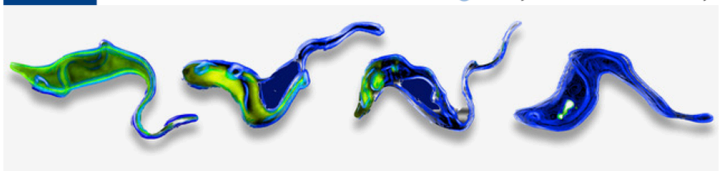

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Screening for genetic determinants of Vibrio cholerae biofilm architecture

Most of the bacterial biomass on Earth is found in three-dimensional communities, termed biofilms, which confer protection against many forms of physical, chemical, and biological stress. In this work we overcome previous limitations by developing a novel microfluidic high-throughput biofilm cultivation approach, as well as an automatized adaptive fluorescence microscopy screening procedure, to obtain single-cell resolution, three-dimensional biofilm images of a V. cholerae genome-wide transposon mutant library. Extraction of high-dimensional architectural data with the image analysis pipeline BiofilmQ and examination of the overall biofilm formation capabilities of each strain enabled us to establish the biofilm lifestyle in V. cholerae as a highly regulated one in which half of the V. cholerae genome plays an important role, most of its genes affecting either the temporal development of biofilm formation or the three-dimensional structure of the biofilm. Interestingly, we found that genes encoding motility- and chemotaxis-related proteins have an impact on biofilm structure, their absence leading to an exacerbated biofilm seeding density, biofilm size and cell packing in some cases, but also to a complete incapability to form three-dimensional biofilm structures.

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