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Bacterial Motility and its Role in Biofilm Formation

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ABSTRACT

Bacterial biofilms are known to cause millions of dollars in damage in the medical industry per year via infection of central venous catheters, urinary catheters, and mechanical heart valves. Unfortunately, there are some characteristics of biofilm formation that are yet to be fully understood. Recently much work has been done to investigate the motility characteristics of bacteria with hopes of better understanding the phenomena of biofilm formation. Still, one of the least understood stages is bacterial attachment or adhesion, a process designed to anchor bacteria in an advantageous environment. Providing a better understanding of bacterial motility near solid interfaces will serve to advance knowledge of hydrodynamic interactions at play in one of the early stages of biofilm formation, bacterial attachment. In this study, multiple bacteria strains: HCB 437, HCB 1262, HCB 1736, and Putida Pseudomonas are placed in lab created-microfluidics chambers. Using phase-contrast microscopic cinematography, the motion paths of individual bacterium are analyzed for evidence of significant hydrodynamic interaction with their surroundings. Preliminary results have indicated that the locomotive behavior of individual bacteria, as well as their collective motion in a constrained environment, is greatly altered compared to the behavior seen in the bulk fluid. These differences could be vital in the initial stages of biofilm formation and highlight the need for further research to more accurately reflect the environments that bacteria encounter.

KEYWORDS

Bacteria, Escherichia Coli, Motility, Pseudomonas Putida