Here, we report on the impact of polymer structure and film composition on both the inherent and β-peptide-mediated ability of PEM-coated catheters to prevent or reduce the formation of C. albicans biofilms in vitro and in vivo using a rat model of central venous catheter infection" Raman et al (2016).

Abstract:

Candida albicans is the most prevalent cause of hospital-acquired fungal infections and forms biofilms on indwelling medical devices that are notoriously difficult to treat or remove. We recently demonstrated that the colonization of C. albicans on the surfaces of catheter tube segments can be reduced in vitro by coating them with polyelectrolyte multilayers (PEMs) that release a potent antifungal β-peptide.

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Here, we report on the impact of polymer structure and film composition on both the inherent and β-peptide-mediated ability of PEM-coated catheters to prevent or reduce the formation of C. albicans biofilms in vitro and in vivo using a rat model of central venous catheter infection. Coatings fabricated using polysaccharide-based components and coatings fabricated using polypeptide-based components both served as reservoirs for the loading and sustained release of β-peptide, but differed substantially in loading and release profiles and in their inherent antifungal properties (e.g., the ability to prevent colonization and biofilm growth in the absence of β-peptide). In particular, CH/HA films exhibited inherent antifungal and antibiofilm behaviors in vitro and in vivo, a result we attribute to the incorporation of CH, a weak polycation demonstrated to exhibit antimicrobial properties in other contexts. The antifungal properties of both types of films were improved substantially when β-peptide was incorporated. Catheter segments coated with β-peptide-loaded CH/HA and PLL/PGA films were both strongly antifungal against planktonic C. albicans and the formation of surface-associated biofilms in vitro and in vivo. Our results demonstrate that PEM coatings provide a useful platform for the design of new antifungal materials, and

suggest opportunities to design multifunctional or dual-action platforms to prevent or reduce the severity of fungal infections in applied biomedical contexts or other areas in which fungal biofilms are endemic.

Reference:

Raman, N., Marchillo, K., Lee, M.R., Rodríguez López, A.L., Andes, D.R., Palecek, S.P. and Lynn, D.M. (2016) Intraluminal Release of an Antifungal β-Peptide Enhances the Antifungal and Anti-Biofilm Activities of Multilayer-Coated Catheters in a Rat Model of Venous Catheter Infection. ACS Biomaterials Science & Engineering. 2(1), p.112-121.

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