

## **Liposomes as a Formulation Approach to Overcome Microbial Biofilm Infections**

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### **Background:**

Biofilm is a cluster of microbial cells attached to living or non-living surfaces resulting in the development of chronic and persistent infections. It is considered a critical health threat as it makes bacteria 1000-fold more resistant to antibiotic treatment. Therefore, higher doses of antibiotics must be administered, which may result in serious side effects to the patient and the risk of antimicrobial resistance development. Biofilm resistance for treatment is attributed to the presence of a thick layer of extracellular polymeric matrix surrounding the bacterial cells inside the biofilm and existence of bacterial cells in metabolically inactive dormant state.

### **What is the problem and our approach to solve it:**

Once a biofilm is formed, it is very difficult to treat the infection efficiently with currently available formulations. The use of nano-sized drug delivery systems, such as liposomes, might be a suitable approach to improve the delivery of antibiotics to bacterial biofilms, thus eliminating the need for using higher drug doses and reducing the possibility of patient toxicity. The principle of how liposomes will work and how we are working towards developing them will be presented.

### **Research methods:**

Different types of liposomes were prepared, characterized, and evaluated regarding their ability to fuse with bacterial cells and penetration depth into the biofilm

### **Main findings:**

We were able to prepare nanosized, fusogenic liposomes that were stable for at least six months. This screening experiment will lay the basis for future work on encapsulating a new antibiotic for the delivery to bacterial biofilms.