Cologne Evolution Colloquium

Akos Kovacs Universität Jena

SFB 680 Molecular Basis of Evolutionary Innovations

Division of labor and evolution of autonomy in bacterial biofilms

Biofilms are structurally complex bacterial communities, where the cells are enclosed in an extracellular matrix that mediates the attachment of cells to each other or to surfaces. While the biofilm matrix benefits the population, i.e. protection, attachment to a substratum or surface spreading, its production is costly for the individuals. Mutant strains of the Gram-positive bacterium, *Bacillus subtilis* lacking matrix production have a higher fitness under well mixed planktonic conditions. Matrix producers have an advantage when cultivated in spatially structured environment initiated at low cell densities, i.e. in colony biofilms [1]. Contrariwise, biofilms on an air-medium interface, the so called pellicles are governed by different ecological processes. Colonization of the air-liquid interface requires aerotaxis driven motility [2]. Moreover, non-producers are excluded from the pellicles formed by wild-type cooperators, however, their abundance could change over time after prophage awakening [3].
Here, I will present the long term evolutionary dynamics of biofilms formed through genetic division of labor. Despite a short term success, genetic division of labor in biofilm formation collapses and slows down the evolution of autonomy of the winning partner. Differences in dependency levels and availability of public goods exchanged by the cooperating partners influence cooperation collapse revealing a barrier against evolution of intraspecific cooperation in microbes.

[1] van Gestel et al 2014 ISME Journal
[2] Hölscher et al 2015 J Mol Biol
[3] Martin et al 2017 Nat Commun

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University of Cologne, Institute for Theoretical Physics
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Hosted by **Berenike Maier**