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Protein aggregation and biofilm

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Background

Protein aggregation has traditionally been associated with disease however more recently protein aggregation has also been linked to the formation of functional aggregates utilized by a range of bacterial pathogens in the formation of biofilm. The formation of biofilms significantly increase the resistance towards antibiotics and is thus of central importance in the context of bacterial infections.

Despite being the key structural component in the biofilms very little is known about the molecular mechanisms involved in the formation of functional aggregates. The cellular pathways to the formation of extracellular biofilm and aggregates differs between different types of bacteria. It is thus important to investigate the mechanism involved in the formation of functional aggregates in order to ultimately prevent biofilm formation.

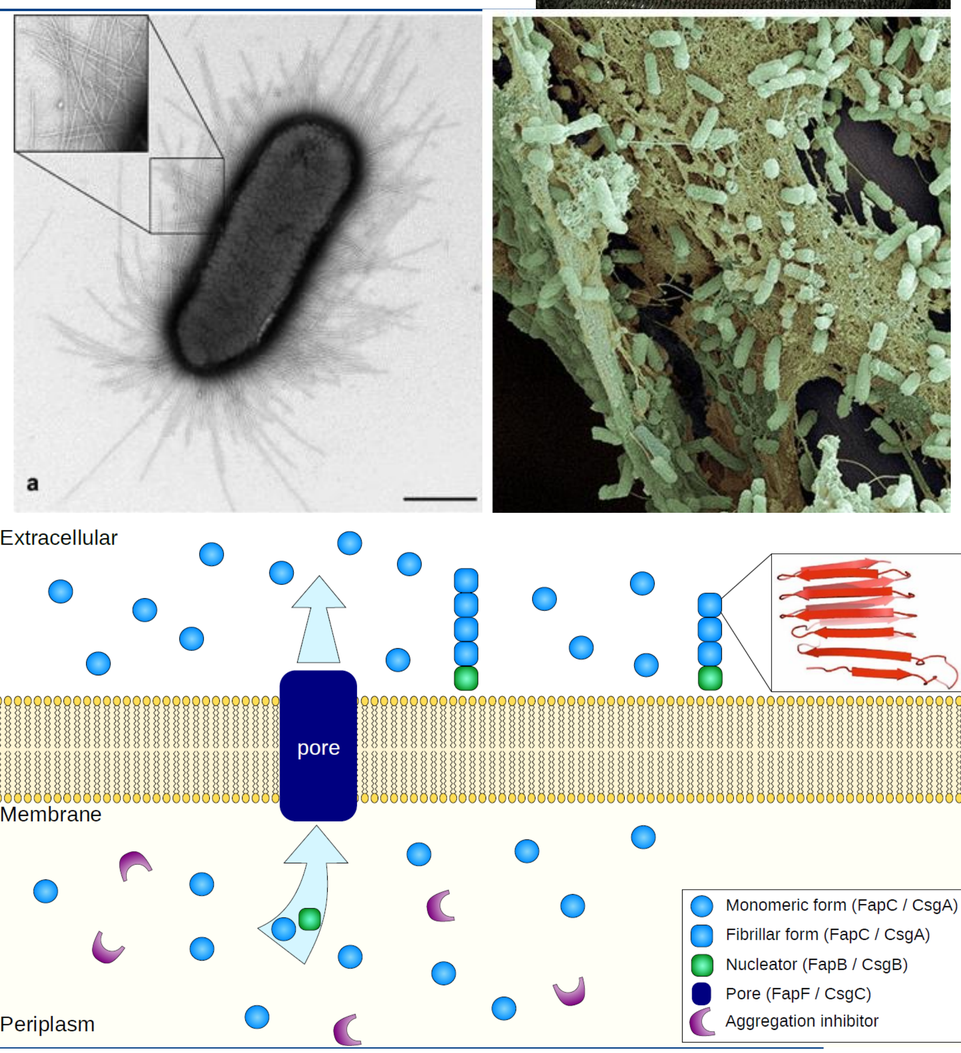

Figure: Top panel: Left: Bacteria forming functional aggregates attached to the surface. Right: Bacteria imbedded in biofilm ona surface. Bottom panel: Mechanism of biofilm formaion in *E. coli* and *Pseudomonas*

Projects and techniques

The projects proposed here aim to gain a better understanding of the biofilm formation of *Staphylococcus aureus* also known as MRSA bacteria. MRSA bacteria are involved in a range of difficult-to-treat infections and is commonly seen to invade surfaces of medical devices such as catheters. It is also often associated with bacterial lung infections following viral lung infections.

For all project the aggregation will be monitored using fluorescence spectroscopy and kinetic fitting algorithms will be used to analyze the data. Furthermore the structures of the aggregates will be examined using TEM imaging and biophysical techniques such as circular dichroism and Fourier Transform Infrared Spectroscopy.

Project 1: Investigate the effects of extracellular DNA on the aggregation mechanism of MRSA bacteria functional aggregates as eDNA have been shown to influence the aggregation.

Project 2: Investigate the effects of mammalian extracellular matrix components such as glycosaminoglycans on the aggregation mechanism of MRSA bacteria functional aggregates as increased susceptibility towards MRSA bacterial infections is seen following damage to the lung tissue after an immune response to a viral lung infection.

Project 3: MRSA bacterial biofilms and surfaces. The effect of different surface properties on the aggregation of MRSA bacteria functional aggregates will be investigated.

The proposed projects will significantly advance our understanding of the complex architecture of *Staphylococcus aureus* biofilm formation that is important for infections to persist in the host.

References:

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