

Catheter Design Using Transmission of Antimicrobial Blue Light to Fight Catheter Related Infections

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PURPOSE Catheters inserted into the human body are lifesaving. However, microorganisms can attach to their surface and form a biofilm resulting in life threatening infections. There are no practical alternatives to antibiotic treatment. Antimicrobial blue light that is nontoxic to human cells is a promising new alternative. **ENGINEERING GOAL** To determine the efficacy of antimicrobial blue light on the prevention or destruction of the biofilm associated with catheter related infections and to develop a device that delivers antimicrobial blue light to all surfaces of a catheter. **PROTOTYPE** Methods of delivering antimicrobial blue light was investigated. A blue LED (450 nm) was chosen as the light source. A luminal fibre optic cable, wall embedded fibre optic and an edge lit catheter hub were explored as delivery methods. The wall embedded fibre optic with a polyvinyl chloride catheter was chosen as the final prototype. **TESTING** The efficacy of antimicrobial blue light on the destruction of a catheter biofilm, using scanning electron microscopy was investigated. Light transmission along the length of the catheter was assessed with a smartphone lux meter. **RESULTS** Destruction of the biofilm was demonstrated. Light transmission decreased with increasing distance from the source. The wall of the PVC catheter adequately reflected and refracted the blue light. **CONCLUSION** Antimicrobial blue light is an effective means of penetrating and destroying biofilms. A catheter system that utilizes blue light in a wall embedded fiber optic design may help control, prevent and treat catheter related infections that are resistant to antibiotic therapy.