Researchers discover novel anti-viral immune pathway in the mosquito

January 10 2012, By Lindsay Taylor Key

Photo Credit: CDC/James Gathawy. The Asian Tiger mosquito (Aedes albopictus), originated in tropical and sub-tropical regions of Asia, but can now be found across the globe.

(Medical Xpress) -- As mosquito-borne viral diseases like West Nile fever, dengue fever, and chikungunya fever spread rapidly around the globe, scientists at Virginia Tech are working to understand the mosquito's immune system and how the viral pathogens that cause these diseases are able to overcome it to be transmitted to human and animal hosts.

In nearly every part of the world, humans and animals experience high levels of morbidity and mortality after being bitten by mosquitoes

infected with viruses. More than 100 different viruses transmitted by blood feeding arthropods like mosquitoes have been associated with human or animal disease.

Two especially prolific vectors are the yellow fever mosquito (*Aedes aegypti*) and Asian tiger mosquito (Aedes albopictus), which is easy to spot because of its striped patterning. Although native to Africa and Asia, these insects can spread through the western world by hitching rides in used tires, which trap water to create a perfect breeding site.

Virginia Tech researchers recently identified a novel anti-viral pathway in the immune system of culicine mosquitoes, the insect family to which both vectors belong. Kevin Myles and Zach Adelman, both associate professors of entomology in the College of Agriculture and Life Sciences, publish their findings this month in PLoS Pathogens.

"We have previously shown that an antiviral response directed by small interfering RNAs (siRNAs) is present in culicine mosquito vectors. However, we show here that another class of virus-derived small RNAS, exhibiting many similarities with ping-pong-dependent piwi-interacting RNAs (piRNAs) is also produced in the soma of culicine mosquitoes," they explain. Myles, Adelman and co-workers made use of a technique called next generation sequencing to aid in their discovery.

The newly discovered antiviral pathway appears to act redundantly to the previously described siRNA pathway, indicating a robust immune system, said Myles. Thus, understanding how viruses get around the mosquito's dual antiviral responses poses an increasingly interesting challenge to scientists.

"In the case of mosquito-borne pathogens, our health depends as much on the mosquito's immune response as it does on our own immune response, yet surprisingly little is known about the immune system of the

mosquito," Myles said.

After coming to Virginia Tech in 2005, Myles and Adelman built a research program devoted to work in this sub-field. They are members of Virginia Tech's Vector-Borne Disease Research Group and affiliated faculty members in the Fralin Life Science Institute. The mission of the Vector-Borne Disease Research Group is to elucidate the fundamental mechanisms involved in the transmission and pathogenesis of vector-borne infectious organisms, to deepen understanding of the nature of infectious disease, and to lead the search for novel approaches to disease mitigation.

Provided by Virginia Polytechnic Institute and State University