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MAX VON PETTENKOFER-INSTITUT
LEHRSTUHL MEDIZINISCHE MIKROBIOLOGIE UND
KRANKENHAUSHYGIENE



***The Max von Pettenkofer Institute
Microbiology Seminar Series***

Date: **Wednesday, November 20, 2024**

Time: **5.00 pm (sharp)**

Location: **Lecture Hall MvPI (3rd floor)**

Speaker: Prof. Dr. vet. med. Marcus Fulde

Department of Veterinary Medicine

Institute of Microbiology and Epizootics

Freie Universität Berlin



Title: The other side of the coin: molecular mechanisms of bacterial (hetero-) resistance

Antimicrobial resistance (AMR) poses severe threats to human, animal, and environmental health 1. In 2019, antibiotic resistant bacteria were associated with the deaths of 5 million people 2. More frightening, it has been estimated that within the next 30 years this number will increase up to 10 million annual deaths, which would surpass the number of deaths due to prevailing non-communicable diseases, such as cancer and diabetes, respectively 2 3

For many years, scientists have been studying the classical resistance mechanisms, such as intrinsic or horizontally acquired genetic resistance determinants, or mutations in target genes, and have focused their attention on bacterial populations as a whole. Research into so-called phenotypic resistance mechanisms, such as bacterial persistence or hetero-resistance, has been mostly neglected. These are mostly based on phenomena that occur at the level of bacterial subpopulations or even single cells and often appear only transiently. Technical progress in recent years and decades now makes it possible to examine these mechanisms in detail, both functionally and mechanistically. This lecture will therefore provide insights into these phenotypic resistance mechanisms. Using the model organisms *Salmonella Typhimurium* and *Enterobacter cloacae* complex (ECC), we show how bacteria respond to classical stressors, such as antibiotics, through gene duplication and multiplication (GDA) mechanisms. We were able to show that these GDAs occur only transiently in the bacterial population, are determined at the single-cell level and significantly influence the heterogeneity of the overall population. Higher antibiotic concentrations or longer antibiotic treatments, however, lead to the evolution of genetically heritable resistance determinants; this transition from transient to deterministic can be predicted by suitable modeling approaches and could be a helpful aspect to prevent antibiotic resistance before it arises.

Host: Dr. Tobias Geiger

This Seminar is registered by BLAEK (Bayerische Landesärztekammer) and authorized with 1 Training Point (Fortbildungspunkt).

Medical course leader: Prof. Dr. med. Sebastian Suerbaum
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