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Competence development and natural transformation in *Micrococcus luteus*

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Natural genetic transformation has been documented in more than 80 bacterial species, including members of nearly all major taxonomic groups. Being one of the main routes for horizontal gene transfer, this process incorporates the internalization and the chromosomal integration of exogenous DNA during a genetically preprogrammed differentiated state called competence. In spite of the longstanding investigation of this phenomenon, so far only little is known about the regulatory mechanisms involved in genetic transformation and notably so in the case of representatives of the *Actinobacteria* phylum (high GC Gram-positive bacteria). In this report we focus on the competence development in the *Actinobacteria* member *Micrococcus luteus*. We provide evidence that nutritional limitation, provoked by the absence of amino acids in the growth medium, induces natural transformation in this species. Paradoxically, we also show that amino acid auxotrophy strongly inhibits competence development. We demonstrate the negative impact of a deletion of a RelA/SpoT-like homologue (Mlut_12840) and a putative novel (p)ppGpp synthetase (Mlut_22200) on natural transformation and we therefore speculate the involvement of the stringent response in the complex regulation of the competent state of *Micrococcus luteus*. Furthermore we investigate the specific regulatory function of branched-chain amino acids (BCAAs) and signify them as modulators of competence that alter expression of transformation-related genes. To our knowledge our data provides the first general insights into the regulation of natural transformation in a member of the *Actinobacteria* phylum and may also prove to be pertinent to a number of important pathogens belonging to the same taxonomic group.

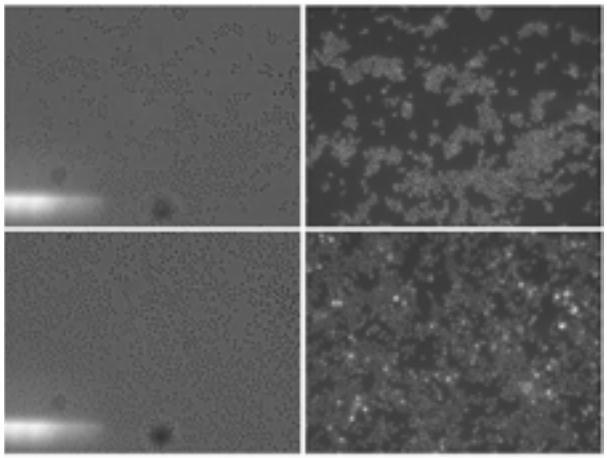

Figure 1: Competence development under nutritional limitation is a bimodal population trait occurring in only 5-10 % of the cells

Recent Publications:

1. Angelov A., Bergen P., Nadler F., Hornburg P., Lichev A., Übelacker M., et al. (2015). Novel Flp pilus biogenesis-dependent natural transformation. Front. Microbiol. 6:84.

Biography

Antoni Lichev has finished his Bachelor's and his Master's Thesis in Molecular Biotechnology at the Technical University of Munich. Since 2015 he has been doing his PhD in Microbiology at the Department of Microbiology at the Technical University of Munich. His previous work has been published in the journal "Frontiers in Microbiology".

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