Seminar/Talk

Hysteresis treatments: Exploiting cellular memory to prevent resistance evolution

Roderich Römhild
Uppsala University

Host: Calin Guet

Antibiotic resistance is a growing challenge. Resistance can rapidly emerge during treatment, due to the high potential of bacteria for rapid evolutionary adaptation. One approach to sustain the efficacy of antibiotics is to develop treatment strategies that inhibit resistance evolution. This talk will show an example of a new treatment strategy - hysteresis treatments - that inhibits resistance evolution by using available antibiotics in a new way. Hysteresis treatments exploit cellular phenotypic memory, which refers to long-lasting changes in cellular physiology induced by previous antibiotic exposures. Antibiotics can act as signals, and induce specific and long-lasting cellular responses, such as heat-shock response, motility and changes in membrane permeability. Bacterial responses are stabilized across generations and can have pleiotropic effects for treatment with other antibiotics. Cellular memory can harm bacteria, when they are treated with appropriate sequences of antibiotics. Using evolution experiments, mathematical modelling, genomics, and functional genetic analysis, we demonstrate that hysteresis treatments are highly efficient - they cause extinction at sub-MIC concentrations - and inhibit the evolution of resistance. Hysteresis treatments impose specific selective pressure on the bacteria that does not favour resistance mutations, but rather mutations causing cellular ignorance behaviour, or a loss of memory. Cellular hysteresis can be harnessed as a novel principle to optimise antibiotic therapy, in order to achieve both, enhanced bacterial elimination and reduced resistance evolution.

Wednesday, April 10, 2019 11:30am - 12:45pm
Mondi Seminar Room 1, Central Building

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station. Please find a schedule of the ISTA Shuttle on our webpage: https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.