Mosquito-borne diseases are of significant concern for Illinois. From 2004 to 2016, the state ranked in the top 20% of reported cases of mosquito-borne illnesses nationally. This is largely due to transmission of West Nile virus, predominantly by the mosquito species *Culex pipiens* (northern house mosquito) and *Culex restuans*. West Nile virus transmission occurs throughout Illinois, leading to neuro-invasive human disease cases each year.

Other mosquito species, most notably *Aedes albopictus* (Asian tiger or forest day mosquito), are invading Illinois and are potential vectors for invasive disease agents like chikungunya, dengue, and Zika viruses and established viruses of public health concern, like La Crosse encephalitis virus.

Since 2017, the Medical Entomology Laboratory at the Prairie Research Institute (PRI) has worked with the Illinois Department of Public Health (IDPH) to monitor Illinois mosquitoes for insecticide resistance. This effort has found insecticide-resistant populations of invasive mosquitoes and the mosquito species primarily responsible for spreading West Nile virus.

**MOSQUITO-BORNE DISEASE**

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**MOSQUITO CONTROL AND INSECTICIDE RESISTANCE**

Insecticides can play an important role in reducing the risk of exposure to West Nile virus by reducing the numbers of adult, biting, and potentially infective female mosquitoes. Insecticides also can be used as an emergency measure in the case of an outbreak of a rare or emerging virus.

Over time and with repeat applications, it’s possible for mosquito populations to become less sensitive to these chemicals. Because this insecticide resistance threatens our ability to quickly kill disease-transmitting mosquitoes, it is critical to know where and how frequently such resistance occurs and what may be
Monitoring finds insecticide resistance in multiple mosquito species

The PRI Medical Entomology Lab conducts statewide monitoring of mosquito populations in Illinois to characterize where and how frequently insecticide resistance occurs.

Understanding what may be causing insecticide resistance in Illinois mosquito populations is a complex challenge because it requires data on pesticide use (where, when, what and how much and how frequently it is being applied) by sector (public health, agriculture, commercial applications, etc.) on a long-term basis at a fine-scale spatial resolution. Although certain data on pesticide use are readily available, having finer-scale spatial data across multiple sectors publicly available would allow for a more robust assessment of what might be causing insecticide resistance in mosquito populations statewide.

**Culex pipiens**  Our surveillance revealed a widespread resistance or tolerance to commonly used permethrin-based insecticides in Illinois’ Cx. pipiens mosquitoes, a common vector of West Nile virus. Among Cx. pipiens, 82% of sampled populations are resistant to permethrin. Organophosphate insecticides such as malathion are nowadays rarely used in Illinois but could be deployed in case of an emergency response. Surprisingly, 61% of Cx. pipiens showed resistance to malathion. Of the Cx. pipiens specimens to undergo genetic sequencing, 55% were found to contain a point mutation associated with resistance.

**Culex restuans**  For Cx. restuans, another common vector of West Nile virus, 44% of sampled populations tested showed resistance to permethrin.

**Aedes albopictus**  For Ae. albopictus, a possible vector for a wide range of invasive and established viruses, including chikungunya and La Crosse encephalitis virus, 28% of sampled populations show signs of resistance to permethrin.

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For more information about the Medical Entomology Lab visit [https://medical-entomology.inhs.illinois.edu](https://medical-entomology.inhs.illinois.edu) or contact Angie Coy, PRI coordinator of stakeholder engagement, at wisehart@illinois.edu or 217.265.4677.