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DISSERTATION

"The Power That Lies Within: Identification of *Serratia marcescens* Mechanisms that Play a Role in Predation by the Predatory Bacteria *Bdellovibrio bacterivorous* and *Micavibrio aeruginosavorus*"

by

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10:00 A.M.
MSB C-600

ABSTRACT

The rise of multidrug resistant bacteria (MDR) or superbugs has become a "fundamental threat" to global health. In recent years, the use of predatory bacteria has gained interest as a novel therapeutic to treat MDR infections. The two predatory bacteria that have been well studied are *Bdellovibrio bacterivorous*, an intracellular predator and *Micavibrio aeruginosavorus*, an epibiotic predator. Both predators prey on Gram-negative bacteria but the mechanisms governing predation and prey specificity are still unknown. With both predators having to circumvent secreted factors and physical barriers of their prey, we hypothesize that these components might be involved in predation and predator-prey interactions. In this study, we used *Serratia marcescens*, an important human pathogen, to study the role played by different structural and secreted factors on predation by the two predators. Among the mutants tested, higher predation was measured on the *S. marcescens* metalloprotease mutant when incubated with *M. aeruginosavorus*. Incubating *M. aeruginosavorus* with purified metalloprotease was found not to impact predator viability; however, pre-incubating prey, but not the predator, with purified metalloprotease was able to block predation. Using flow cytometry and fluorescence microscopy, we were able to confirm that the ability of the predator to bind to the metalloprotease mutant was higher than that of the metalloprotease producing wild type. We also found that when *S. marcescens* cultured at temperatures that support serratamolide production, *B. bacteriovorus*' ability to prey is severely impaired. Utilizing fluorescence microscopy, we were able to determine that the predator's ability to form bdelloplast is being blocked at early timepoints. Additionally, we found that the S-layer plays a role in predation. We hypothesize that the S-layer contributes to the containment of the serratamolide which is affecting predation during predator-prey association. The factors identified in this study provide a better understanding of the mechanisms involved in predator-prey interactions. The work here advances our knowledge of the basic biology that revolves around predation and a framework for how to utilize these predators to treat MDR infections.