Antimicrobial Coatings for Polymer Surfaces

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Cather associated urinary tract infections (CAUTIs) is one of the most frequent types of infections related to medical devices. It is responsible for almost half of all hospital infections and prolongs the mean bed time for patients by up to 2.4 days[1]. The infections often requires treatments with strong antibiotics, which for users of urinary catheters, is a severe limitation in their everyday life. To reduce the number of infections, antimicrobial surfaces have been developed and applied on catheters, but with limited effect[1]. Much effort have been made in order to find new and better candidates and a wide range of compound classes have been investigated for application in antimicrobial surfaces. The general mechanism by which these surfaces work to achieve antimicrobial activity, can be simplified into 3 categories: 1) repelling 2) leaching and 3) contact-killing surfaces[2]. For repelling surfaces, usually a hydrophilic polymer is used to establish a hydration layer, which is capable of protecting the surface against attachment of proteins and bacteria. Here, hydrogels, hydrophilic brushes and zwitterions are most commonly seen, due to their strong binding of water (See Fig. 1). Leaching surfaces have bactericidal agents incorporated into a given matrix and from here, the agent is able to steadily diffuse and kill surrounding bacteria. Release of silver nanoparticles or antibiotics have gained the most attention within this category (See Fig. 1). Finally, contact-killing surfaces kills bacteria only when in direct contact, through disruption of the cell membrane, leading to cell lysis. Some peptides are naturally bactericidal and have been immobilized onto surfaces and cationic polymers have been proven to be highly antibacterial as well (See Fig. 1). The aim of this project is to establish a high throughput screening method, which is to be used in combination with a state of the art literature study to find suitable antimicrobial candidates. Finally, potential candidates are to be implemented in a urinary catheter coating to prevent or reduce the number of CAUTIs.

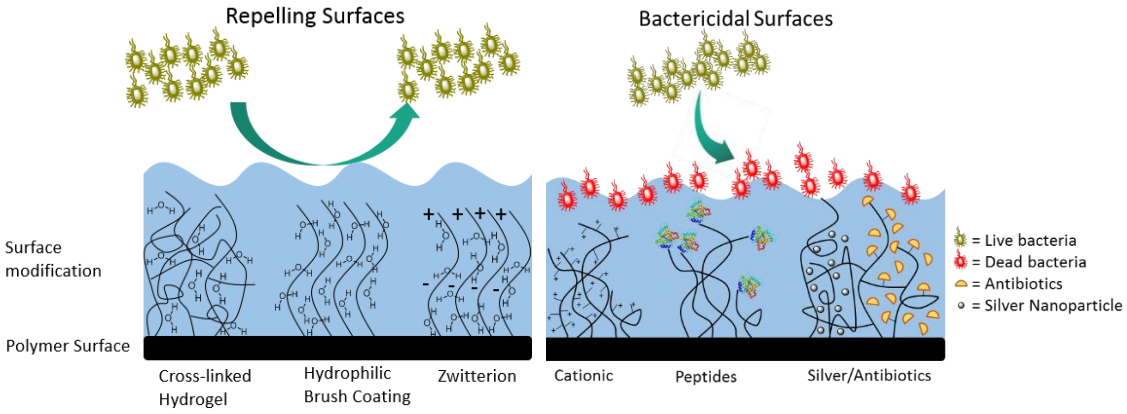

Figure 1 Schematic illustration of some of the working principles of antimicrobial surfaces.

1. Kirdis H. Development of novel methods for microbiological evaluation of urology products. 2011.

2. Kaur R, Liu S. Antibacterial surface design Contact kill. *Prog Surf Sci*. 2016;91(3):136-153.

doi:10.1016/j.progsurf.2016.09.001.