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Periodontopathogens : Bacteriology of Periodontal Disease : Mini Review

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Bacteria cause few infections in the oral cavities, other than pharyngitis given the impossibility of collecting a surface culture of these spaces without including the abundant indigenous flora, culture from lesions of these bacteria is of great importance for proper diagnosis. The indigenous microbiota plays an important role in health and diseases of humans and animals. Indigenous bacteria can survive in the oral cavity because they are less susceptible to or can avoid immune mechanisms. Oral diseases seem to appear after an imbalance among the indigenous microbiota, leading to the emergence of potentially pathogenic bacteria. The main disease caused by the oral flora are dental plaque, dental caries, gingivitis and periodontal disease yet they may also cause systemic disease also.

Key words: Oral cavity, periodonto-pathogens, periodontitis, microbiome

The human oral cavity contains a number of different habitats, including the teeth, gingival sulcus, tongue, cheeks, hard and soft palates, and tonsils, which are colonized by bacteria[1]. The presence of nutrients, epithelial debris, and secretions makes the mouth a favorable habitat for a great variety of bacteria. The presence of microorganisms on hard and soft oral tissues is fully compatible with health[2]. Dental plaque, dental caries, gingivitis and periodontal disease result from actions initiated and carried out by the normal bacterial flora. Oral bacteria include streptococci, lactobacilli, staphylococci and corynebacteria, with a great number of anaerobes, especially Bacteroides[3,4].

The indigenous microbiota plays an important role in health and diseases of humans and animals. Indigenous bacteria can survive in the oral cavity because they are less susceptible to or can avoid immune mechanisms[1,5]. It contributes to the development of the immune system and provides resistance to colonization by pathogenic micro-organisms. It also constitutes a reservoir of potentially pathogenic bacteria that may infect host tissues[5,6]. In the oral cavity, indigenous bacteria are often associated with the etiology of two major oral diseases, which are endemic in industrialized societies and are increasing in developing countries. Oral diseases seem to appear after an imbalance among the indigenous microbiota, leading to the emergence of potentially pathogenic bacteria [7,8].

Periodontitis

Periodontal disease is one of the most prevalent afflictions world wide. The most serious consequence is the loss of the periodontal supporting structures which includes gingiva, cementum, periodontal ligament and alveolar bone[9]. Periodontal disease is an all-encompassing term used to describe all disorders of the supporting structures of the teeth. These structures include the gingiva, periodontal ligament and the

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underlying alveolar bone. The level of infection can range from gingivitis, which is the inflammation of the gingiva all the way to full-blown periodontitis that can result in tooth loss[10]. Unlike most illness, bacteria that are foreign to the body do not cause periodontal diseases. Today, periodontal disease is considered primarily a polybacterial manifestation connected with certain bacterial pathogens Rather it's the microbes that inhabit the oral cavity which are responsible for periodontal disease[10,11]. The attack is triggered by a shift in the balance of oral microflora towards more invasive microbes. These microorganisms can cause inflammation leading to periodontal disease, by either directly invading the surrounding tissues or indirectly by emitting a toxin[12]. The diversity of microorganisms that have been detected in the oral cavity is greater than at any other location in the human body.

Oral Microflora

More than 700 bacterial phylotypes have been reported from oral sites, and estimates suggest that any individual harbors around 100–200 phylotypes[5]. The microorganisms found in the human oral cavity have been referred to as the oral microflora, oral microbiota, or more recently as the oral microbiome. The term microbiome was coined by Joshua Lederberg "to signify the ecological community of commensal, symbiotic, and pathogenic microorganisms that literally share our body space and have been all but ignored as determinants of health and disease" [13].

The mouth presents a succession of different ecological situations with age, and this corresponds with changes in the composition of the normal flora. At birth, the oral cavity is composed solely of the soft tissues of the lips, cheeks, tongue and palate, which are kept moist by the secretions of the salivary glands. At birth the oral cavity is sterile but rapidly becomes colonized from the environment, particularly from the mother in the first feeding[8,14]. The creation of the gingival crevice area (supporting structures of the teeth) increases the habitat for the variety of anaerobic species found[4,5]. The complexity of the oral flora continues to increase with time, and Bacteroides and spirochetes colonize around puberty[15,16,.] The normal bacterial flora of the oral cavity clearly benefits their host who provides nutrients and habitat. The normal flora occupies available colonization sites which makes it more difficult for other microorganisms (non-indigenous species) to become established. Also, the oral flora contributes to host nutrition through the synthesis of vitamins, and they contribute to immunity by inducing low levels of circulating and secretory antibodies that may cross react with pathogens. Finally, the oral bacteria exert microbial antagonism against non-indigenous species by production of inhibitory substances such as fatty acids, peroxides and bacteriocins[7,8,10,12,17].

Microorganisms from the oral cavity have been shown to cause a number of oral infectious diseases, including caries (tooth decay), periodontitis (gum disease), endodontic (root canal) infections, alveolar osteitis (dry socket), and tonsillitis. Evidence is accumulating which links oral bacteria to a number of systemic diseases, including cardiovascular disease, stroke, preterm birth, diabetes, and pneumonia[4,13,17-19].

Key characteristics of Common bacteria flora found associated with Periodontitis are [20-26]

Actinobacillus actinomycetemcomitans

Actinobacillus actinomycetemcomitans are small, short, straight or curved rod with rounded ends. It is non-motile and gram negative. It can be cultivated in Trypticase Soy Bacitracin Vancomycin Agar Media where it shows star shaped internal structure. It is Benzidine, Phosphotase, Maltose, Mannitol, Xylose positive, Oxidase negative and can decompose Hydrogen Peroxide[20-32].

Porphyromonas gingivalis

Porphyromonas gingivalis are short coccus to rods (cocco-bacilli). It is non-motile obligate anaerobe and gram negative. It can be grown in Blood Agar, TSBV agar Media and Robertson cooked meat media broth where it shows dark, proteolytic colony and proteolytic activity respectively [20-26,33-35].

***Prevotella* sps**

Prevotella sps are short round ended rods. They are gram negative bacteria and can be grown anaerobically in Blood Agar and TSBV agar media showing brown-black pigmented colonies. They are Sacchrolytic, Bile sensitive, Lipase, Indole, Gelatin, Glucose and Sucrose positive and Lactose negatve[20-26].

***Campylobacter* sps**

Campylobacters are motile having polar flagellum and are gram negative. They show dark

grey stain when grown in anaerobic media (TSBV) and incubated anaerobically[20-26].

***Fusobacterium* sps**

They are characterised by having cigar shaped cells with pointed ends. They are non-motile, non-sporing. They are gram negative grows well under anaerobic atmosphere in Blood Agar and TSBV agar media. They are Indole positive , Bile positive, shows Gelatin liquefaction, Aesculin hydrolysis and is Nitrate negative[20-26,36-37].

Peptostreptococcus micros

It is gram positive cocci arranged singly or in short chains and is obligate anaerobe so can be grown anaerobically in TSBV agar media. They are Glucose, Maltose positive and Indole, Sucrose, Xylose, Lactose, Coagulase and Nitrate positive[20-26,38,39].

***Eubacterium* sps**

It is a gram positive, obligate anaerobic small pleomorphic rod. They are Glucose positive, Indole positive, shows Aesculin hydrolysis but negative for Tween -80 and Arginine[20-26,40].

Streptococcus mutans

They are important in the initiation of dental caries because its activities lead to colonization of the tooth surfaces, plaque formation, and localized demineralization of tooth enamel. It can be cultivated on Salivarius mitis agar media (Gold's Media). It is Mannitol, Raffinose, Sorbitol positive, shows Aesculin hydrolysis but is negative for Starch[20-26,41-42].

Lactobacillus acidophilus

They are proteolytic bacteria, commonly found in human carious dentin and cementum, which suggests that they are secondary invaders that contribute to the progression of the lesions. They are cultivated in Ragosa SL Agar media and are lactose positive[20-26].

Actinomycetes

They are gram positive shows branching and beaded appearance. They are grown well on Blood Agar and are Indole negative[20-26].

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