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

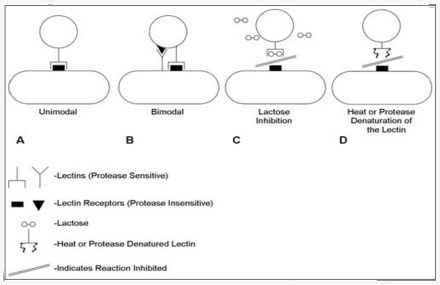
Predation:

1 organism consumed by another

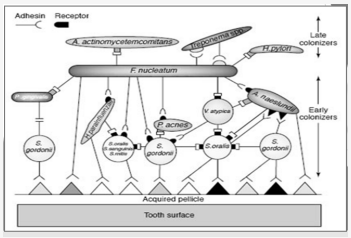
Parasitism:

1 organism invaded intracellularly by another

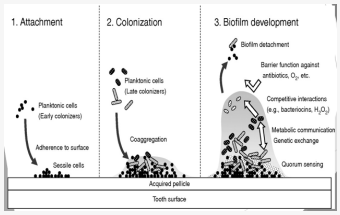
Interactions:Coaggregating Pairs of Organisms:



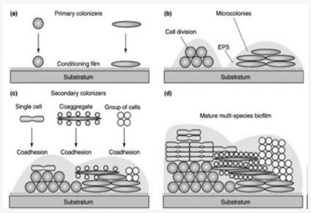
Biofilm Formation and Content:



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*

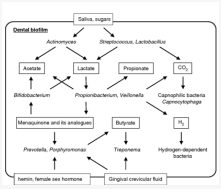
Homotypic:

- *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)

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