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## Polymeric micro- and nanocarriers for the treatment of biofilm-associated infections in cystic fibrosis

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A ntimicrobial treatment is a cornerstone of cystic fibrosis (CF) therapy, as approximately 90% of CF patients die from lung destruction promoted by pathogens such as *Pseudomonas aeruginosa* and *Burkholderia cepacia*. However, the efficacy of the inhaled antibiotics is limited due to a hindered penetration of drugs through mucus and bacterial biofilms which is difficult to imitate *in vitro*. In our experiments we developed a way to overcome these barriers, by loading tobramycin (Tb) into biodegradable poly(lactic-co glycolic acid) based nano- (NP) and microparticles (MP) modified with PEG and a blue fluorescent dye (AMCA) to investigate the penetration in mucus and the antibiotic efficacy in bacterial biofilms. Tb-loaded particles of 830 nm (MP) or 230 nm (NP) and zeta potentials of ca. -10 mV were prepared by a double-emulsion evaporation method and characterized by SEM and HPLC. For biofilm experiments, bacteria were cultivated in artificial mucus (AM)-containing chamber slides to allow the formation of a biofilm close to those of CF patients or in a microfluidic device to imitate the physiological shear flow in the body. The excellent penetration abilities of Tb-loaded particles through AM and biofilms and the remarkable antimicrobial efficacy in comparison to the free drug was confirmed by confocal laser scanning microscopy of LIVE/DEAD\* stained biofilms. In conclusion, we demonstrated that the NP and MP displayed excellent properties as biocompatible, mucus-penetrating delivery systems for antibiotics with improved deposition and bacterial killing of biofilm-embedded pathogens even under more physiological conditions compared to conventional *in vitro* models.

## Biography

Julia Ernst is a Pharmacist by training and graduated at the Friedrich Schiller University Jena in 2012. After gaining practical experience in pharmaceutical industry, hospital and public pharmacy in Switzerland and Germany, she started her PhD studies in 2014 at the Department of Pharmaceutical Technology, FSU Jena. Her research is focused on formulations for nanoparticular drug delivery systems to the lungs.

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