Colonial and Motile Advantages of Pseudomonas aeruginosa in the Presence of Flow

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Pseudomonas aeruginosa can cause nosocomial infections in immunocompromised patients' tracts or organs that other bacteria would not normally inhabit. P. aeruginosa's twitching motility and type IV pili allow it to colonize areas that are supposed to be inaccessible to pathogens due to the presence of fluidic stress. To analyze the bacteria's motion, multiple branching microfluidic channels were constructed with variations in the distance between where the bacteria were introduced and the node of the branch. The different distances allow a way to calculate how far into a channel or pathway the bacteria can go before being overcome by the flow. A mutant type of P. aeruginosa, the pilTU mCherry mutant, was used as a control group as it has inactive type IV pili. Samples were collected at the lower end of the channels, and concentrations were determined using spectroscopy and fluorescent microscopy. Data from the instruments confirmed that the Wild Type cells were able to colonize the second branch of the channel while the mutants followed the path of the flow due to their lack of the twitching motility. Quantifying the displacement of this opportunistic bacterium can lead to better preventative care for hospital patients and stop the suffering of those who are already suffering.

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