

Drug delivery systems for antimicrobials

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This course will highlight selected aspects of drug delivery of antimicrobials. The scientific field of pharmaceutical sciences is interdisciplinary ranging from fundamental to applied research. The topic of the lectures relates to design and development of novel and more efficient drug delivery systems to prevent and treat infections to reduce the risk of resistance of bacteria to current antimicrobials.

Lecture 1. Tailoring nanogels for improved delivery of antimicrobial peptides

Antimicrobial peptides and chemical analogs hereof represent a group of promising new drug candidates for treatment of bacterial infections. However, challenges with these compounds are achieving sufficient delivery of the active compound to the specific target site of action as well as avoiding the cellular toxicity, which may be associated with direct exposure of the active compound to e.g. the blood vessel cells. We have designed biocompatible nanogels, which can be prepared by using microfluidic chips. These nanogels – if designed properly – may be a potential novel drug delivery system for antimicrobials.

Lecture 2. Biomedical devices for sustained release of antimicrobials

Many bacterial strains adhere to solid surfaces such as biomedical devices and there create communities (commonly referred to as biofilms) consisting of sessile bacterial cells embedded in a complex matrix. While growing in biofilms, the bacteria are more difficult to target and may develop resistance to standard treatments with antibiotics. Emerging technologies to prevent bacterial colonization on e.g. catheters include modification of the material used as well as coating the material with an antimicrobial drug. Our approach is to embed antimicrobials into the biomedical device matrix for sustained release of one or more antimicrobials to prevent bacteria adherence and biofilm formation.

Lecture 2. Surface-modified nanoparticles for treatment of lung infections

Chronic infections in the lungs are extremely difficult to treat, since the bacteria accumulate in biofilms in and on the surface of the viscoelastic mucus surface-lining the tissue in the respiratory tract. By surface-modifying particles encapsulating a drug and of a sufficiently small size, it may be possible to improve delivery of potent antimicrobials into the biofilm. One of our approaches will be presented.

Prerequisites for attending the lecture: In the lectures will aim to provide an overview of the general challenges in drug delivery, and with focus on antimicrobials. Since the field is inter- and multidisciplinary, the lectures will address the both aspects to a higher or lesser extent, and be prepared for participants with basic knowledge in natural and life sciences.