

Invitation to the Keynote Lecture Faculty of Biology

Dr. Henrik Strahl von Schulten

Newcastle University, UK

Lysis-independent bacterial killing by cell wall -targeting antibiotics

Abstract: Antibiotics that target bacterial cell wall synthesis are generally assumed to induce lysis as their core antibacterial mode of action. This process is catalysed by cell wall autolysins that degrade peptidoglycan in an uncontrollable manner upon inhibition of cell wall synthesis. This runaway degradation leads to weakening of the cell wall sacculus and, ultimately, to cell lysis. However, lysis is insufficient to explain the rapid killing observed in Gram-positive bacteria that frequently occurs faster than lysis. To study the mechanisms behind the rapid killing, we analysed the mode of action of cell wall antibiotics using microscopic, single-cell techniques. Our experiments with *Bacillus subtilis* and *Staphylococcus aureus* revealed that inhibition of cell wall synthesis triggers depolarisation of the cytoplasmic membrane that precedes and is independent of the lysis process. Using various fluorescence reporters and cellular assays, we found that depolarisation induced by cell wall-antibiotics leads to energy starvation, extensive disturbances of cellular organisation, and production of reactive oxygen species (ROS) that ultimately leads to accumulation of lethal cellular damage. Thus, rather than being a simple lytic process, the bactericidal activity of cell wall-targeting antibiotics is a complex cellular phenomenon that integrates autolysis with severe disturbances and damages triggered by membrane depolarisation.

June 06, 2024, 2-4 pm

Host: Prof. Dr. Susanne Gebhard

The keynote lecture will be presented at the
Biozentrum 1, HS BZ1, 00.187, Hanns-Dieter-Hüsch-Weg 15, Ground Floor