

Almost 80% of Earth (i.e. oceans, Arctic, Antarctic or montane regions of Alps, Himalayas or Rocky Mountains) is permanently cold, with temperature below 5°C and thus organisms capable to grow in such conditions are thought to be the most abundant organisms in biosphere. Bacteria and archaea dominate amongst them. The main aim of the following project is to explore the role of mobile genetic elements in the adaptation of psychrotolerant bacteria and archaea to extreme environmental conditions in cold regions.

Amongst the most widespread mobile genetic elements are plasmids, phages and transposable elements. Plasmids are extrachromosomal, self-replicating DNA elements. Phages are viruses of bacteria and archaea, that infect and kill their host or thrive as prophages in their genomes. Transposable elements are genetic modules capable of "jumping" within the host genome. All abovementioned mobile genetic elements may carry auxiliary genes not associated with their maintenance and spread, but potentially beneficial for their hosts. These are called accessory (auxiliary) genetic loads.

All meta-analyses planned in this project will be conducted based on publicly available genomic data of psychrotolerant bacteria and archaea and metagenomic data of cold environments. Identified mobile genetic elements will be manually reannotated, which will allow their classification and distinction of auxiliary genetic loads they carry. Afterwards, these will be analyzed in the course of phylogenetic and comparative genomic analyses, which will present evolutionary relations between mobile genetic elements themselves and mobile genetic elements and their hosts, as well as exploration of their diversity, biogeography and taxonomic- and/or habitat-specificity. Additionally, mobile genetic elements will be grouped based on their origin and carried accessory genetic modules. This will define their ecological adaptive potential. Finally, in the course of this project, public database of mobile genetic elements of psychrotolerant bacteria and archaea will be created. It will stand as a reliable source of information about mobile genetic elements of psychrotolerants for other researchers.