Alginate production affects Pseudomonas aeruginosa biofilm development and architecture, but is not essential for biofilm formation - DTU Orbit (13/10/2019)

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Extracellular polymers can facilitate the non-specific attachment of bacteria to surfaces and hold together developing biofilms. This study was undertaken to qualitatively and quantitatively compare the architecture of biofilms produced by Pseudomonas aeruginosa strain PAO1 and its alginate-overproducing (mucA22) and alginate-defective (algD) variants in order to discern the role of alginate in biofilm formation. These strains, PAO1, Alg(+) PAOmucA22 and Alg(-) PAOalgD, tagged with green fluorescent protein, were grown in a continuous flow cell system to characterize the developmental cycles of their biofilm formation using confocal laser scanning microscopy. Biofilm Image Processing (BIP) and Community Statistics (COMSTAT) software programs were used to provide quantitative measurements of the two-dimensional biofilm images. All three strains formed distinguishable biofilm architectures, indicating that the production of alginate is not critical for biofilm formation. Observation over a period of 5 days indicated a three-stage development pattern consisting of initiation, establishment and maturation. Furthermore, this study showed that phenotypically distinguishable biofilms can be quantitatively differentiated.

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