Early Lessons from the Zika Virus Outbreak: Why We Need a 'Museum' for Data

By: David Pecor

The emergence of Zika virus throughout the Americas on the heels of the Ebola outbreak in West Africa has created high demand for swift action to assess the risk of Zika virus exposure to U.S. military personnel and their families living and working on DoD installations. However, developing accurate assessments of risk requires accurately defining the distribution of the primary mosquito vector, *Aedes aegypti*[1], and suspected vectors like *Aedes albopictus*. Despite requirements for installation MEDDACs and MEDCENs to routinely monitor the distribution of mosquito vectors in support of installation pest management policies and plans, detailed historical data from surveillance activities is not readily available. This current "crisis de jour" serves as the most recent reminder of the need for DoD entomological surveillance data to be well-curated and housed in a central, readily accessible, repository. This issue is not only a requirement for a more effective response to the current threat of Zika virus, but for future emerging vector-borne disease threats across the globe.

The CDC reported that prior to May 2015, the Zika virus had only been reported in Africa, South East Asia and on some Pacific islands. Since then, the virus has been found in nearly every country between the United States and Argentina. Accurate guidance on vector control and surveillance activities at each DoD installation requires knowing the current distribution of vectors, as well as accurate mapping/modeling tools to identify gaps in surveillance records, estimate potential exposure hotspots in space and time, and allow for better utilization of limited resources. To quickly produce useful information it is necessary to have ready access to records that indicate where and when past surveillance efforts have detected vectors of interest. However, valuable surveillance data sets generated by DoD personnel are dispersed across numerous locations and are not currently organized under a universal archival and retrieval system. As a result, the true value of the U.S. military's unrivaled effort to monitor mosquitoes and other arthropod vectors continue to be underutilized.

In addition to informing an effective response to the Zika outbreak, a central data repository would support future deployments as well. By providing historical context, future surveillance efforts can benefit from lessons learned instead of starting from scratch with every new disease outbreak. Imagine redeployment scenarios to areas where entomological surveillance has been conducted for multiple years but the data is not readily available to new personnel. Despite the heroic efforts of skilled DoD entomologists, new personnel would not be able to build on this valuable knowledge base, or utilize this information to plan out surveillance requirements ahead of an up-coming deployment.

Assembling and maintaining a central repository of data is certainly a challenge, but the backbone expertise for such a task already exists. The Walter Reed Biosystematics Unit (WRBU) has managed the Smithsonian Institution's National mosquito collection for over 30 years. With approximately 1.5 million specimens, the collection is the largest and most comprehensive in the world. This tremendous resource was assembled in large part by DoD Entomology efforts beginning in earnest as early as WWII. The primary purpose of this effort is to preserve material that can be used to drive research and development of knowledge products aimed at mitigating the risk of vector-borne diseases.

Early Lessons from the Zika Virus Outbreak: Why We Need a 'Museum' for Data

By: David Pecor

Managing the mosquito collection requires the WRBU to ensure collections meet rigorous curation standards including permanently storing specimens, updating taxonomic information to reflect current knowledge, documenting geographic distributions and associated biosystematics data and making this valuable resource available for future studies. This same service is greatly needed to curate, manage and make available valuable data in addition to specimens.

In recent years, the WRBU has also developed VectorMap, a web mapping and database resource to facilitate the dissemination of collection records associated with museum specimens. Since its conception, VectorMap has grown to include data from DoD surveillance and from peer-reviewed scientific literature. The primary purpose of VectorMap is to providing the most comprehensive database of vector collection records possible by combining multiple datasets and standardizing each under a single data management scheme.

The WRBU along with the Armed Forces Health Surveillance Branch's Global Emerging Infections Surveillance and Response System (GEIS) has also recently established the DoD Entomological Surveillance Working Group (ESWG) composed of U.S. Military entomologists from around the world. The working group is currently developing a 'Best Practices Guide to Entomological Surveillance' to establish universal standards for entomological surveillance data.

The WRBU is now in the early stages of formally establishing a centralized data repository for all U.S. Army Public Health Center entomological surveillance data as well as data generated through the GEIS network. As new surveillance and diagnostic tools are developed, the complexity and sheer abundance of data generated will only increase with time.

No other single organization on the planet matches the DoD's scope of logistics capability for monitoring arthropod vectors. However, the potential of this vast resource has not been fully realized. Similar to the Smithsonian Institution's physical collections, a central repository of collection records would establish a 'museum' for data. This resource would ensure valuable information is made available across the Armed Forces and to the wider public health community *before* vector-borne disease outbreaks occur.

Any effort to establish a centralized resource will fail without participation and support from those contributing to and benefiting from that resource. For more information about WRBU or to contribute your entomological surveillance data contact wrbu@si.edu.

Material has been reviewed by the Walter Reed Army Institute of Research. There is no objection to its presentation and/or publication. The opinions or assertions contained herein are the private views of the author, and are not to be construed as official, or as reflecting true views of the Department of the Army or the Department of Defense.

Early Lessons from the Zika Virus Outbreak: Why We Need a 'Museum' for Data

By: David Pecor

References:

Desmond H. Foley, Richard C. Wilkerson, and Leopoldo M. Rueda. 2009. Importance of the "What," "When," and "Where" of Mosquito Collection Events. Journal of Medical Entomology, 46(4):717-722.

Desmond H. Foley, Anna L. Weitzman, Scott E. Miller, Michael E. Faran, Leopoldo M. Rueda and Richard C. Wilkerson. 2008. The Value of Georeferenced Collection Records for Predicting Patterns of Mosquito Species Richness and Endemism in The Neotropics. Ecological Entomology, 33, 12–23.

Saul Lozano-Fuentes, Aritra Bandyopadhyay, Lindsay G. Cowell, Albert Goldfain, and Lars Eisen. 2013. Ontology for Vector Surveillance and Management. Journal of Medical Entomology 50(1):1-14.

Seth Birch and Kenneth Linthicum. 2008. c. Technical Bulletin of the Florida Mosquito Control Association 8, 1-9. [http://pubag.nal.usda.gov/pubag/downloadPDF.xhtml?id=55668&content=PDF]
Jeffrey R Powell, Walter J Tabachnick. 2013. History of domestication and spread of *Aedes aegypti*, A Review. Mem Inst Oswaldo Cruz, Rio de Janeiro, Vol. 108(1): 11-17.

Sprenger D, Wuithiranyagool T. The discovery and distribution of *Aedes albopictus* in Harris County, Texas. J Am Mosq Control Assoc. 1986;2:217–9.

New 72 Series Assignment Officer

LTC Rodriguez will no longer be the 72 series assignment officer effective 10 June 2016. Her replacement is MAJ Jered Little (72D) who is currently completing CGSC at Fort Leavenworth and will report on/around 22 June 2016. There will be a couple of weeks of underlap and LTC Paul Kassebaum will be covering down during that time. She asks that you do not email MAJ Little for routine inquires such as ORB updates, Summer 2017 assignments, ADSO calculations, records review if you are not within 90 days of a promotion board until September 2016 unless there is an emergency that requires his immediate action. Please give him approx. 2-3 months to get settled and work through other priority actions.

Please utilize your local S1 for ORB updates and to add documents to your official file. If you have problems, please send Mr. James Cassel and email and he can try to assist.