



**CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY**

Name(s) Anin Sayana	Project Number J1732
Project Title Novel Use of T4 Bacteriophage to Substitute for Antibiotics in the Treatment and Prevention of S. epidermidis Biofilms	
<p style="text-align: center;">Abstract</p> <p>Objectives/Goals Bacteria become resistant to antibiotics by forming biofilms that commonly attach to indwelling medical devices such as mechanical heart valves, pacemakers, and urinary catheters. The CDC estimates that 65% of hospital acquired infections are caused by biofilms which lead to the increase in hospital costs or disability of patients and may pose a health problem for people requiring indwelling medical devices. Current treatments usually involve the invasive method of removing the device and replacing it. My goal is to see if T4 bacteriophage can be used to prevent and destroy a biofilm caused by Staphylococcus epidermidis. The widespread use of antibiotics in humans, animals, and agriculture plays a significant role in the increase of strains of drug resistant bacteria.</p> <p>Methods/Materials Growth of biofilm: A 1:100 dilution with 100ml TSB, 1ml of S.epidermidis culture grown overnight, 6 negative control (exposed to white light), and 6 positive control (UV light) was used. Prevention of biofilm: A 1ml phage solution with 3ml of TSB with the concentration 5×10^8 phages/ml was prepared. Added 5.5ml of the 1:100 dilution and 0.5ml of phage into cuvettes and incubated overnight. Treatment of biofilm: After biofilm creation, added the bacteriophage to cuvettes, incubated overnight, and pipetted 100uL of culture to TSA plates to incubate overnight. Absorbances were recorded from spectrophotometer. Experiment was performed over a period of 4 months in 3 trials using 33 cuvettes to research the effects of T4 on S.epidermidis.</p> <p>Results Biofilm growth: A biofilm successfully grew on the walls of cuvettes. Average positive control absorbance: 0.297; average negative control absorbance: 0.357. Higher absorbance=denser biofilm. Biofilm Prevention: When adding T4 with S.epidermidis to the cuvettes, the difference in absorbances with the controls was 0.034 and 0.07. This showed that T4 prevented the formation of biofilm. Biofilm destruction: Adding T4 after formation of biofilm showed a difference in absorbance from the control of 0.055, showing that the T4 could successfully destroy the biofilm.</p> <p>Conclusions/Discussion My results show that T4 prevented and destroyed the S.epidermidis biofilm. The prevention worked better than destruction of biofilm. This research proposes an alternative method to treat bacterial biofilms using the T4 bacteriophage.</p>	
Summary Statement The purpose of this experiment was to see if T4 bacteriophage can be a possible alternative to antibiotics to prevent and treat S.epidermidis biofilms that cause infections in implanted medical devices of urinary bladder, kidney, and heart.	
Help Received My mentor, Ms. Sarah Thaler, supervised my experiments to ensure that I was using safe lab technique; my school science teacher Mrs. Nguyen answered my questions.	