High Impact Publication Selected for Special Recognition in 2020

Unit: Florida Medical Entomological Laboratory **PDF Download(s):** Publication

Publication Full Citation: Paige, A., Bellamy, S., Alto, B.W., Dean, C., Yee, D. 2019. Linking nutrient stoichiometry to Zika virus transmission in a mosquito. Oecologia 191: 1-10.

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Publication Impact: The current study was a collaboration between UF and University of Southern Mississippi (USM). This publication is the product of the senior thesis project for Andrew Paige, an undergraduate student. The project was led by Andrew Paige with supportive assistance from graduate students Shawna Bellamy (UF) and Catherine Dean (USM). All three students are co-authors on the paper. The paper is published in the ecological journal Oecologia (journal impact factor, 2.92). This paper was selected to be published in the "highlighted student research" section of Oecologia. This section is intended to honor the highest quality student research. Papers for this section must be recommended by the handling editors following the normal peer review process. The study received attention from the media in the form of press releases, thus disseminating the information to the public. Select examples: "More nitrogen in the mosquito diet reduces its ability to transmit Zika." UF-IFAS Blogs, June 24, 2019. https://blogs.ifas.ufl.edu/news/2019/06/24/more-nitrogen-in-mosquito-diet-reduces-its-ability-to-transmit-zika/ "Nitrogen-rich diet reduces mosquitoes' ability to transmit Zika." News Medical, June 24, 2019. https://www.news-medical.net/news/20190624/Nitrogen-rich-diet-reduces-mosquitoes-ability-to-transmit-Zika.aspx The study investigated the role of larval nutrition on adult mosquito Aedes aegypti infection and transmission of Zika virus. Zika virus is an emergent mosquito-borne virus that spread throughout the Americas with circulation occurring primarily between humans and A. aegypti. To date, millions of humans have been infected with Zika virus. Most of the emergent mosquito-borne viruses affecting human health are transmitted by mosquitoes that inhabit water-filled containers during their immature stages, where allochthonous inputs of detritus (plant and animal) serve as the basal nutrients for microorganisms which form the mosquito diet during the larval stage. These detritus types can vary considerably in their nutrient content (i.e., carbon and nitrogen), and therefore produce variable effects on the performance of mosquitoes. In this study the quantity and type of detritus (animal and plant) were manipulated in microcosms containing newly hatched A. aegypti mosquito larvae. Adult mosquitoes derived from the microcosms were allowed to ingest Zika virus-infected blood and then tested for disseminated infection, transmission, and total nutrients (percent carbon, percent nitrogen, ratio of carbon to nitrogen). Insect detritus was positively correlated with percent nitrogen, which affected Zika virus infection. Disseminated infection and transmission decreased with increasing insect detritus and percent nitrogen, likely attributable to a positive relationship between nitrogen and immunity against pathogens. We provide the first definitive evidence linking nutrient stoichiometry to arbovirus infection and transmission in a mosquito using a model system of invasive A. aegypti and emergent Zika virus. This research provides the framework for additional studies investigating links between elemental composition and host-pathogen interactions, thus extending the frontiers of our understanding of fundamental concepts in science. Additionally, this study impacts human welfare by addressing factors that influence transmission of Zika virus by the primary mosquito vector A. aegypti.