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Research Article

Oral Streptococci and Other Oral Commensals in Children

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Abstract

Oral Streptococci are important commensal flora of children and also play a role in development of many diseases of the mouth cavity and extra-oral diseases. They belong to many genera and species. It is important to know about commensal oral bacteria and their interplay with other bacteria. In this article the author has tried to give brief information about these bacteria and their functions and ill effects while being present in the mouth.

Keywords: : Oral microbiota; Streptococci; caries

Introduction

Leeuwenhoek's microscopic observations in his own dental plaque, more than 3 centuries ago, had indicated an unexpected diversity of microorganisms ("animalcules") in the human oral cavity [1]. Oral streptococci are common commensals in children. Their presence in excess amounts causes plaque and caries. Numbers can increase after eating sweet food items. Bacteria in the genus Streptococcus are the first inhabitants of the oral cavity and can be acquired right after birth. They thus play a very important role in the assembly of the oral microbiome [2]. Hence it is important to study the oral Streptococci and their characteristics, particularly in children.

Materials and Methods

Thorough scientific literature search using scientific terms was used to search for literature.

Types of oral streptococci in children: *Streptococcus mitis, Streptococcus salivarius, S. sanguis* and others are common. They belong commonly to the capsular Lancefield groups F, M and N. Now the oral streptococci are classified into 8 distinct groups: mitis, sanguinis, anginosus, salivarius, downei, mutans, pyogenic, and bovis. Pyogenic and bovis groups are not commonly seen in mouth [2]. The mitis group is the largest bacterial group found in the oral cavity, presently having 20 species.

Other oral commensal bacteria in children: *Leptospira and Borellia* can also be seen in oral cavity in children. Even anaerobes like *Fusobacterium spp.* are common in oral cavity of children and tend to colonize early [1]. In healthy children and adults, there is a balance between the numbers of cariogenic bacteria and non-cariogenic commensals. The latter keeps the cariogenic population in mouth in check by the formation of alkali, Hydrogen peroxide or other inhibitory molecules [2]. Bacteria like Rothia spp., *Treponema spp.* and *Veillonella spp.* are later colonizers of the mouth [1].

Development of the oral microbiome in children: It has been postulated that oral bacteria of the mother get entry into the blood and then via placenta can enter the oral cavity of the developing fetus. However, this theory is debated and needs further testing [1]. Also, a combination of different mother microbiome sources like gut, vaginal, skin flora and other factors. Additionally, breast milk and early foods may also shape the early oral microbiome in children [1]. The metabolic products formed by Streptococcus spp. using dietary oligosaccharides in breast milk or formula as substrates by fermentation, pave the way for other oral commensal bacteria to survive [1].

Role of the oral commensals in children: Commensal bacteria in the oral cavity play some pathogenetic roles in disease and ill health.

Caries: Oral Streptococci , also called Viridans Streptococci, are directly implicated in Dental caries. It is well known that the oral streptococci ferments carbohydrates to form demineralizing acids that leads to plaque and caries [3]. Mutans Group of Streptococci has 2 main cariogenic species: S. mutans and *S. sobrinus* [4] Good oral hygiene and regular flossing has been shown to prevent

caries of teeth in teenagers(3). An association of S. mutans with other acidogenic bacterial species, like *Scardovia wiggsiae* and *bifidobacteria*, has been documented in severe early childhood caries [2].

Pathogenesis of caries: Under the conditions of too much of carbohydrates and less oxygen, streptococci tend to carry out homolactic fermentation, thus reducing pyruvate into lactic acid and making NAD from NADH. The formation of lactic acid leads to speedy acidification of the environment, which allows streptococcal species to outclass acid-sensitive microorganisms [2]. Bacterial adhesins adhere well to the substrates in the acquired salivary pellicle , like albumin, proline-rich proteins, glycoproteins, mucins, and sialic acid. This then promotes release of bacterial polysaccharide and DNA. Salivary amylase also plays a pivotal role in bacterial colonization of oral surfaces of man and other mammals. This is because amylase-binding bacteria (like S. mitis, S. gordonii, S. salivarius and S. cristatus) have been found to colonize only the hosts having salivary amylase activity [5].

Role of Lactobacilli in caries: In around 3 month old children, Lactobacilli are also common in oral microbiome. This genus is also cariogenic, and their presence is highly predictive of caries at about 3 years of age [1].

Rheumatic fever and oral Streptococci: Rheumatic fever can develop after pharyngitis caused by Group A Streptococci. Oral streptococci share antigens with tissues in heart, glomerulus of kidney and joints. Hence antibodies cross react, and this can explain Rheumatic fever. Mainly Group A Streptococci are imp0ortant here. Anti-myosin antibodies in blood have been found to react with the M protein epitope of Group A Streptococci [6]. *S. pyogenes* (group A β-hemolytic streptococcus) can be seen in the oropharynx of more than 20% of children and a smaller portion of adults. Carriage rates increase a lot during epidemics and in crowded conditions [7].

Periodontitis: Other than dental caries , periodontitis is also directly related to the presence and metabolic activities of the dental plaque bacteria [2].

Other diseases: Oral Streptococci, the first microorganisms to colonize oral mucosal surface and the dominant bacteria in the human oral cavity, have recently gained attention as the pathogens of various systemic diseases, like infective endocarditis, purulent infections, brain hemorrhage, intestinal inflammation, autoimmune diseases, and also bacteremia [8].

Use as probiotics: Commercially available products containing Streptococcus salivarius strains K12, M18 or 24smb have been used for optimum oral and dental healthcare [9]. *S. salivarius* is a component of the healthy microbiota of the oral and nasopharyngeal cavity. *S. salivarius* K12 was first extracted from the oral cavity of a healthy school-going child in New Zealand, and many strains have been developed since to protect and maintain oral health also. Salivaricins liberated from *S. salivarius* interact with the cell walls of Gram-positive bacteria, producing a bactericidal effect. It is capable to reduce load of otopathogens causing Acute otitis media in nasopharynx of children [9].

Other interesting facts

Oral bacteria also help enhance mucosal immunity. Both cellular and numeral immunity may be enhanced by the oral microbiota. The oral bacteria and its importance are highlighted in Figure 1 below.

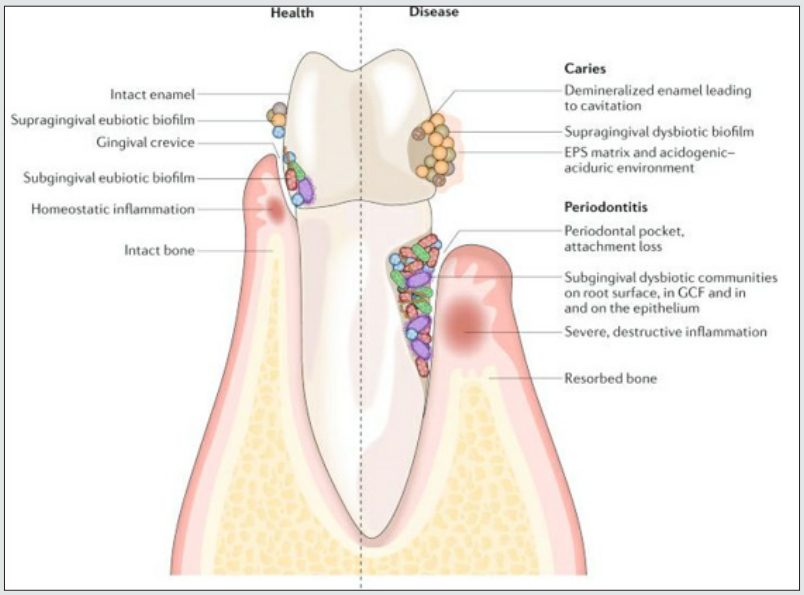

Figure 1: Oral commensals and disease.

Detection

The oral Streptococci can be detected by appearance of colonies that are alpha hemolytic on sheep blood agar and form black heaped colonies commonly on Mitis- Salivarius agar. Mitis- salivarius agar has casein enzyme hydrolysate, Dextrose, sucrose and Trypan blue with other constituents. This medium (having 1% potassium

tellurite) is a highly selective medium, that enables to isolate streptococci from highly contaminated specimens like exudates from body cavities and faeces, since it inhibits a wide variety of bacteria [10]. E. coli is inhibited in this medium, Enterococci produce blue-black colonies while *S. salivarius* produces blue or gum-drop colonies.

Discussion

Oral Streptococci are very common in mouth of children and should be investigated whenever serious lesions are seen. They have diverse pathogenetic factors. Their quantity or population is linked with plaque, caries, and periodontitis in children. Other bacteria are also important in the mouth. The oral microbiome is complex and is very interesting to study.

Conclusion

Oral Streptococci play diverse roles in the body and hence should be studies and researched meticulously.

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