IN SITU CHEMICAL CHARACTERIZATION OF THE MOTILE TO SESSILE TRANSITION OF *PSEDOMONAS AERUGINOSA* COMMUNITIES

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Pseudomonas aeruginosa is a Gram-negative opportunistic pathogen which infects more than 50,000 people each year in the United States alone. Its abilities to move, colonize surfaces, and develop biofilms give rise to the high resistance to antimicrobial treatment. One type of motility employed by *P. aeruginosa* is swarming motility, where bacterial cells undergo physical and metabolic alterations. Swarming has been studied by many researchers but the knowledge on its chemical composition that relates to the transition between the motile and sessile biofilm stages are still lack. Here we apply confocal Raman microscopy (CRM) to examine *P. aeruginosa* wild-type PA14 (a virulent strain isolated from a burn wound) under swarming and biofilm conditions.

The comparison between the swarming and biofilm samples indicates different molecules linked to the motile to sessile transition, revealing their community-specific chemical features. While the *Pseudomonas* quinolone signal (PQS) is found in swarm colonies and biofilms, the *N*-oxide quinolines (4-hydroxy-2-heptylquinoline-*N*-oxide,2-nonyl-4-hydroxyquinoline, etc.) are present in higher abundance and are synthesized and secreted much earlier in swarm colonies. Moreover, a closer investigation spanning from the center to the edge of a swarm colony shows high abundance of PQS at the center while *N*-oxides dominate the edge of the colony. The results provide insights into the chemical profile change occurring during the motile to sessile transition in *P. aeruginosa*, and demonstrate the broad application of CRM in biomolecular imaging.

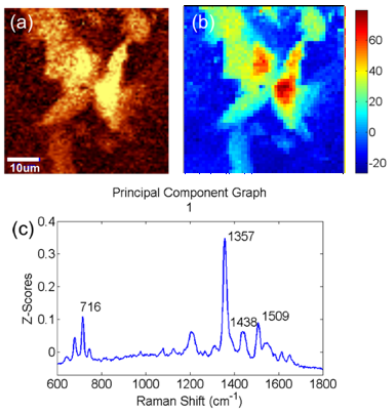

Figure 1. **Analysis of 24hr swarming assays of PA14. Raman image intergrated over 1330-1380 cm^{-1} for representative regions of signal molecules (a); principal component heat map (b); Raman spectral loading plot (c).**