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The role of spatial dynamics in modulating metabolic interactions in biofilm development FEDERICO BOCCI, Rice University, MINGYANG LU, The Jackson Laboratory, YOKO SUZUKI, Meisei University, JOSE ONUCHIC, Rice University — Cell phenotypic expression is substantially affected by the presence of environmental stresses and cell-cell communication mechanisms. We study the metabolic interactions of the glutamate synthesis pathway to explain the oscillation of growth rate observed in a *B. Subtilis* colony. Previous modelling schemes had failed in fully reproducing quantitative experimental observations as they did not explicitly address neither the diffusion of small metabolites nor the spatial distribution of phenotypically distinct bacteria inside the colony. We introduce a continuous space-temporal framework to explain how biofilm development dynamics is influenced by the metabolic interplay between two bacterial phenotypes composing the interior and the peripheral layer of the biofilm. Growth oscillations endorse the preservation of a high level of nutrients in the interior through diffusion and colony expansion in the periphery altogether. Our findings point out that perturbations of environmental conditions can result in the interruption of the interplay between cell populations and advocate alternative approaches to biofilm control strategies.

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