I. Project Title
Biofilm remediation by extracellular polymeric substance (EPS) modification

II. Project Completion Date
Expected Feb. 2020

III. Student(s), Department(s), and Major(s)
Matthew Borglin, Biology Department, MS biology

IV. Faculty Advisor and Department
Christopher Kitts, Biology Department

V. Cooperating Industry, Agency, Non-Profit, or University Organization(s)
Sigma Xi, NSF CSU I-Corp

VI. Executive Summary
With the help of the Baker Koob endowment this project was able to investigate the novel application of chemical modifiers on mature biofilms as a new potential method for its removal. The major challenge that this project initially faced was the designing an experimental procedure for consistent biofilm production in order for a comparison treatment across sampling surfaces and follow up experiments. However, the consistency was hard to determine until a reliable sampling method was established. Fortunately, after interacting with industry leaders in biofilm remediation technics a methodology was discovered that was recently approved by the Environmental Protection Agency as a reliable way to test for the ability of novel agents as biofilm removers. With the help of the endowment the equipment for the experimental set up was purchased and the chemical modifier was tested.

After four experimental runs of the EPA approved methods a trend is forming suggesting that the chemical modification of interest does behave as a biofilm remover. Although it is hard to be sure of its properties at this point in the process, our modifier, if effective, could greatly benefit many industries.

From this point on more experimental trials will need to be ran to further determine if the trending properties of the modifier are what we think they are. In conclusion, and with high hopes that the experiment maintains a support for the chemical modifier to be a viable biofilm remediation agent, experimental runs will end in February, with results analyzed and written by the end of April.
VII. Major Accomplishments

(1) Interacting with industry to discover EPA approved methodology.
(2) Establishment of the methodology that produces consistent biofilm on sampling surfaces and uses a reliable procedure for testing the treated biofilms.
(3) Experimental outcomes that suggest our novel chemical modifier can effectively remove mature biofilm.

VIII. Expenditure of Funds
The Baker Koob endowment funds allowed for the investigation of methods to produce and test for consistent biofilm production. Also allowed for the purchase for the necessary equipment to run EPA’s approved methodology which required the CDC Bioreactor and its auxiliary equipment. Finally, the endowment allowed for the purchase of consumable reagents and equipment needed to run the experiment.

IX. Impact on Student Learning
This endowment has impacted student learning in a few major ways. First, it has impacted my master’s education greatly as I was not fortunate to receive funding from my advisor to approach my thesis research. Therefore, this funding has allowed me to pursue my question, as well as learn and experience the process of science to its fullest. Starting out I was not sure how I was even going to begin to ask the question. However, now I feel comfortable in my approach and my ability to take on my next investigation. Besides myself, this endowment has greatly impacted the learning process of my undergraduate team member. This student was greatly engaged in the development of the EPA approved methodology. From this experience he will be able to finish his own senior project requirements and allowed him to be a competitive applicant for graduate programs.