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Conference Details

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Communication Title: Insecticide Resistance in Culex vectors throughout the Upper Midwest

ABSTRACT

Pesticide resistance is an important issue worldwide, and in the United States, resistance in mosquitoes has been neglected in areas such as the upper Midwest. The Midwest Center of Excellence for Vector-borne Disease aims to address these deficiencies through research, training, and public outreach. Following a survey in 2018, given to public and mosquito control practitioners, an extensive outreach program was launched to promote insecticide resistance testing and management throughout the region. This program was centered around regional mosquito and vector control association meetings and specific workshops focused on vector surveillance and control. Beginning in January 2019 and continuing through May 2019, a series of presentations were given at five meetings and four hands-on workshops, including one specifically focused on insecticide resistance testing, reaching over 500 public health and mosquito and vector control practitioners. Materials compiled in a resistance testing kit were distributed to 39 organizations to aid in the implementation of annual resistance testing using the Centers for Disease Control bottle bioassay. Follow-up efforts, to determine the success of resistance testing by kit recipients, will take place when the mosquito season concludes in October 2019. Additionally, during the 2019 mosquito season, insecticide resistance surveillance was conducted with Culex spp. mosquitoes from 26 locations in seven states, including MI, IL, OH, IN, MN, WI, and IA. Following the World Health Organization recommendations, potential resistance to permethrin was detected in 12 of 26 locations. Surveillance will continue throughout 2020, using additional pyrethroid insecticides. A genetic assessment of the regional population of Culex pipiens complex mosquitoes will also be conducted using individuals from bottle bioassays to examine the presence of Culex pipiens form pipiens and form molestus, Cx quinquefaciatus, and hybrids. Preliminary data from 2018 mosquito samples show a surprising number of Cx. pipiens form molestus in unexpected areas. The presence or absence of genes associated with these forms and species could influence the evaluation of insecticide susceptibility in hybridized mosquitoes. Microsatellite analysis of these genetic admixtures could provide valuable insight into the importance of hybrid vector populations.

COMMUNICATION OUTCOMES

The current research on insecticide susceptibility is funded by the Midwest Center of Excellence for Vector-borne Disease (MDE-VBD), which aims to address the wide variety of issues associated with ticks, mosquitoes, and the pathogens they can transmit, through research, outreach, and building communities of practice throughout the upper Midwest. Funded by the Centers for Disease Control, the MCE-VBD includes several partners in five states. One of the center's main areas of focus is evaluating and addressing regional insecticide resistance. Dr. Edward Walker's lab has conducted high level research on vector and vector-borne disease ecology, surveillance, and management for decades and has provided valuable training and professional consultation to public health professionals and mosquito control practitioners, including routine arbovirus testing. Insecticide resistance assessment is an essential component of vector control programs as susceptibility is a large portion of what determines vector control efficacy, and this work is a major contribution to the Walker lab's continued research and outreach efforts. Previous research has examined the genetic relationships of Culex species complex mosquitoes to feeding and habitat preferences. Continued genetic assessment of regional Culex populations will contribute to our current knowledge of Culex vector ecology and behavior, and the current research will contribute information previously not evaluated on susceptibility within the Culex pipiens complex. Participation in the American Mosquito Control Association's annual meeting will allow opportunities to network with colleagues that also conduct research on insecticide resistance, interact with mosquito control and public health professionals, and attend a variety of presentations directly related to vector and vector-borne disease ecology and management. The content of the annual AMCA meeting also often includes various new techniques on mosquito husbandry, an essential component in the process of testing for susceptibility, adulticide evaluations, and other important techniques directly applicable to this research. Overall this research will help to develop and maintain regular insecticide resistance testing programs throughout the region and aid in the efficiency of mosquito control programs.