Master/ Bachelor Thesis Project
Institute of Biophysics
Department of Applied Experimental Biophysics
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Nano-Microbiology

Single cellular interactions with biofilm

Many infectious diseases in humans are caused by virulent biofilms that result from complex interactions between specific microorganisms and their extracellular environments. Involved in biofilm formation are various types of filamentous structures that also form immunogenic complexes with environmental DNA (eDNA). Although bacterial infections are known to contribute to pathogenesis by inducing cell death and inflammation, the exact mechanism and the molecular players that lead to cell binding and pathogenesis remain obscure to date. This project aims at exploring the unique physical, biochemical, and electrostatic properties of living bacterial cells and biofilms. Using a portfolio of scanning probe microscopy (SPM)-based methodologies with nano-metric spatial resolution and single molecule detection sensitivity, we will study the molecules involved in bacterial attachment to surfaces and biofilm development.

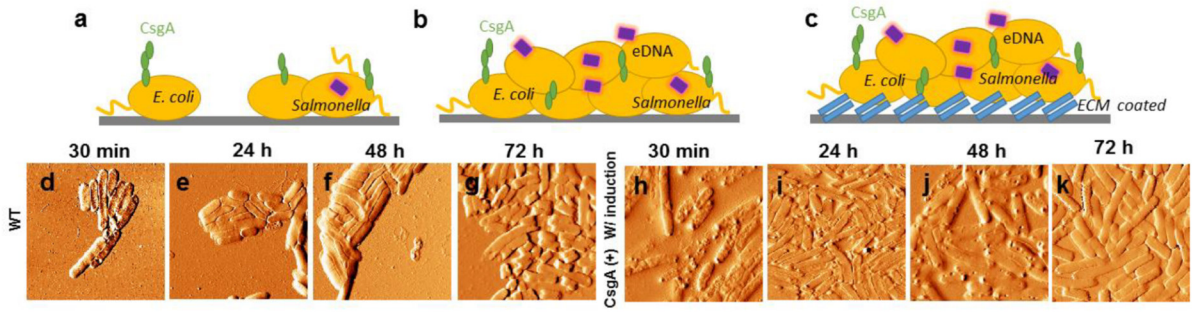

Figure 1 *Schematic design of biofilm formation. (a) Initial attachment on abiotic surfaces, (b) biofilm formation on abiotic surfaces, (c) biofilm formation of extracellular matrix coated surfaces, and (d-k) AFM images of bacterial attachment on a glass surface.*

Tasks performed by the student:

- Biofilm formation on different surfaces (glass, coated with selected recombinant ECM protein)
- AFM imaging of biofilm to characterize the morphological variation
- Detect the distribution of eDNA within the each step of biofilm formation using combined AFM/fluorescence microscopy
- Image processing and data evaluation

Requirements:

- Motivation, good communication, and creativity

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