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Research Project

Bacterial infections – discovering new virulence factors and understanding antibiotic resistance/tolerance by bridging basic research and clinical microbiology

Third-party funded project

Project title Bacterial infections – discovering new virulence factors and understanding antibiotic resistance/tolerance by bridging basic research and clinical microbiology

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Organisation / Research unit

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Bacterial infections are associated with high health care costs, significant morbidity and mortality. Especially, young children, pregnant women, the elderly, and patients with immunosuppression are at high risk. Rapid treatment with appropriate antibiotics is crucial for a favourable clinical outcome, but increasing antimicrobial resistance severely limits treatment options. Bacterial pathogens such as *Pseudomonas aeruginosa* (a cause of pneumonia and sepsis) rapidly exchange resistance genes (such as VIM or IMP carbapenemases) and spontaneously acquire further mutations, resulting in pan-resistant strains for which no effective treatment is available.

Moreover, some strains carry specific virulence factors that cause dramatic pathology and rapid life-threatening disease exacerbation. Recently, it was recognized that in addition to inheritable resistance and virulence factors, antibacterial treatment can also fail since bacteria show a wide range of transient heterogeneous properties including disparate metabolic states and growth rates. As a result, some bacterial subpopulations can even survive prolonged exposure to otherwise lethal antibiotics ("antibiotic tolerance"). In spite of an increasing awareness of the crucial clinical importance of these mechanisms, as well as their underlying fundamental mechanisms, joint efforts of complementary teams of clinical microbiologists and basic researchers are still rare but hold promise to improve therapies that need to specifically address each clinical case ("personalized medicine"). To this end, research groups from the Biozentrum and the Clinical Microbiology at the University Hospital Basel want to intensify their collaboration.

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