Colonial architecture in mixed species assemblages affects AHL mediated gene expression

Vince P. Mason, Gerard H. Markx, Ian P. Thompson, Johanna S. Andrews and Mike Manefield

Abstract

Many bacterial species produce metabolites that accumulate in the extracellular environment and induce specific transcriptional responses in producing cells. This phenomenon, most often referred to as quorum sensing, is thought to constitute a self-cell-density sensing mechanism allowing bacterial populations to alter gene expression in response to increases in their own density. Quorum sensing systems involving N-acyl-L-homoserine lactone (AHL) production and response are the most intensively investigated example. In this study we have employed a novel technique, known as dielectrophoresis, to investigate the impact of colonial architecture on the induction of AHL mediated gene expression. Using dielectrophoresis, we constructed artificial mixed species microcolonies with specific architectures. In this way, we were able to show that approximately 1000 Escherichia coli cells layered over an immobilised cluster of approximately 500 AHL responsive cells alters the response of this cluster to AHLs supplied either exogenously or endogenously. These findings lend credence to the hypothesis that the accumulation of extracellular metabolites signifies generic crowding in mixed species assemblages.

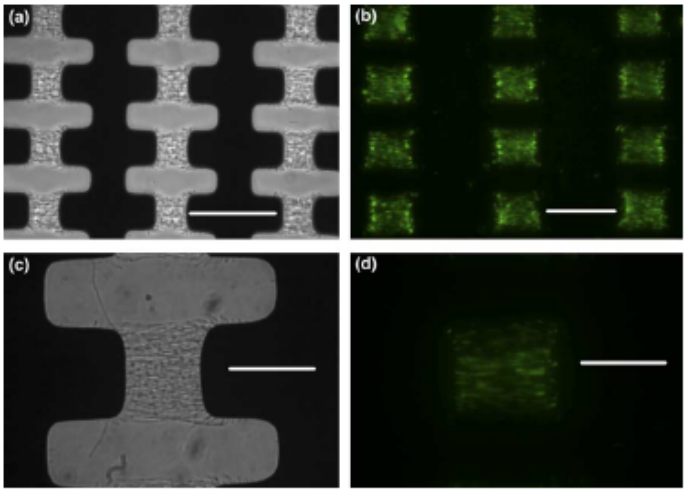

Fig. 2. Artificial microcolonies constructed by dielectrophoresis. Electric field gradients between adjacent microelectrode castellations (black) have drawn *Escherichia coli* (pJBA89) cells into aggregates that have been immobilised with a flocculating agent. (a) and (c) are phase contrast images displayed at lower (scale bar is 75 μm in length) and higher (scale bar is 30 μm in length) magnification, respectively. (b) and (d) are epifluorescence images displayed at lower and higher magnification, respectively. GFP production can be observed after exogenous addition of *N*-acyl-L-homoserine lactones.

Mason, V. P, Markx, G. H., Thompson, I. P., Andrews, J. S. and Manefield, M. (2005) Colonial architecture affects bacterial intercellular signal accumulation. *FEMS Microbiology Letts.* **244**:121-127.