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NEVBD DIGEST

Official Newsletter of the Northeast Regional Center for Excellence in Vector-Borne Diseases

SPECIAL ISSUE

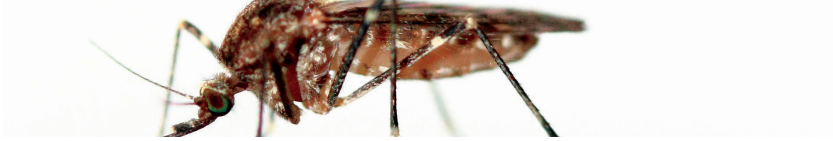
Looking Back Over the Past Five Years: A Celebration of Achievements & Partnerships Across the Northeast in Vector-Borne Disease Prevention

NEVBD is celebrating five years of applied research, education, and service to the vector control and public health community.

We want to celebrate the accomplishments and thank the thousands of partners and participants in NEVBD's work!

Join us in this special issue to learn more about our programming from the past five years.

In This Special Issue:



A Brief Background

The Northeast Regional Center for Excellence in Vector-Borne Diseases (NEVBD) was established in December 2016 through a Cooperative Agreement between the Centers for Disease Control and Prevention and Cornell University.

Our founding partners include the New York State Department of Health Vector Ecology Laboratory and Wadsworth Center Arbovirus Laboratory, Connecticut Agricultural Experiment Station, Columbia University E3B Department, Rutgers University Center for Vector Biology, and Louis Calder Center of Fordham University.

Our efforts during our 5-year funding period have focused on innovative training for the vector-borne disease workforce; applied research targeting new strategies for vector-borne disease monitoring, prediction, and control; and connecting partners across the Northeast to share knowledge, resources, and form new collaborations in a community of practice.

We established a diverse network of colleagues representing professional associations, academic institutions, and state and local agencies working in vector-borne disease and public health. We built unprecedented connections between academic and public health organizations at the local and state levels through our applied research program and training curricula.

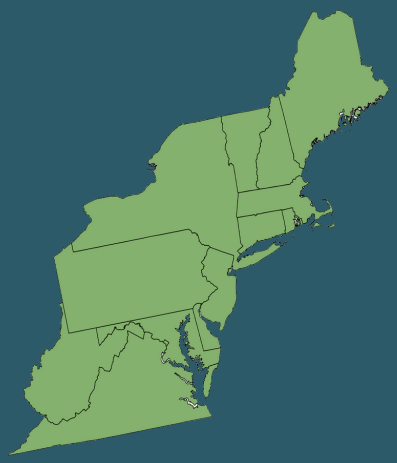
NEVBD Network

20 REGIONAL & NATIONAL PROFESSIONAL ASSOCIATIONS

17 UNIVERSITIES & ACADEMIC MEDICAL CENTERS

30 STATE DEPARTMENTS OF HEALTH, AGRICULTURE & ENVIRONMENT

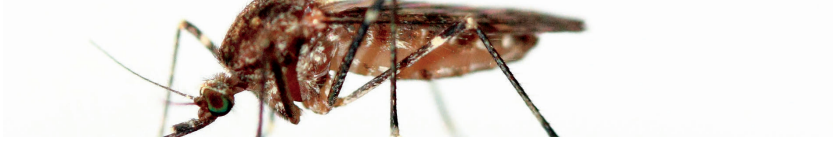
50+ LOCAL DEPARTMENTS OF HEALTH & VECTOR CONTROL



ADDRESSING NEEDS IN THE REGION

To ensure that we built valuable programs, NEVBD's efforts began with a regional needs assessment to understand the needs and priorities of regional stakeholders. Full results of the assessment, published in 2017, are available on our eCommons archive. NEVBD's needs assessment process has continued through annual strategic planning sessions held at our network conference. This process has enabled NEVBD to incorporate network feedback into our activities each year.

In this special issue, we provide a snapshot of the major initiatives we undertook based on the results of our regional needs assessment and strategic planning sessions across the past five years.



Responsive Training for the Public Health and Vector-Borne Disease Workforce

NEVBD initiated novel programs to train the next cadre of entomologists who can address future challenges in vector-borne disease monitoring and control. We also offered professional development opportunities to support the current vector surveillance and control workforce while reducing barriers to participation.

TRAINING THE NEXT GENERATION

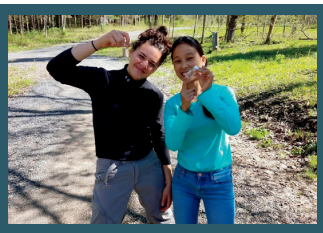
We developed and delivered an integrated and novel Entomology/Vector-Borne Disease Biology Master of Science program at Cornell University, supporting 10 graduates cross-trained in the fundamentals of public health and vector ecology, biology, and control. All program graduates to-date have been successful in obtaining positions in the vector-borne disease and public health field. Each MS student worked with public agency partners to conduct applied field research thesis projects. Projects conducted across 5 states focused on ecology of mosquito vectors, sampling and prevalence of tick vectors, and behaviors and attitudes of communities at risk of vector-borne disease exposure.

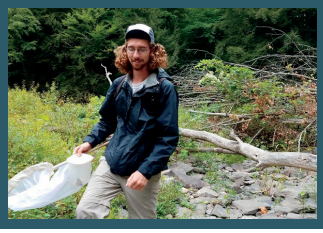
We additionally supported 16 undergraduate, 28 graduate, 9 doctoral, and 15 postdoctoral researchers in applied research efforts across our core institutions. All trainees received cross-institutional mentorship from NEVBD personnel and participated in virtual and conference events to disseminate their findings.

Connecting with the Medical Community

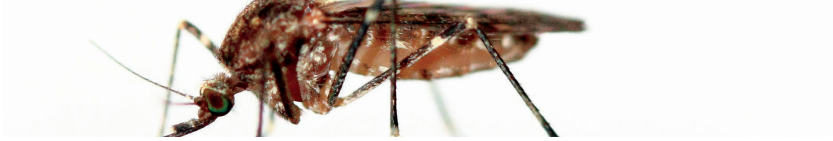
Health care providers play a critical role in vector-borne disease treatment and prevention.

NEVBD supports efforts to identify gaps in clinical training & work with medical professionals to offer responsive continuing medical education opportunities.





Summer field partners include: NYSDOH, NYC Parks, NJ Mosquito Control, TN-DOH, The Nature Conservancy, Maine Medical Center, Suffolk County Public Health Partners, Virginia Mosquito Control, NH-DHHS, National Park Service



SUPPORTING PROFESSIONAL DEVELOPMENT IN THE CURRENT WORKFORCE

We offered our first Vector Biology Boot Camp through the Louis Calder Center of Fordham University in 2018. This hands-on program specifically targeted early-career professionals working in the Northeast whose job duties involve vector surveillance and control. We engaged 47 professionals in person and 56 in virtual programs held during COVID-19 lockdowns.

Pre-post assessments of participant knowledge revealed **statistically significant improvements in knowledge** of major regional vectors and vector-borne diseases, tick and mosquito taxonomy and identification, approaches to collecting ticks and mosquitoes from the environment, and strategies for public health communication within each program cohort.

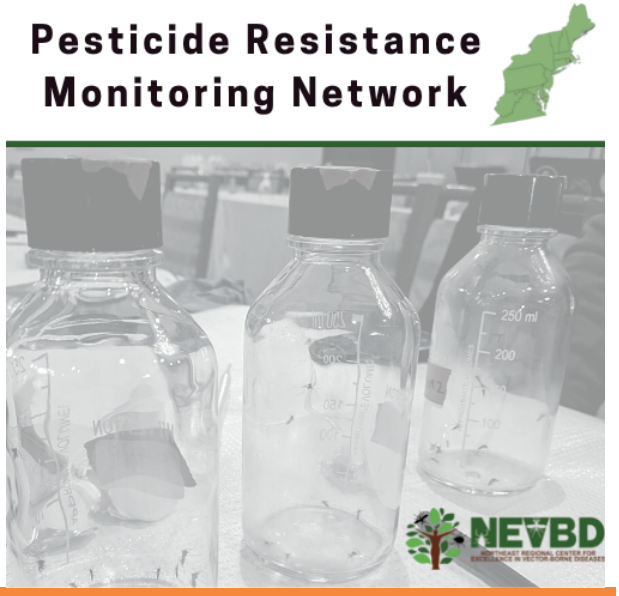
Program attendee feedback indicated that the Vector Biology Boot Camp content was directly applicable to participants' work responsibilities. A summary of the workplace impact of the Vector Biology Boot Camp program is available on our eCommons archive.

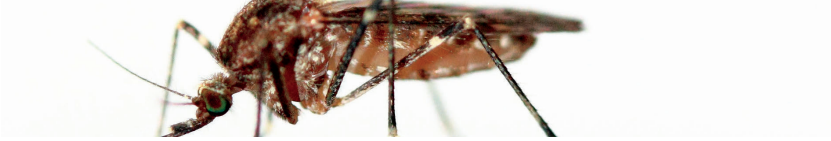
NEVBD also developed and offered six open access webinars and virtual seminars, with 1,626 professionals engaged in live events and 4,607 web hits to-date for enduring materials. These seminars covered concepts in tick control, a primer on the invasive Asian longhorned tick, fundamentals of tick surveillance program operations, insecticide resistance and mosquito rearing, and strategic public health communication. These webinars can be accessed on the NEVBD Online Programs website.

Tools for Agile and Effective Emergency Response

MOSQUITO SURVEILLANCE & CONTROL

NEVBD offers direct services to public health and vector control agencies in the Northeast to augment and support sustainable capacity building for mosquito control and pesticide resistance monitoring through our Pesticide Resistance Monitoring Program (PRMP).





Our staff supply local vector control agencies with equipment and professional guidance for the collection of mosquitoes of medical importance in our region. Our field partners either send us their mosquito specimens for testing at our laboratory or receive equipment and guidance for in-house testing at their own facilities. **As a free service, the submission system has reduced costs and alleviated time, equipment, and personnel constraints for public agencies to conduct pesticide resistance monitoring within their programs**.

NEVBD Pesticide Resistance Monitoring Network: Establishing a Centralized Network to Increase Regional Capacity for Pesticide Resistance Detection and Monitoring FREE

James C Burtis ✉, Joseph D Poggi, Joseph R McMillan, Scott C Crans, Scott R Campbell, Amy Isenberg, Janice Pulver, Patti Casey, Kerry White, Craig Zondag ... Show more

Journal of Medical Entomology, Volume 58, Issue 2, March 2021, Pages 787–797, https://doi.org/10.1093/jme/tjaa236

Evaluation of a Methoprene Aerial Application for the Control of *Culiseta melanura* (Diptera: Culicidae) in Wetland Larval Habitats FREE

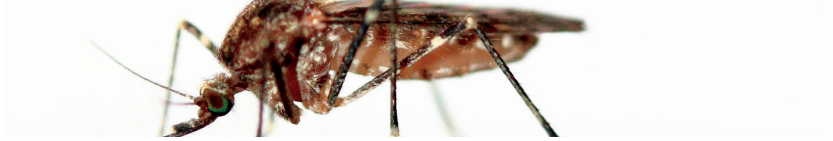
James C Burtis ✉, Joseph D Poggi, Todd B Duval, Ellen Bidlack, John J Shepard, Priscilla Matton, Ross Rossetti, Laura C Harrington

Journal of Medical Entomology, Volume 58, Issue 6, November 2021, Pages 2330–2337, https://doi.org/10.1093/jme/tjab108

Since our services went live in 2019, we have assayed over 18,000 individual mosquitoes, receiving mosquitoes from 11 of the 13 states in the Northeast region. Efforts include larval assay requests from 24 agencies spanning 8 states and adult bottle bioassay requests from 17 agencies spanning 9 states. NEVBD and partnering agencies have identified wide-spread, low-level resistance to methoprene in regional *Culex pipiens* populations, as well as moderate to high resistance to pyrethroids in several locations and emerging resistance to organophosphates in the mid-Atlantic coastal region. Pesticides are a vital tool for emergency response to mosquito-borne disease outbreaks. The work we do in collaboration with vector control programs in our region will help ensure this tool remains useful for future public health emergencies.

NEVBD supported the formation of targeted working groups to connect government-based agencies during arbovirus and vector surveillance seasons. This communication infrastructure proved especially important during the Eastern equine encephalitis virus (EEE) outbreak of 2019. This outbreak resulted in 34 human cases across seven states, with 12 fatalities. Human cases of EEE were reported in the northeastern states of Massachusetts, Connecticut, New Jersey, and Rhode Island during this outbreak. The arbovirus working group shared rapid updates across jurisdictions to inform on-the-ground control and share ideas for critical action thresholds as the outbreak unfolded.

NEVBD also assisted colleagues in Massachusetts during the 2019 EEE outbreak with efficacy assessments of their mosquito control operations in response to the public health threat. PRMP members from Cornell University continue to work with mosquito control districts in Massachusetts and New Jersey to conduct field control efficacy assessments targeting important mosquito vectors.



INVASIVE AND EMERGING TICK THREATS

In 2017, the Asian longhorned tick (*Haemaphysalis longicornis*) was detected for the first time on a farm in New Jersey. It has since been detected in 17 states across the eastern and southern US. NEVBD was able to quickly mobilize our network of experts to respond to this new threat.

NEVBD colleagues at Rutgers, Columbia, Cornell and Fordham Universities as well as the New York State Department of Health have led a diverse and aggressive applied research agenda focused on this tick since 2019. They determined the seasonal life cycle and optimal sampling methods for this invasive tick, conducted assessments of environmental tick control, tested the tick for pathogens of human and animal importance, and conducted studies to understand how the Asian longhorned tick survives our harsh winter climate.

NEVBD colleagues at Columbia University, the Connecticut Agricultural Experiment Station, New York State Department of Health, Maine Medical Center, and partners in public health agencies across the Northeast have also worked collaboratively to monitor our communities for ticks expanding their ranges northward. These include the lone star tick (*Amblyomma americanum*) and the Gulf Coast tick (*Amblyomma maculatum*), which have both moved northward over the past 5 years, posing important public health risks to our communities.

Developing Resources for the Community

NEVBD has developed outreach resources targeting many at-risk communities in our region, including farm workers & non-English speaking communities

ELSEVIER

Ticks and Tick-borne Diseases
Volume 12, Issue 1, January 2021, 101581

A life stage-targeted acaricide application approach for the control of *Haemaphysalis longicornis*

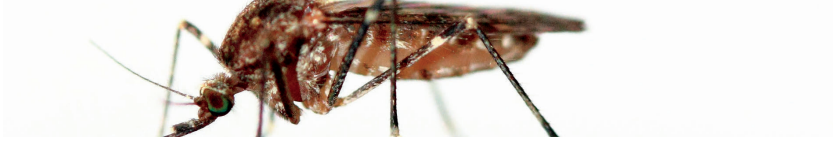
Matthew Bickerton [a, b, c], Kathryn McSorley [b], Alvaro Toledo [a, c]

Established Population of the Gulf Coast Tick, *Amblyomma maculatum* (Acari: Ixodidae), Infected with *Rickettsia parkeri* (Rickettsiales: Rickettsiaceae), in Connecticut FREE

Goudarz Molaei, Eliza A H Little, Noelle Khalil, Bryan N Ayres, William L Nicholson, Christopher D Paddock

Journal of Medical Entomology, Volume 58, Issue 3, May 2021, Pages 1459–1462,
https://doi.org/10.1093/jme/tjaa299

In fact, NEVBD colleagues at the New York State Department of Health documented the first instance of Heartland virus transmission to a human in the Northeast. This rare and emerging virus is associated with the lone star tick and is a growing concern in multiple regions of the US. Another virus of growing concern is the deer tick virus (or Powassan virus lineage II). This virus is primarily associated with the bite of the blacklegged tick



(*Ixodes scapularis*), but NEVBD partners at the Connecticut Agricultural Experiment Station have shown that in laboratory settings, the lone star tick and American dog tick (*Dermacentor variabilis*) can also transmit this virus. This is important information for our public health programs in the region conducting surveillance for these tick species.

CHANGES TO VECTOR BEHAVIOR IN A WARMING CLIMATE

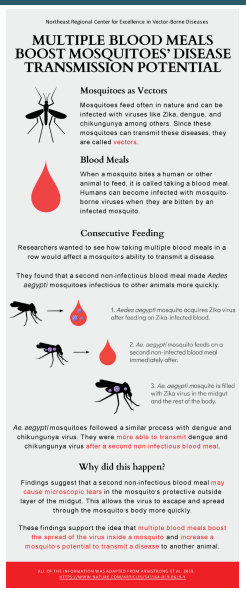
How mosquito and tick vectors survive, reproduce, and transmit pathogens are all affected by environmental conditions, including temperature and humidity. Much of our work evaluates how a changing regional climate will impact the public heath risk posed by ticks and mosquitoes in the near future.

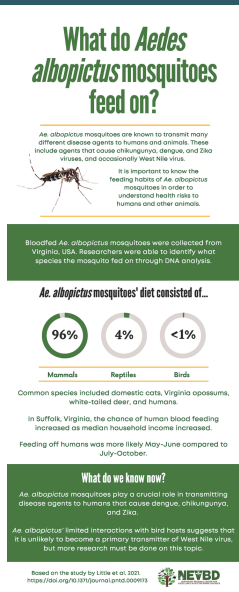
NEVBD colleagues at the Connecticut Agricultural Experiment Station and the Maine Medical Center Research Institute worked to understand how the lone star tick might be able to survive harsh northeastern winters. Their findings show that this tick species can survive the winter in areas as far north as coastal Maine, serving as an early warning for what we might expect to see for this species under warming climate conditions.

Additionally, teams from Cornell University, Columbia University, the New York State Department of Health, and the Connecticut Agricultural Experiment Station have evaluated how the invasive Asian tiger mosquito (*Aedes albopictus*) will behave in our region as our climate changes. This mosquito is a serious biting nuisance and significant public health threat, as it likes to bite humans, lives and breeds in human-made containers, and can spread many diseases. Our team has determined that local populations of this mosquito are able to transmit both native and exotic viruses, including Zika virus, dengue virus, and chikungunya virus.

Engaging Students in Science Communication

NEVBD engaged with undergraduate students to translate our applied research into infographics. Students gained skills in effective science communication for non-specialized audiences.

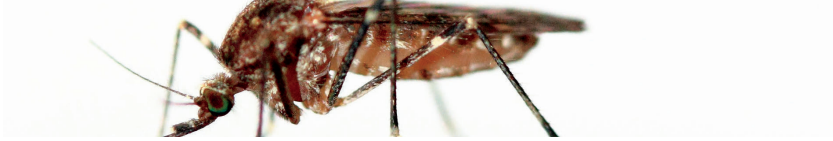




***Aedes albopictus* (Diptera: Culicidae) on an Invasive Edge: Abundance, Spatial Distribution, and Habitat Usage of Larvae and Pupae Across Urban and Socioeconomic Environmental Gradients** FREE

Talya Shragai, Laura C Harrington

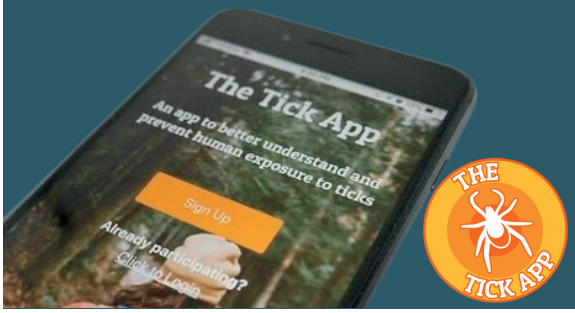
Journal of Medical Entomology, Volume 56, Issue 2, March 2019, Pages 472–482, https://doi.org/10.1093/jme/tjy209



Our team of researchers also demonstrated that human exposure to biting Asian tiger mosquitoes can remain high over the fall months with warming temperatures. This means that the Asian tiger mosquito can pose a public health threat to humans for longer periods each year and quickly adapt to our winter climate as it makes its way northward.

The TICK APP

This research project uses a smartphone application to understand how people & ticks interact in the environment



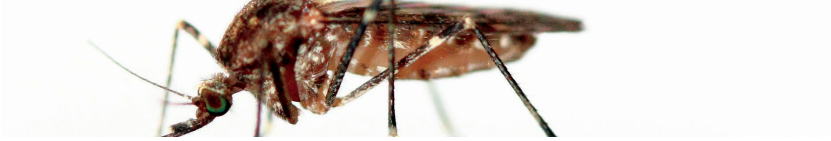
UNDERSTANDING HOW HUMAN BEHAVIOR INFLUENCES RISK OF VECTOR-BORNE DISEASE EXPOSURE

NEVBD collaborators at Columbia University have been working over the past five years to better understand how humans, animals, and green spaces all interact and lead to human-tick encounters. One way they have explored this question is through the creation of the TickApp. This free smartphone app was developed in partnership with the Midwest Center of Excellence in Vector-Borne Diseases. It allows users to track their daily activities, tick prevention practices, and encounters with ticks. This information helps our team understand when and where humans are most likely to encounter ticks, and how we can effectively communicate risk to our community members.

Our teams from Columbia University and Cornell University also studied how park users in Staten Island think about ticks. They found that people were more likely to practice tick checks when they knew multiple prevention methods, could recognize tick habitat, and perceived a higher likelihood of encountering ticks. Our team found a similar theme after surveying large numbers of residents across Long Island, who were more likely to use tick prevention strategies when they felt higher anxiety about tick exposure. Studies such as these help us understand how residents of urban and suburban communities think about ticks and make tick safe choices when using outdoor spaces.

CONNECTING AND SUPPORTING OUR COMMUNITY WHEN RESOURCES ARE LIMITED

A central goal of the NEVBD is to support connections between experts and professionals working in academia, public agencies, non-profit and private organizations, and community residents. One of our first efforts in this area was the development of a website housing results for our applied research efforts, connecting users to state public health programs and resources, and providing education and outreach on tick and mosquito vectors of medical importance to our region. We also support an e-newsletter and social media accounts, which serve as useful tools for partnering organizations to share and access employment and training opportunities, as well as receive timely updates on region-wide vector-borne disease programming.



During the COVID-19 pandemic, NEVBD served as a resource for public health programs negatively impacted by the lockdown restrictions. We hosted annual conferences virtually for five regional vector control associations at no charge. This allowed the associations to provide necessary yearly training to their membership in the difficult context of the pandemic lockdown. NEVBD also directly benefited from hosting these meetings, as our own membership were able to attend the virtual conferences and learn the names, faces, and expertise of local vector control officials working in states across the region.

"The programming the Center assists in helps train thousands of people working in vector-borne disease control & research. My association, and the others the NEVBD has helped, owe you and the Center a debt of gratitude for providing a platform, technical expertise, and training opportunities for our members." - Pennsylvania Vector Control Association President, 2021

Thank You!

The accomplishments we have summarized above from the past 5 years are shared together with everyone in our network of Northeast vector-borne disease professionals and associations. We could not have achieved success in our programming without their support and contributions.

A sincere thank you from NEVBD to all our colleagues and collaborators. The past 5 years of working together have been a privilege and a pleasure, and we look forward to continuing this important work.