

Biofilm:

- > 3D-structured communities attached to a solid surface
- > Embedded in an exopolysaccharide matrix
- > Biofilm formation is not random - follows specific pattern of succession
- > Availability of bacterial species
- > Coaggregation pairings
- > Cell-cell interactions

Types of Bacterial Interactions:

Neutralism:

- No effect on each other

Competition:

- 2 populations compete for the same nutrients

Commensalism:

- 1 benefits from the other with benefactor remaining unaffected

Mutualism:

- Both populations benefits

Symbiosis:

- Obligatory interactions

Protocooperations:

- Facultative interactions

Syntrophy:

- Cross-feeding

Synergism:

- Enhanced production of a certain products

Ammensalism:

- 1 population has an indirect negative impact on another

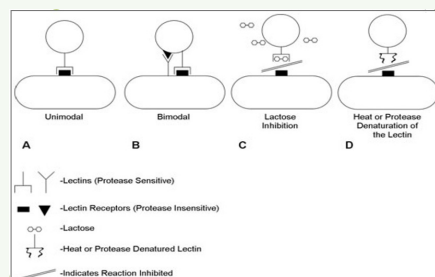
Predation:

- 1 organism consumed by another

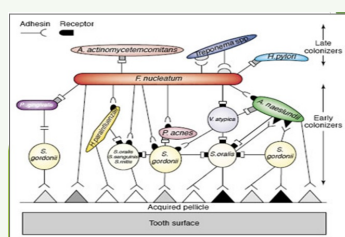
Parasitism:

- 1 organism invaded intracellularly by another

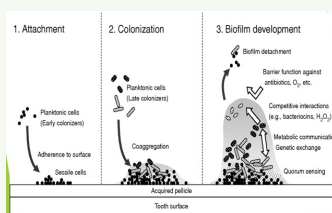
Interactions:Coaggregating Pairs of Organisms:



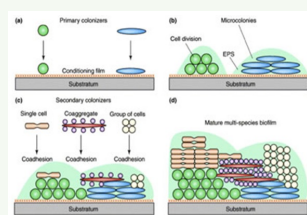
Biofilm Formation and Content:



Biofilm Formation and Roles of Interactions:



Increase in Mass of Biofilm:



Communication in Biofilm:

- > Genetic expression is different in biofilm bacteria when compared to planktonic (free floating)bacteria
- > Biofilm cells can coordinate behavior via intercellular "communication" using biochemical signalling molecules

Quorum sensing:

- Involves regulation of expression of specific genes through accumulation of signaling compound that mediate intercellular communication
- Dependent on cell density and mediated through signalling compounds
- Quorum sensing gives biofilms their distinct properties

Involved in the regulation of:

- > Genetic competence
- > Mating
- > Bacteriocin production
- > Sporulation
- > Stress response
- > Virulence expression
- > Biofilm formation
- > Bioluminescence

Bottle-Brush Formation:

Heterotypic:

- Streptococci with *Fusobacterium*, *Bacteroides*, *Actinomyces*, *Campylobacter*

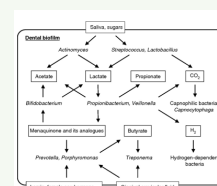
Homotypic:

- *Eubacterium yurii*, *Tannerella*

Bottle-Brush in subgingival biofilm: *Eubacterium Yurii*

Micrograph Max Listgarten

Metabolic Relationships:



Metabolic Relationships among oral bacteria within dental biofilm communities,

Why Study Biofilms:

- Know adversaries in order to defeat them.
- Development of treatment strategies
- Interfere with cell-cell communications (intrageneric and intergeneric)