

Scientists study insect immune systems

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More than 120 million people in the tropics and sub-tropics are infected with *Wuchereria bancrofti*, a parasitic worm that causes the tropical disease lymphatic filariasis. This disease is the leading cause of morbidity worldwide and can cause disfigurement of the limbs and genitalia.

Michelle Michalski, associate biology professor at the University of Wisconsin Oshkosh, devoted her recent sabbatical to studying filarial worms that cause this disease and the mosquitoes that transmit them. Her research was done in collaboration with a team of scientists from the University of Wisconsin Madison and Iowa State University.

“My collaborators study the immune response of mosquitoes to filarial worms, which include canine heartworm,” Michalski said. “Lymphatic filariasis is a mosquito-borne disease of humans, and the worms that cause the disease have to develop to certain stages in the human in order to be infective to the mosquito. In the mosquito they must go through a certain sequence of development before they can infect the next human.”

The scientists found that one major vector of *W. bancrofti*, the mosquito species *Culex pipiens pipiens*, does not support development of another type of worm, *Brugia malayi*, even though the two worm species have the same life cycle and cause the same disease.

Normally when the worm enters the mosquito through a blood meal, it penetrates the mosquito stomach and enters the flight muscles to develop further. Michalski and her team determined that this particular mosquito species kills *B. malayi* early in the infection process.

“It turns out that when *Wuchereria* gets into the *C. p. pipiens* it behaves normally,” Michalski said. “*Brugia*, on the other hand, never escapes the stomach – some toxic factor in the mosquito stomach selectively kills *Brugia*.”

This phenomenon has never before been described and may have an impact on how decisions are made for controlling this neglected tropical disease. People with lymphatic filariasis can be given medication so they are no longer infectious to the disseminating mosquitoes, but there is no cure for the disease.

Villages are currently being mass treated to decrease transmission, but it may be necessary to target mosquitoes to eliminate the disease.

“There are a lot of control efforts going on right now to stop the transmission of the disease, but few are targeting mosquitoes in any way,” Michalski said.

Often insecticides or bed nets are used to control diseases that are transmitted through blood feeding insects. Knowing which mosquito species in different geographic regions are responsible for disease

transmission will allow scientists to efficiently target mosquitoes.

“In each geographic region, the dynamic between the mosquitoes and the people differs, the dynamic between the mosquitoes and the parasites differs,” Michalski said. “You have to understand the biology of what’s going on in each area in order to effectively control the disease.”

Treating people with drugs has failed in some areas so it is important to understand which mosquitoes are transmitting the disease and how they can be targeted.

“In areas where *Brugia malayi* is endemic, we now know why *Culex* mosquitoes are not transmitting the disease, and we don’t need to target this particular mosquito species,” Michalski said.

In January, Michalski will be traveling with her UW Madison colleagues to Papua New Guinea, a country where *W bancrofti* transmission is affecting the population. The team will study natural transmission of the disease.

Michalski said New Guinea is an interesting country to go to because not only are they battling *W. bancrofti*, but they are battling malaria as well. The country is home to all four species of human malaria, and people are often infected with multiple diseases.

Michalski and her colleagues will test their new hypotheses about the filarial worms and the mosquitoes that transmit them.

“We are very interested in the immune response of mosquitoes carrying multiple infections, and we will use native mosquitoes, worms and malaria in a laboratory setting to infect mosquitoes with both the worm and malaria to test our hypotheses,” Michalski said.

For more information on Michelle Michalski’s research, visit www.uwosh.edu/facstaff/michalsk.