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Short Communication

A Keynote on Biofilms

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ABSTRACT

Bacterial biofilms are formed by communities that are embedded in a self-produced matrix of extracellular polymeric substances (EPS). Importantly, bacteria in biofilms exhibit a set of 'emergent properties' that differ substantially from free-living bacterial cells. Bacterial biofilms can be considered to be an emergent form of bacterial life, in which communal life is completely different from bacteria that live as free-living cells. Emergent properties of bacterial biofilms include social cooperation, resource capture and enhanced survival following exposure to antimicrobials, and cannot be understood and predicted through the study of free-living bacterial cells. The physical scaffold of biofilm life is the matrix of extracellular polymeric substances (EPS) that keeps cells in the biofilm together and attaches them to substrata when colonizing surfaces. The matrix underlies the emergent properties of biofilms. The emergent properties of the biofilm are the reason for the evolutionary success of biofilms and underlie the role of biofilms as global habitat formers.

Keywords: Petrole; Microbiology

BIOFILM FORMATION

Biofilms are complex three-dimensional communities of microorganisms adhering to a surface and encased in a protective exopolymer substance. Biofilm formation progresses over five main stages . In stage one, individual planktonic cells migrate and adhere to a surface. Providing the correct conditions are present, these adherent cells then initiate biofilm production on the surface and become encased in small quantities of exopolymer material. In stage two, adherent cells exude an extracellular polymeric substance (EPS) and become irreversibly attached to the surface, which results in cell aggregation and matrix formation. In stage three, the biofilm begins to mature by developing microcolonies and water channel architecture, while also becoming significantly more layered. In stage four, the fully mature biofilm reaches its maximum cell density and is now considered a three-dimensional community. In stage five, the mature biofilm releases microcolonies of cells from the main community, which are free to migrate to new surfaces spreading the infection to other locations. To do this, the significant molecules are heated to temperatures of 500°C and 'cracked' into lighter molecules, with a catalyst want to accelerate the reaction. Often, the entire yield is

ULTRASTRUCTURE OF BIOFILM

Microbial biofilm is the grouping of sessile microbial communities which is attached with substratum and embedded in the self-produced pool of non-crystalline extracellular polymeric matrix

Bacterial biofilm communities differ from the planktonic ones in different ways such as growth rate, gene expression, transcription and translation because these biofilms communities live in different microenvironments which have higher osmolarity, nutrient scarcity and higher cell density of heterogeneous bacterial communities. Formation of the three-dimensional structure of biofilm is the dynamic process by heterogeneous bacterial communities. Bacteria living within the biofilms are protected from the varieties of environmental stresses, such as desiccation, antimicrobials attack by the immune system and ingestion by protozoa hence this architecture makes the biofilm communities to advance as compared to planktonic one. Coordination within the biofilm via cell-to-cell communication called quorum sensing (QS) in which accumulation of signaling molecules in extracellular environment leads to regulation of the specific gene's expression. Some bacterial species use QS to coordinate the disassembly of the biofilm community. Development of biofilms is multi step process. It starts with the initial adherence of bacteria to the substratum and irreversible attachment followed by their colonization in which modification in genes/proteins expression occurs followed by exponential growth phase. The exopolysaccharides (EPS) and water channels formation occur, facilitating nutrient supply which leads to the maturation of the biofilms. Ultimately surface detachment of the cells starts in the environments which again restart/recycle the biofilm formation onto the new surfaces

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The majority of microbes are able to develop multicellular biofilm communities. These communities are composed of subpopulations of different cell types that provide additional benefits to the organisms. There are numerous differences among the mechanisms that induce biofilm formation in different species.