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Introductory Chapter: Oral Flora and Oral Diseases

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1. Introduction

The mouth is colonized by 200–300 bacterial species. The indigenous microbiota plays an important role in health and disease of humans. Indigenous bacteria are often associated with the etiology of two major oral diseases: the dental decay (caries) and periodontal disease. This book attempts to describe the oral ecosystems, factors controlling the oral microbiota, identification of the oral microbes, and basic aspects of immune system with a particular emphasis on periodontal disease.

2. Periodontal disease

Periodontitis occurs when the plaque-induced inflammatory response in the tissue results in actual loss of collagen attachment of the tooth to the bone, to loss of bone, and to deep periodontal pockets.

2.1. Etiology

Periodontal infections are mixed often involving anaerobes such as *Treponema denticola*, *Porphyromonas gingivalis*, *Actinobacillus actinomycetemcomitans*, *Tannerella forsythia*, *Prevotella intermedia*, *Fusobacterium nucleatum*, *Peptostreptococcus micros*, *Campylobacter rectus*, and *Spirochetes* and other aerobic species such as *Pseudomonas aeruginosa*, *Enterobacteriaceae*, *Candida albicans*, *Staphylococci*, and *Enterococci* have also been found in association.

2.2. Pathogenesis and clinical manifestation

These bacteria in plaque secrete compounds such as H₂S, NH₃, amines, toxins, and enzymes, which initiate an inflammatory response responsible for loss of periodontal tissue, pocket

formation, and loosening and loss of teeth. Although there is no manifestation of pain, bleeding gums and bad breath may occur.

Periodontitis in systemic disease of systemic disease-severe periodontitis has been observed in patients with defective neutrophils such as in Chediak–Higashi syndrome, Down syndrome, Neutropenia, Leukocyte adhesion deficiency, etc.

2.3. Microbiologic diagnosis

The traditional culturing techniques along with DNA-based methodology for identification and detection of specific bacteria and viruses, which have advantages in time and cost. Also the number of samples and the number of microorganisms identified and detected that cannot be cultivated have become possible by molecular biology techniques. The other methods commonly used are darkfield examination for spirochetes and enzyme assays.

3. Dental caries

Dental decay is due to the degradation of tooth mineral by acids derived from bacteria which form a dental plaque that accumulates on the tooth surface.

3.1. Etiology

The specific plaque hypothesis proposes that species such as *Streptococcus mutans* and *Streptococcus sobrinus* are actively involved in the disease. Other spp. such as *Veillonella*, *Actinomyces*, *Bifidobacterium*, and *Lactobacillus fermentum* are associated with caries. However, in advanced caries in adults, *S. mutans* is not commonly detected but species in the genera *Lactobacillus*, *Prevotella*, *Selenomonas*, *Dialister*, *Fusobacterium*, *Eubacterium*, *Olsenella*, *Bifidobacterium*, *Propionibacterium*, and *Pseudoramibacter* are abundant. Finally to understand the mechanism involved in caries and periodontal diseases, it is important to understand the microbial ecology of oral cavity and the factors responsible for transition of the commensal flora to the pathogenic microflora in the host. The concept of bacterial succession is important in oral microbiology.

The normal flora benefits the host as it occupies the normal oral flora occupies colonization sites in the mouth and it becomes difficult for the noncommensal flora to establish, oral flora also contributes to host nutrition, low levels of circulating immunity cross reacting with the pathogens. Thirdly, microbial antagonism of normal oral flora by secreting fatty acids, bacteriocins, and peroxides is also a beneficial effect in the host.

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