The University of Edinburgh - Friedrich Schiller University **Population Dynamics Virtual Seminar**



Hildegard Uecker - MPI for Evolutionary Biology Plön 12.05.23 - 14:30 BST - 15:30 CEST - 09:30 EDT

Mathematical population genetics of bacteria: Evolutionary dynamics on multicopy replicons

The vast majority of mathematical models for bacterial evolution treats bacteria as monoploid. Yet, polyploidy is common among bacterial species. Moreover, many plasmids have a copy number greater than one, and genes encoded on multicopy plasmids hence experience polyploidy even if the bacterium itself is monoploid. Alleles on multicopy replicons are subject to dynamics at two levels -- the intracellular processes of replication and segregation and the processes at the level of cells, in particular cell division and cell death. In this talk, I will present population genetics theory for bacterial adaptation driven by novel alleles on multicopy replicons, mostly focusing on plasmids. With these models, we assess the consequences of the replicon copy number for the probability of stochastic loss of rare new alleles, the probability of evolutionary rescue, and the trajectory of allele fixation. A comparison of our theoretical predictions to results from in-vitro evolution experiments confirms our understanding of the dynamics.

References:

Santer M., Kupczok A., Dagan T., Uecker H. (2022) Fixation dynamics of beneficial alleles in prokaryotic polyploid chromosomes and plasmids. Genetics 222(2), iyac121 https://doi.org/10.1093/genetics/iyac121

Santer M. and Uecker H. (2020) Evolutionary rescue and drug resistance on multicopy plasmids. Genetics 215(3): 847-868 https://doi.org/10.1534/genetics.119.303012