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A stochastic modelling approach for bacterial cell-cell communication

Quorum sensing is a form of microbial communication via so-called autoinducers which regulates many bacterial processes. In an experiment, bacteria (*Pseudomonas putida*) were attached in a flow chamber. There, they grow in small microcolonies; the state of the bacteria (ON or OFF, influenced by the present autoinducer concentration) can be observed via Gfp (a fluorescence protein) by confocal laser scanning microscopy. We developed stochastic modelling approaches which allow to quantify e.g. rates of cell division, activation or detachment of the bacteria. The autoinducer production can also be considered in the model and depends on the the bacterial states in the microcolony. The model (a kind of extended birth-death process) can be adapted numerically to data of quite different situations: e.g. flow versus non-flow, and by that helps to understand better the steps of cell activation and how they can be influenced.

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