2015 Summer Research Experiences (SRE) for Undergraduates and Teachers
Abstract

JOHNSON, T, KHANAL, J., ROHLY, M., SIREK, N., DAY, J., LEGRAND, E. and B. PANTHA. Exploring host-pathogen interactions with agent-based modeling in NetLogo. National Institute for Mathematical and Biological Synthesis, Knoxville, TN; Morehouse College, Atlanta, GA; Southeastern Louisiana University, Hammond, LA; Columbus State University, Columbus, OH; L&N STEM Academy, Knoxville, TN; The University of Tennessee, Knoxville, TN.

Agent-based modeling (ABMs) is an effective way to abstractly represent host-pathogen interactions. Our goals for this project were to investigate additional aspects of host-pathogen interactions as they pertain to the effectiveness of non-specific stress in host defense by extending an existing ABM (LeGrand and Day 2012). Extensions include the addition of specialized cells (neutrophils), an inflammation radius indicator, viral infections, initial pathogen spatial distribution, and barriers around key host cells meant to represent vital organs. Additionally, we were able to simplify the observer interface by splitting the screen into host and pathogen controls, as well as changing how easy it is re-adjust the pathogen location. We constructed an ABM using NetLogo to simulate intricate interactions and observe resulting behavior. Our findings highlight the fine balance between adequately using essential resources to defend oneself against harm and defending past the point of self-benefit.