canals [15].

Osteomyelitis

Osteomyelitis is an inflammation of the medullary depth inside the maxilla or mandible with conceivable expansion of infection into the cortical bone and overlying periosteum [16]. Inveterate osteomyelitis of the jaws is widespread within the developing nations where these infections are related with injury, surgical strategies and previous infections like endodontic and periapical diseases [17].

Facial space infections

A dentoalveolar disease, if it is not treated earlier then it can spread bilaterally to the tissue spaces i.e. submandibular, submental and sublingual within the head or neck. This is a serious, life threatening disease that needs quick intercession [18]. It emerges as a result of dental or postextraction disease, mandibular breaks, peritonsillar abscess, oral soft tissue lacerations and cut wounds on the floor of mouth.

Candidiasis

This infection is caused by fungus, Candida albicans. And the other species which are also involved in this infection is *C. tropicalis*, *C. parapsilosis*, and *C. krusei*. *Candida* is a major component in normal oral microbiota, contains 30-50% part of it and is kept under control via specific and nonspecific defence methods [19]. Candidiasis is the most frequently seen fungal infection in humans. Though, the mere existence of the microbe is not adequate to cause the disease. This is opportunistic infections which flash up when immune suppression occurs or a radical change in the oral flora. *Candida* has the capability to adhere the mucosa and dentures plays significant role in the pathogenecity of oral infections. Candidiasis prevalence has reappears over the current years with the emergence of HIV. It is proclaimed that over 85% of HIV infected patients grow candidiasis [20]. Various studies related to infections of oral cavity and other aspects have been done with successful therapeutic approach [21-30].

Conclusion

Oral microflora, incontrovertibly, plays a noteworthy role in maintenance of homeostasis of the ecosystem in oral cavity. It is pivotal for clinicians to be mindful of this reality and they should focus their cure concerning control of this flora instead of killing it. A careful information of the ordinary and modified flora and mechanics behind how the alter can happen and what it might lead to would deliver us a reasonable thought of how different oral diseases could be controlled and preventive strategies be developed.

Acknowledgment
I am very thankful to Lovely Professional University, Phagwara, Punjab, India for technical support to complete this study and unlimited help in all steps.

Competing Interest's Statement
The author(s) declare(s) that there is no conflict of interest.

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