1154-92-2756 **Shelby R Stanhope*** (shelby.stanhope@usafa.edu) and **Isaac Klapper**. *Using Stochastic Differential Equations to Model the Immune System Response to Bacterial Infection on the Surface of a Medical Implant Device.*

The occurrence of biofilms on the surface of implant devices in the human body is a problem of great concern in the medical community. In this study, we use mathematical modeling in conjunction with data collected in laboratory studies, to model the immune response to bacterial infection on the surface of implant devices. We focus on the early stage of the initiation of infection and aim to understand which factors determine whether the infection will be eliminated or will eventually lead to the development of a biofilm on the device. One of the first responders in the innate immune response are neutrophils, which follow chemical signals to locate and phagocytose bacteria. We model the growth of bacterial populations and their release of chemoattractants (which initiate the immune response) with a system of partial differential equations. The chemotactic movement of neutrophils to the sites of infection occurs through directed random motion, which is modeled using stochastic differential equations. By varying the amount of bacteria present in the initial infection and the strength of the immune response, we observe cases where the infection is completely eradicated and others where the infection persists. (Received September 17, 2019)