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Evaluation of a ureteral catheter coating by means of a BioEncrustation *in vitro* model

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Abstract

Biomaterials for applications in the urinary tract are challenged with both biofilm formation and encrustation, two highly interconnected processes. While great effort has been achieved developing promising materials there is only a limited choice of sophisticated *in vitro* models that are available to analyse the performance of biomaterials prior to performing delicate and expensive *in vivo* studies. In this study we present a complex BioEncrustation model that imitates both the processes of multi-species biofilm formation and encrustation *in vitro*. The resulting crystalline biofilms are compared to the deposits found on explanted ureteral stent surfaces (*in vivo* situation) and to deposits formed in an experimental set up that does not contain bacteria (Encrurator[®]). Further focus of this study is dedicated to employing the developed BioEncrustation model to evaluate the effect multifunctional coatings impose on the processes of biofilm formation and encrustation under *in vitro* conditions. The investigated TANP coating combines unspecific and broad band specific antibacterial properties with a degrading polymer matrix that is intended to inhibit crystal formation. The coating was prepared on both polyurethane and silicone tubes and the subsequent results of the *in vitro* BioEncrustation analyses reveal a promising potential for employing the coating to render ureteral stent surfaces more biocompatible.

Keywords

Urinary tract infection, biofilm formation, catheter associated encrustation, *in vitro*-test, urinary tract model, biodegradable coating

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