

Department of Biological Sciences Seminar Blog

Seminar Date: 2/9/18

Speaker: Dr. Joel Vega-Rodríguez, Johns Hopkins School of Public Health

Title: *“Making the Most of it: How Malaria Parasites use our Fibrinolytic Proteins to Infect the Mammalian Host and the Mosquito”*

Malaria, Mosquitoes, and Minorities in Science

By: Will King (Biology PhD Student)

As a graduate student in the sciences, attending scientific talks and being introduced to new scientists slowly begins to integrate into one's everyday life. At Duquesne, we host a weekly seminar where speakers will come and share with Faculty, Graduate students, and Undergraduates about their research. While this is now how I am used to spending my Friday afternoons, this particular seminar was slightly different. It was the first time in my scientific career I have personally encountered a fellow Puerto Rican as a featured speaker. Growing up with a Puerto Rican mother molded me into who I am today, but as I continue in my growth, as a scientist and academic, I have come to realize there is a lack of representation of Hispanics/Latinos in the field of science. According to the National Center for Science and Engineering Statistics' 2017 report, Hispanics make up 17% of the population of the United States (NSF, 2017). Despite this, only 5.6% of Science and Engineering Ph.D recipients in the past 10 years identify as Hispanic/Latino (NSF, 2017). Being able to attend a seminar by a fellow Latino, was therefore inspiring and encouraging. I was able to see someone from my culture achieve the same goals I have set for myself for the first time in my life. It helped provide a sense of comfort and confidence that there is also a place for me in the field of science. So first and foremost, I just want to thank Dr. Joel Vega-Rodríguez for not only being an outstanding scientist, but also being an inspiration to

fellow Hispanic/Latino scientists as he, among many other Hispanic/Latinos, begin to pave the way for aspiring young scientists. But now, let's talk about the fun stuff, his science.

Dr. Vega-Rodriguez is currently a research associate at John Hopkins School of Public Health. He received his Bachelor's as well as his Ph.D at the University of Puerto Rico. His current research focuses on *Plasmodium* invasion of the mosquito midgut, as well as molecular mechanisms of *Plasmodium* fertilization. He opened his seminar with an introduction to Malaria. Despite much progress in the field of Malaria, there are still around 214 million infections per year resulting in 500,00 deaths. While drugs, like artemisinin, have been used to assist in the fight against Malaria, Malaria continues to adapt and gain resistance to these drugs. (Vega-Rodríguez et al, 2015). Therefore, further need for study is still necessary for targeting possible drug treatments for antimalarial medication. One of these target processes is fibrinolysis. Fibrinolysis is the process in which fibrin is broken down. This process is catalyzed by enzyme called plasminogen which can be activated to become plasmin by either tPA or uPa. These activators, in Malaria, can either be made or use the host's activators to activate plasminogen. The use of plasmin is used by a multitude of species including bacteria, fungi, viruses, other parasites, and Malaria (Vega-Rodríguez et al, 2013). In terms of *Plasmodium*, when plasminogen is removed from the blood system, one witnesses no infection from *Plasmodium*, which supports the necessity of plasmin use for *Plasmodium* as well.

Then the next question for our speaker became what part of the life cycle does this effect. To test this, they fed the parasite to the mosquitos and dissected them at 24 hours and used immunofluorescence to classify ookinete formation with and without the presence of plasmin. What they discovered is that when plasmin is removed, they witness a reduction in ookinite formation. This lead to

the conclusion that plasmin is necessary not only for infection but also ookinete formation in *Plasmodium's* life cycle. To activate plasmin in this process, they also discovered that the parasite uses the host activators tPA or uPa.

Using microscopy, tPa and uPa were shown to colocalize to the parasite gametes *in vivo*. These activators, from the host, are then used to activate plasmin to allow the parasite to move through substances like fibrin. This movement through the fibrin was examined by using flow cytometry to examine how this mechanism functions. They also examined other functions of plasmin by the parasite by examining the sporozite and their infection into mammalian cells. When plasmin is not present in sporozite infection, it greatly affects the mobility of the sporozites. This was shown by placing the sporozite on a glass slide with matrigel in the presence and absence of plasmin, and then tracking the parasite's movement. He furthered showed the use of plasmin is not only used in the initial infection of the dermis for the sporozite, but also the liver. These discoveries may be the start to targeting possible ways to stop Malaria infection with further study.

Overall, Dr. Vega-Rodriquez was able to give a highly engaging talk, describing the process of Malaria infection to an audience with limited experience and background knowledge. It was one of those talks that when you enter the room you feel like the concept is entirely foreign but leave ready to explain the entire seminar to one of your peers. So, thank you Dr. Vega-Rodriquez, for your story, your research, and for your time. Thanks for a communication style that helps your audience understand foreign topics, and for inspiring one young Latino scientist.

Citations:

1. National Science Foundation, National Center for Science and Engineering Statistics. 2017. *Women, Minorities, and Persons with Disabilities in Science and Engineering: 2017*. Special Report NSF 17-310. Arlington, VA.
2. Vega-Rodríguez J, Pastrana-Mena R, Crespo-Lladó KN, Ortiz JG, Ferrer-Rodríguez I, Serrano AE. 2015. Implications of Glutathione Levels in the *Plasmodium berghei* Response to Chloroquine and Artemisinin. *PLoS One*. 10: e0128212. PMID: 26010448.
3. Vega-Rodríguez J, Ghosh AK, Kanzok SM, Dinglasan RR, Wang S, Bongio NJ, Kalume DE, Miura K, Long CA, Pandey A, Jacobs-Lorena M. 2014 Multiple pathways for *Plasmodium* ookinete invasion of the mosquito midgut. *Proc Natl Acad Sci USA* 111: E492-500. PMID: 24474798.