Testing a Coating on Peritoneal Dialysis Catheter Extension to Reduce Biofilm Formation

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Introduction

• The project goal is to design a test to demonstrate the effectiveness of a coating for the intraluminal tubing of peritoneal catheter extensions to reduce biofilm formation.
• Kidneys (renal system) filter blood to remove excess fluid and chemical waste. Patients with chronic renal failure (CRF) require treatment.
• Peritoneal dialysis (PD) is a treatment option that filters blood using the peritoneum [1].
• Dialysate enters the body through a peritoneal catheter-extension. Excess fluid and chemical waste diffuse across the peritoneum and into the PD fluid. The PD fluid is then removed from the body [2].
• Peritonitis is the inflammation of the peritoneum usually from bacterial or fungal infection. Peritonitis is a big hurdle for patients using PD. Minimizing infections is important for PD patients to improve quality of life. [3]

Method

The coating will be applied to silicone coupons and tested against *Staphylococcus aureus* and *Pseudomonas aeruginosa* [4]. Coupons will be challenged with bacteria solution at a known concentration in a six-well plate and placed in a rocking incubator at 37°C for 24 hours. After the time period the reduction of biofilm will be analyzed on the coated vs. uncoated coupons by Atomic Force Microscopy (AFM), solution plating and colony counting, and live/dead stain.

Training Results

• *Pseudomonas chlororaphis* O6 (PcO6) and PET coupons have been used in test runs to determine standard operating procedures.
• PcO6 has been used in place of *S. aureus* and *P. aeruginosa*.
• Polyethylene terephthalate (PET) has been used in place of silicone material in catheter extension.
• With each training iteration the experimental design was changed and improved.

Future Work

• Quantify colony forming units in working culture and in solutions in contact with catheter extension material.
• Ensure biofilm formation with the uncoated catheter extension material.
• Quantify bacterial growth on coated material and compare to positive and negative control.
• Analyze the results with microscopic techniques.
• Analyze results using live dead staining techniques.
• Replicate results to ensure reliability.
• Iterate through and improve upon the experimental design.

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References