Bioinspired Materials to Reduce Infective Endocarditis in Artificial Heart Valves

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Infective endocarditis (IE) is an infection caused by bacteria that enter the bloodstream, settle in different parts of the heart, and, specifically for this project, attach to artificial heart valves and develop biofilm. New research for IE is more recently being developed, hoping to create new diagnostic strategies, largely through the application of bioinspired materials in the construction of artificial cardiac valves and the idea that they can yield improved properties. The theory of this project is that by using bioinspired materials, the bacteria Staphylococcus epidermidis, a common bacteria seen with infective endocarditis, will have reduced biofilm growth. Two bioinspired materials were researched: a nano-infused antibacterial PLA filament and hydrogel contact lenses. 36 wells in well plates were inoculated with 5 mL of nutrient media and 5 uL of rehydrated S. epidermidis, then coverslips or material samples were inserted, 12 wells for each sample. After 24 hours of incubation, the samples and coverslips were analyzed with a crystal violet stain and photographed. The experiment was successful in demonstrating that these materials reduce biofilm growth. The control samples had an average of 38% biofilm accumulation, the filament had an average of 10.75% accumulation, and the lenses had an average of 11% accumulation. After running an ANOVA test and t-tests for comparison of the individual samples, the p-value was below 0.05 when comparing the lenses and the filament to the control, demonstrating further statistical success of the individual samples completing the hypothesis and exemplifying the future of implantable devices.

Awards Won:

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