TRADE-OFFS OF CHRONIC VIRAL INFECTION IN SULFOLOBUS ISLANDICUS. S. J. DeWerff, M. A. Bautista, C. Zhang, A. Herrera, and R. J. Whitaker University of Illinois, Department of Microbiology, 601 S Goodwin Ave. Urbana, IL 61801, USA

Viruses are a major component of microbial ecosystems and their virus-host dynamics can have an influential role in shaping the overall ecosystems. While past research has focused on lytic viruses and their effects on population dynamics new discoveries in the field of virology suggest that these dynamics are just a small portion of what happens in nature. An additional dynamic that has only begun to be explored is beneficial infections. Previous models of virus host interaction, such as the two state model of resistance and susceptibility, fail to include the possibility of a beneficial infection for the host. In this study we explore a unique virus-host interaction and uncover mutualistic outcomes of infection and how these effect population dynamics. We are utilizing the model system of the thermophile *Sulfolobus islandicus* and its virus *Sulfolobus*-spindle shaped virus 9 (SSV9) isolated from Kamchatka, Russia. This is an ideal model system because we are able to study different host-virus phenotypes in the same system, including resistance and susceptible, but also the additional phenotypes of immunity through CRISPR-Cas systems and chronic infection. In chronic infection, the host can grow and replicate in the culture; however, it does so while continually producing new infectious viral particles. Additionally, we find in natural population of *S. islandicus* there is varying rates of infection in different hot springs. This continued long term interaction between the host and virus together with the observation of infection in nature leads us to believe that this is one area where mutualistic viral interactions can be uncovered. To test this hypothesis, we have been able to isolate chronically infected host from lab controlled infections. In growth curves of pure culture, we have shown that there is a cost to infection in which the infected strain is unable to reach the same carrying capacity of the un-infected ancestor. However in competitions between an infected and un-infected host, the infected host quickly fixes in the population. These two results suggest that there is a trade-off in fitness for the infected host. In nature this could be seen as a beneficial where the virus acts as natural weapon to prevent the colonization of the environment of a susceptible strain. By studying his fitness-trade off in chronic infection in *S. islandicus* and how they may apply to natural populations and extend the role of viruses in the host spring ecosystem.