2014 Summer Research Experiences (SRE) for Undergraduates and Teachers
Abstract

ANYAECHE, V., JAMES, T., KURAMOTO, T., NELSEN, T., CHEN, S., LANZAS, C. and S. LENHART. An epidemiological model of Bovine Respiratory Syncytial Virus infection dynamics. National Institute for Mathematical and Biological Synthesis, Knoxville, TN; Fisk University, Nashville, TN; LeMoyne Owen College, Memphis, TN; Augsburg College, Minneapolis, MN; University of North Carolina, Chapel Hill, NC; University of Tennessee, Knoxville, TN.

Bovine Respiratory Syncytial Virus (BRSV) is one etiological agent in the larger Bovine Respiratory Disease (BRD) Complex that causes damage to the respiratory tract, facilitates bacterial growth and compromises the immune system. Negative effects of BRSV include costs stemming from death, reduced performance, poor growth and the administration of vaccines and treatments. Understanding the effect of cattle contact networks on the transmission of the pathogens causing BRD will help reduce unnecessary treatments, costs and public health concerns of growing drug-resistance. A stochastic agent-based epidemiological model has been developed to predict the outcome of infection under different circumstances. The model simulates the spread of BRSV using a spatially implicit contact network generated by a real time location system and visualized in NetLogo. It takes a top down approach to understanding the complex relations between the key transmission components. The underlying theory of model relies on basic Susceptible-Infected-Recovered (SIR) compartmental principles. Simulations were completed under varying initial conditions and compared maximum infected prevalence, time of maximum infected prevalence and final infected prevalence to see how disease dynamics and emergence differed under the given initial conditions.