



Lec-٧- Criteria for colonization

Adhesion

- Major milestone allowing resistance of the microorganisms against washing action of the saliva;
- Provides from adhesins of the microbial surface and receptors on oral surfaces.

microbial adhesins

- Constructed of:
 - Polysaccharides;
 - Lipoteichoic acid;
 - Glycosyltransferase;
 - Carbohydrate-binding proteins;
- They are located in the cell wall in the form of:
 - Fimbriae;
 - Fibrils;
 - Capsules.



MECHANISMS OF ADHESION BY ORAL BACTERIA

- Adherence mechanisms of oral bacteria are essential to bacterial colonization of the oral cavity;
- In their absence, bacteria become part of the salivary flow and are swallowed;
- Consequently, oral bacteria have evolved several mechanisms to fulfill this role.
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Mechanism of adhesion

- Nonspecific chemical and physical interactions:
 - Example: Lipoteichoic acid at the microbial surface interacts with the negative charged components of the host by Ca, H ions or hydrophobic coatings;
- Then act strong stereo-chemically interactions;
- Microorganisms can adhere to the surface of the already colonized microorganisms – coaggregation.

Inter-bacterial coaggregation

- *Streptococcus cristatus* coaggregating with *F. nucleatum*
- - adhesins interacting with receptors;



- Coaggregation is important in ecological succession;
- *Fusobacterium nucleatum* is considered a bridge species because it is a promiscuous coaggregator.

Mechanism of the coaggregation

- Coaggregation interactions are believed to contribute to the development of biofilms by two routes:
 - The first route is by single cells in suspension specifically recognizing and adhering to genetically distinct cells in the developing biofilm;
 - The second route is by the prior coaggregation in suspension of secondary colonizers followed by the subsequent adhesion of this coaggregate to the developing biofilm;
- In both cases, bacterial cells in suspension (planktonic cells) specifically adhere to cells in the



- biofilm in a process known as coadhesion.

Ecological significance of bacterial coaggregation

- Specific coaggregation processes are likely to have an important ecological role as an integral process in the development and maintenance of mixed-species biofilm communities;
- Allows adhesion of the microorganisms, who are not able to direct adhesion;
- Strengthens bacterial attachment;
- Increases the stability of the plaque matrix.



Bacterial attachment to a surface can be divided into several distinct phases

- Primary and reversible adhesion;
- Secondary and irreversible adhesion;
- Biofilm formation.

Adhesion is dependent on:

- A contact:
 - Start of interaction;
- A dose:
 - There is a certain amount of micro-organisms;
- Frequency of exposure:
 - Partial colonization;
- Adsorption:
 - By electrostatic forces to the surface of pellicle;
 - With specific receptors on the cell surfaces;
 - With fibrillere coupling end.



Retention

- Adaptation;
- Growth;
- Reproduction;
- Accumulation.

Ecological relationships

- Independence
 - Life free from influences, management or control of other organisms;
- Favorable relationships – commensal;
 - One type of benefit, but others did not suffer;
- Pathological.



Microbial relationships

- There are a complex of relationships between different microbial species:
 - Neutral;
 - Antagonistic microbial interactions;
 - Synergistic.

Neutral

- Relationship between two species living together without affecting each other - neither favorable nor unfavorable.