

Publication

Antimicrobial Glycolipid Nanoparticles towards the Inhibition of Biofilm on Medical Catheters

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Author Oliveira da Cunha, Tânia Lou

Author at UniBasel [Oliveira da Cunha, Tania Lou](#) ;

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Healthcare-associated infections are a major problem in hospitals and health care facilities, mostly caused by bacteria such as *Staphylococcus aureus*. These infections are often related with biofilm formation onto surface of medical devices such as catheters. Due to this fact, the need to find strategies for prevention is emergent and required. A possible alternative is the use of the biosurfactants sophorolipids that present antimicrobial activity and the ability to prevent biofilm formation. If a more prolonged antimicrobial effect is desired, encapsulation of sophorolipids into nanoparticles can be a promising approach.

The aim of this study was the encapsulation of sophorolipids into chitosan nanoparticles by ionic gelation to obtain antimicrobial particles intended for the prevention of biofilm formation. The antimicrobial activity was evaluated by the broth microdilution method and biofilm production was observed through scanning electron microscopy.

Nanoparticles containing sophorolipids were produced in a small scale approach and incorporation of active compounds was successfully achieved. Within the different concentrations tested, it was the 3.75 mg mL⁻¹ concentration of sophorolipids that the highest mass of active compounds was incorporated into the particles. Scale-up production was performed with an encapsulation efficiency of 11.2 %. The minimum inhibitory concentration of these particles able to inhibit *Staphylococcus aureus* growth was ≥ 40 mg mL⁻¹. From scanning electron microscopy observation of nanoparticlesfunctionalized silicone rubber discs, it was possible to notice a reduction in biofilm formation in these specimens when compared to the ones functionalized without active compound loaded nanoparticles.

In conclusion, the results of this study revealed that sophorolipids incorporated in nanoparticles diminished biofilm formation and might be a possible approach for a prolonged effect on medical catheters.

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