1127-92-336 **Sharon Bewick**, **Phillip P.A. Staniczenko**, **Bingtuan Li*** (bing.li@louisville.edu), **David Karig** and **William F. Fagan**. *Invasion speeds in microbial systems with toxin production and quorum sensing.*

The theory of invasions and invasion speeds has traditionally been studied in macroscopic systems. Surprisingly, microbial invasions have received less attention. Although microbes share many of the features associated with competition between larger-bodied organisms, they also exhibit distinctive behaviors that require new mathematical treatments to fully understand invasions in microbial systems. We model bacterial invasion using a system of coupled partial differential equations. Our model considers a competitive system with diffusible toxins that, in some cases, are expressed in response to quorum sensing. We derive analytical approximations for invasion speeds in the limits of fast and slow toxin diffusion. Interestingly, we find that toxins should diffuse quickly when used offensively, but that there are two optimal strategies when toxin is used as a defense mechanism. Specifically, toxins should diffuse quickly when their killing efficacy is high, but should diffuse slowly when their killing efficacy is low. Our approach permits an explicit investigation of the properties of diffusible compounds used in non-local competition, and is relevant for microbial systems and select macroscopic taxa, such as plants and corals, that can interact through biochemicals. (Received February 06, 2017)