Case Examples

ZIKA VIRUS

The Challenge

The Zika virus—transmitted both sexually and by the bite of an infected *Aedes* species mosquito—was first documented in 1947 in Tanzania's Zika forest and spread intermittently through Africa and Asia for decades. Since then, a generally warming climate, industrial development, and environmental damage have facilitated mosquito migration to new areas. [1, 2] The Zika virus spread to the Federated States of Micronesia and French Polynesia in the South Pacific and reportedly infected 11 percent of the population between 2013 and 2014. By 2015, 1.5 million people were infected with the Zika virus in Central and South America. [2] In 2016, local Zika virus transmission was first documented in the United States.

Zika infection during pregnancy can cause a range of birth defects, including microcephaly—a neurological disorder characterized by unusually small head size resulting from an underdeveloped brain. The disorder ranges in severity from mild to severe and is linked to seizures, developmental delays, intellectual disability, movement and balance problems, difficulty swallowing, and hearing and vision problems. In the United States, between 2 and 12 babies in every 100,000 live births have microcephaly.[3] Yet, between 2015 and early 2016, in Brazil alone, 3,893 babies were born with microcephaly, of which at least 49 have died.[2]

Zika is also potentially linked to Guillain-Barré syndrome, a rare nervous system disease. In the US, there are about 1 to 2 cases per 100,000 people annually.[4]

Rapid detection of Zika infection is difficult. Zika diagnostics are needed at local and state laboratories level. In addition, obstetricians need guidance on speaking with patients about risks of Zika.

Zika is a new disease to the Americas that does not shadow existing epidemiologic studies and response practices of previous large-scale outbreaks, like those involving Ebola virus and dengue fever. The geographical location of the outbreak is a highly connected area that cannot be contained through quarantine or isolation.[5] Research is ongoing to prevent or cure the disease. In the meantime, there are strategies that could limit or delay the spread and transmission of the disease,

such as avoiding mosquitoes through the use of chemical repellants, bed nets, protective clothing, [6] and safe sexual practices, such as abstinence or condom use.[7]

Environmental Health Response

Previously, the *Aedes* mosquito was found in tropical weathers. However, with climate change—and increases in temperatures over longer periods of time—mosquitos have spread into regions that historically have not seen *Aedes* mosquitos. Over 20 countries and territories have reported local transmission of the Zika virus.[8] In the United States, the *Aedes* mosquito has expanded its distribution into the northern regions of the country. The threat of a US Zika outbreak is a public health emergency driven by climate change and should be met with a response rooted in environmental health principles. A robust environmental health system that protects water, reduces harmful chemical exposures, promotes safe housing, and is backed by a sound surveillance system will be able to reduce or prevent the spread of further illness from Zika.

Integrated Mosquito Management

The best way to prevent disease-carrying mosquitoes is through community-based mosquito control and public education programs. Integrated mosquito management programs provide mosquito monitoring and surveillance of the disease, remove standing water where mosquitos lay eggs, and carefully apply pesticides to significantly reduce mosquito populations while protecting water systems and minimizing undue human and animal exposure.[9]

Housing

There are several actions homeowners can take to lessen the risk of Zika virus exposure, such as installing screens on windows, especially in homes that lack air conditioning and rely on open windows for cooling. Also, dumping out standing water around the home found in places like flower pots, rain gutters, bird baths, and more.

Zika infection during pregnancy has been known to cause birth defects, including microcephaly leading to an underdeveloped skull and, often, brain size.

Surveillance and Detection

In 2016, CDC set up the Zika Pregnancy Registry—a combined effort from federal, state, tribal, and local health agencies to collect information about pregnancy and infant health outcomes following Zika infection.[10] This information could feed into a larger surveillance system to detect patterns in all vector-borne disease over time and in the areas affected to help plan a response based on disease prevalence.

Environmental health professionals conduct routine mosquito surveillance to determine local vector presence and risk to humans, and to document trends once transmission is detected. This data informs mosquito control activities, as well as targeted outreach to educate the health care community and public about Zika risks.[11]

In addition, syndromic surveillance can enhance outbreak detection and situational awareness by identifying morbidity trends before diagnoses are confirmed. Collecting useful health data, climatology information, and geo-spatial vulnerability (limitations both geographical and regarding access to care or treatment) are all critical components to painting a picture of outbreak evolution.[12] This public health tool applies existing and real-time data—such as data on over-the-counter drug sales or the number of patients presenting in emergency departments with specific symptoms—for early detection of unusual disease clusters or sentinel cases. It might also provide information on the trajectory of an outbreak after it begins and provide situational awareness in the absence of an outbreak.[13] But Zika surveillance depends on the ability for laboratory confirmation of disease cases. This, in turn, requires Zika diagnostics at regional reference laboratories or local public health laboratories[5] to improve test turn-around times.

Vulnerable Populations

As discussed above, infants born to Zika-infected mothers are especially vulnerable to adverse health consequences. A second vulnerable population is those living in poverty who may reside in sub-standard housing that might have damaged or no window screens and/or standing water in or around the home or a multi-unit building, and more. Women living in poverty may lack access to pre-natal care, decreasing their opportunities to receive information about the risks of Zika infection during pregnancy.

Workforce

Just as an airport ground crew works to ensure passenger safety, the well-trained, multidisciplinary environmental health workforce endeavors to maintain an environment conducive to human health. Instead of pre-flight plane inspections, environmental health professionals monitor water safety, conduct mosquito control activities, carry out syndromic surveillance and biomonitoring, and engage in other critical activities. The work that environmental health professionals perform is greatly realized at the community level, especially by those most vulnerable to harmful environmental exposures.

Opportunities for Action

1) Increase mosquito surveillance capabilities and resources for mosquito control.
2) Instill confidence in the public by creating a robust environmental health system with a lead agency.
3) Provide resources and training to ensure a qualified environmental health workforce.

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