

354A - Ecological role of plasmids in Arctic permafrost environments

Stine Holm¹, Adrian Gorecki², Matthias Winkel¹, Susanne Liebner¹, Dirk Wagner¹, Mikolaj Dziurzynski², Lukasz Dziewit², Fabian Horn*¹

¹GFZ German Research Centre for Geosciences, Germany, ²University of Warsaw, Poland

Permafrost-affected soil is characterized by a low biomass, spatial heterogeneity and strong environmental fluctuations. The thawing of high Arctic permafrost releases nutrients potentially leading to higher microbial activity. These environmental conditions have been suggested to create a “hot spot” for plasmid exchange. Plasmids have the potential to rapidly transfer genetic traits within a bacterial community. Plasmid diversity and the plasmid-mediated plasticity of soil bacteria are studied by metagenomic sequencing, pure isolates or transformed bacterial cultures. Our knowledge about the role of plasmids in the adaptation of microbial communities to changing environmental conditions in the Arctic is still limited.

In this study, the cultivable fraction of active layer permafrost soil was investigated. We applied structural and functional annotations of sequenced metaplasmidomes from two sites of Samoylov Island, Siberia. This was combined with 16S rRNA gene sequencing, qPCR, and PCR replicon typing for the identification of plasmid incompatibility groups.

The metaplasmidome analysis suggests that the original hosts of the plasmids are bacteria of the genera *Acinetobacter*, *Pseudomonas*, *Serratia* and *Janthinobacterium*. The taxonomic diversity of potential plasmid hosts does not resemble the bacterial diversity of the full environment. Sequenced plasmid genes show high potential for mobilization (the presence of *tra* genes), microbial stress tolerance (multidrug efflux systems [SMR, RND], heavy metal resistance genes [e.g. *CzcD*, *TerC*], and UV resistance systems. These traits suggest an important role of plasmids in the adaptation of certain bacterial taxonomic groups to harsh changing environmental conditions in the Arctic.