

Oral microbiology

From Wikipedia, the free encyclopedia

Oral microbiology is the study of the microorganisms of the oral cavity and the interactions between the oral microorganisms with each other and with the host. Of particular interest is the role of oral microorganisms in the two major dental diseases: dental caries and periodontal disease.^[1]

The mouth harbors a diverse, abundant and complex microbial community. This highly diverse microflora inhabits the various surfaces of the normal mouth. Bacteria accumulate on both the hard and soft oral tissues in biofilms. Bacterial adhesion is particularly important for oral bacteria.

Oral bacteria have evolved mechanisms to sense their environment and evade or modify the host. Bacteria occupy the ecological niche provided by both the tooth surface and gingival epithelium. However, a highly efficient innate host defense system constantly monitors the bacterial colonization and prevents bacterial invasion of local tissues. A dynamic equilibrium exists between dental plaque bacteria and the innate host defense system.^[1]

Contents

- 1 Oral bacteria
 - 1.1 *Treponema denticola*
 - 1.2 *Porphyromonas gingivalis*
 - 1.3 *Aggregatibacter actinomycetemcomitans*
 - 1.4 *Lactobacillus*
- 2 Dental plaque
- 3 Cell-cell communication
- 4 Vaccination against oral infections
- 5 See also
- 6 References
- 7 External links

Oral bacteria

Oral bacteria include streptococci, lactobacilli, staphylococci, corynebacteria, and various anaerobes in particular bacteroides. The oral cavity of the new-born baby does not contain bacteria but rapidly becomes colonized with bacteria such as *Streptococcus salivarius*. With the appearance of the teeth during the first year colonization by *Streptococcus mutans* and *Streptococcus sanguis* occurs as these organisms colonise the dental surface and gingiva. Other strains of streptococci adhere strongly to the gums and cheeks but not to the teeth. The gingival crevice area (supporting structures of the teeth) provides a habitat for a variety of anaerobic species. Bacteroides and spirochetes colonize the mouth around puberty.^[1]

Treponema denticola

The levels of oral spirochetes are elevated in patients with periodontal diseases. Among this group, *Treponema denticola* is the most studied and is considered as one of the main etiological bacteria of

periodontitis. *Treponema denticola* is a motile and highly proteolytic bacterium.^[2]

Porphyromonas gingivalis

Porphyromonas gingivalis is a Gram-negative oral anaerobe strongly associated with chronic adult periodontitis. The bacterium produces a number of well-characterized virulence factors and can be manipulated genetically. The availability of the genome sequence is aiding our understanding of the biology of *P. gingivalis* and how it interacts with the environment, other bacteria and the human host.^[3]

Aggregatibacter actinomycetemcomitans

Aggregatibacter actinomycetemcomitans is considered an oral pathogen due to its virulence factors, its association with localized aggressive periodontitis in young adolescents, and studies indicating that it can cause bone loss.^[4]

Lactobacillus

Some *Lactobacillus* species have been associated with dental caries although these bacteria are normally symbiotic in humans and are found in the gut flora. ^[5]

Dental plaque

Dental plaque is the material that adheres to the teeth and consists of bacterial cells (mainly *S. mutans* and *S. sanguis*), salivary polymers and bacterial extracellular products. Plaque is a biofilm on the surfaces of the teeth. This accumulation of microorganisms subject the teeth and gingival tissues to high concentrations of bacterial metabolites which results in dental disease. If not taken care of, via brushing or flossing, the plaque can turn into tartar (its hardened form) and lead to gingivitis or periodontal disease.

Cell-cell communication

Most of the bacterial species found in the mouth belong to microbial communities, called biofilms, a feature of which is inter-bacterial communication. Cell-cell contact, is mediated by specific protein adhesins and often, as in the case of inter-species aggregation, by complementary polysaccharide receptors. Another method of communication involves cell-cell signalling molecules, which are of two classes: those used for intra-species and those used for inter-species signalling. An example of intra-species communication is quorum sensing. Oral bacteria have been shown to produce small peptides, such as competence stimulating peptides, which can help promote single-species biofilm formation. A common form of inter-species signalling is mediated by 4, 5-dihydroxy-2, 3-pentanedione (DPD) or Autoinducer-2 (AI-2).^[6]

Vaccination against oral infections

Dental caries and periodontitis have an infectious etiology and immunization has been proposed as a means of controlling them. However, the approaches vary according to the nature of the bacteria involved and the mechanisms of pathogenesis for these two very different diseases. In the case of dental caries, proteins involved in colonization of teeth by *Streptococcus mutans* can produce antibodies that

inhibit the cariogenic process. Periodontal vaccines are less well developed, but some antigenic targets have been identified.^[7]

See also

- Biofilms
- Environmental microbiology
- Human microbiome project
- Microbiology

References

- [^] ^{*a b c*} Rogers A H (editor). (2008). *Molecular Oral Microbiology*. Caister Academic Press. ISBN 978-1-904455-24-0.
- [^] Jobin M-C et al. (2008). "The Molecular Biology of the Survival and Virulence of *Treponema denticola*". *Molecular Oral Microbiology*. Caister Academic Press. ISBN 978-1-904455-24-0.
- [^] Duncan M J (2008). "The Molecular Biology of *Porphyromonas gingivalis*". *Molecular Oral Microbiology*. Caister Academic Press. ISBN 978-1-904455-24-0.
- [^] Fine D H et al. (2008). "Molecular Windows into the Pathogenic Properties of *Aggregatibacter actinomycetemcomitans*". *Molecular Oral Microbiology*. Caister Academic Press. ISBN 978-1-904455-24-0.
- [^] Ljungh A, Wadstrom T (editors) (2009). *Lactobacillus Molecular Biology: From Genomics to Probiotics*. Caister Academic Press. ISBN 978-1-904455-41-7.
- [^] Rickard A H (2008). "Cell-cell Communication in Oral Microbial Communities". *Molecular Oral Microbiology*. Caister Academic Press. ISBN 978-1-904455-24-0.
- [^] Hajishengallis G and Russell M W (2008). "Molecular Approaches to Vaccination against Oral Infections". *Molecular Oral Microbiology*. Caister Academic Press. ISBN 978-1-904455-24-0.

External links

- Microbiology

Retrieved from "http://en.wikipedia.org/wiki/Oral_microbiology"

Categories: [Microbiology](#) | [Dentistry branches](#) | [Oral pathology](#)

- This page was last modified on 18 May 2009 at 15:44.
- Text is available under the Creative Commons Attribution-ShareAlike License; additional terms may apply. See Terms of Use for details.
Wikipedia® is a registered trademark of the Wikimedia Foundation, Inc., a non-profit organization.