

Who is there, when, where and why? How diffusion helps bacteria to learn more about their environment

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1. Abstract

Bacterial species employ the mechanism of Quorum Sensing (QS), a communication system, to effectively coordinate their behavior, particularly in relation to pathogenicity and significant alterations in their lifestyle. Gene regulation systems are the basis for such systems, often containing positive and negative feedback loops. This may allow under certain conditions e.g. for bistability. The diffusion of signal molecules produced by bacterial cells in the surrounding environment introduces a crucial interplay between nonlinear dynamics and spatial inhomogeneity. To gain a deeper understanding from both mathematical and biological perspectives, numerical simulations serve as valuable tools. Finally, a short view on treatments like classical antibiotics but also Quorum quenching - a kind of inhibition of Quorum sensing is given.