Cavities, Biofilms, and the Dentist

Your mouth is full of bacteria. The bacteria in your mouth help break down the food you have just eaten. A byproduct of this breakdown is a sticky biofilm that forms plaque. Plaque is acidic and eventually starts dissolving the enamel outer layer of a tooth.

Understanding Biofilms

• Biofilms form when bacteria adhere to surfaces in aqueous environments and begin to excrete a slimy, glue-like substance that can anchor them to all kinds of material. They are a structured community of bacterial cells enclosed in a self-produced polymeric matrix and adherent to an inert or living surface. The first bacterial colonists to adhere to a surface initially do so by inducing weak, reversible bonds called van der Waals forces. If the colonists are not immediately separated from the surface, they can anchor themselves more permanently using cell adhesion molecules, proteins on their surfaces that bind other cells in a process called cell adhesion.

• Biofilm bacteria can move in numerous ways: Collectively, by rippling or rolling across the surface, or by detaching in clumps. Individually, through a “swarming and seeding” dispersal.

Cavities!!

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[Solutions]

• Understanding why biofilm microorganisms are difficult to "kill" compared to suspended microorganisms.
• Molecular and genetic characteristics of biofilm microorganisms.
• Structure and function of a biofilm.
• Attachment phenomena of biofilm microorganisms.
• Biofilm analytical methods.
• Modeling of biofilm activity.
• Visiting your dentist on a regular basis
• Brushing your teeth 3x a day after every meal and before going to bed (flossing included)

Development

Once colonization has begun, the biofilm grows through a combination of cell division and recruitment. The final stage of biofilm formation is known as development and is the stage in which the biofilm is established and may only change in shape and size. This development of a biofilm allows for the cells inside to become more resistant to antibiotics administered in a standard fashion. In fact, depending on the organism and type of antimicrobial and experimental system, biofilm bacteria can be up to a thousand times more resistant to antimicrobial stress than free-swimming bacteria of the same species.

Biofilms grow slowly, in diverse locations, and biofilm infections are often slow to produce overt symptoms. However, biofilm bacteria can move in numerous ways that allow them to easily infect new tissues. Biofilms may move collectively, by rippling or rolling across the surface, or by detaching in clumps. Sometimes, in a dispersal strategy referred to as “swarming/seeding,” a biofilm colony differentiates to form an outer “wall” of stationary bacteria, while the inner region of the biofilm “liquefies,” allowing planktonic cells to “swim” out of the biofilm and leave behind a hollow mound.

WORK CITED


"A Biofilm Primer." www.personal.psu.edu/.../biofilms/primer.html

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[1] Early stages: acids dissolve the enamel in the crown of the tooth
[2] Moderate tooth decay: here the dentin is attacked by acids and bacteria invade the cavity.
[5] Periapical abscess forms at the apex of the root. One of the bacteria in your mouth is Streptococcus mutans. Streptococcus mutans (produces plaque) has evolved receptors to help them stick to your teeth and produce lactic acid as a byproduct of sugar digestion. S. mutans is also transmitted from mother to offspring. There are over 60 strains of S. mutans.

Hypersensitive CAVITIES!!

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