

The Path of a Pathogen: The Past, Present, and Future of Zika



by

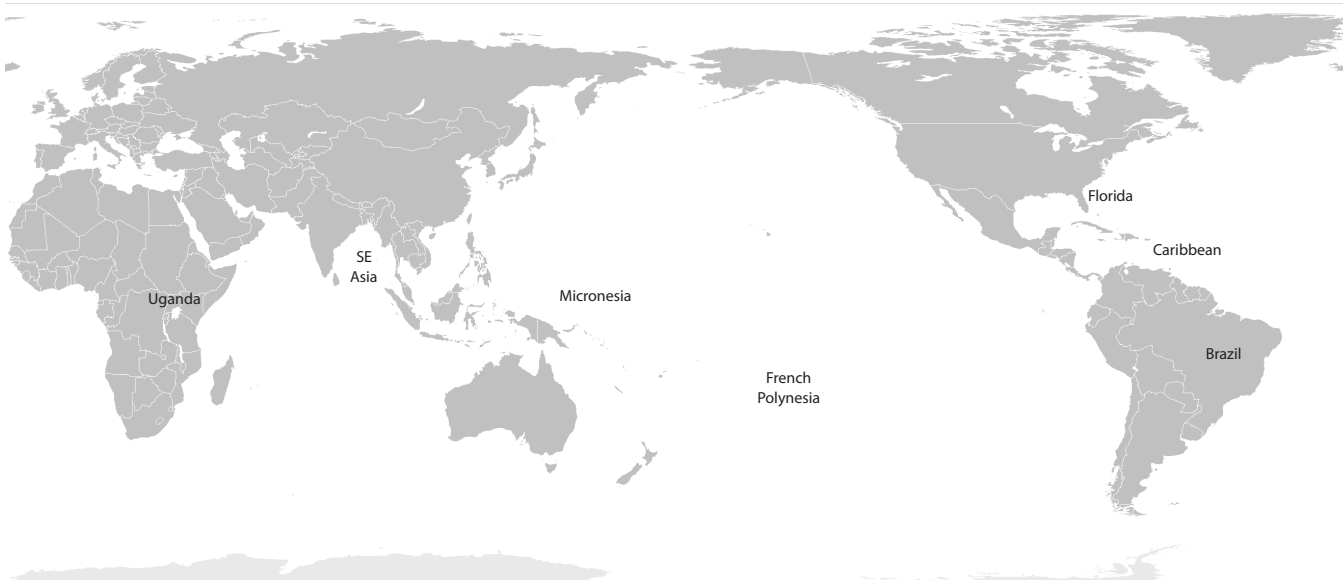
Janet A. De Souza-Hart

School of Arts and Sciences

Massachusetts College of Pharmacy and Health Sciences, Boston, MA

Part I – The Past

Zika infection seemed to run rampant in the Americas beginning in 2015, but where did it come from and why did we not hear much about it before this? If we step into the shoes of an epidemiologist, we can begin to explore these questions. Interestingly enough, the virus was first identified in 1947 in the Zika forest in Uganda. Take a look at this map of the world and trace, using arrows, some of the major stops (described below) on its sneaky path from this remote location.



From Uganda, the virus spread through Western Africa and then to Asia. From the 1960s to 1980s, sporadic cases were identified in humans but no deaths or even hospitalizations were reported. This is a perfect example of why we shouldn't underestimate any pathogen. Throughout the 20th century, the virus was circulating around various human populations, spreading and mutating.

By the 1980s, the virus was detected in *Aedes* mosquitoes in several Asian countries including Pakistan, India, and Malaysia. Micronesia was the next area to see outbreaks as the virus continued a path through the Pacific Islands. In French Polynesia and elsewhere, healthcare workers and scientists were discovering that there are several ways to contract this virus besides through a mosquito bite. But even by 2000, the destructive potential of this virus was generally unrecognized. It was not until between 2013–2015 that the full impact of this public health disaster began to surface. In 2015, Brazil started to make headlines with a startling number of health complications potentially linked to Zika infection. By 2016, we were seeing Zika transmission in several locations in South America, the Caribbean, and the United States...with heartbreaking consequences. (Source: World Health Organization, “The History of Zika Virus,” <http://www.who.int/emergencies/zika-virus/timeline/en/>.)

Imagine you are an epidemiologist—a disease detective on the hunt to learn more about the Zika virus and where it came from. The following questions, mostly focusing on Zika’s “past,” will help you to investigate how to stem the tide of this epidemic.

Questions

1. What are some examples of global factors (e.g., technology, economics, ecology, climate, society) that could have facilitated the spread of Zika?
2. What is the difference between locally-acquired and travel-related transmission of a disease? Which state(s) or territories in the U.S. have shown locally-acquired transmission?
3. What types of genetic mechanisms/changes could the Zika virus have experienced as it moved through the human population over the course of several decades? How might these impact how the disease manifests in humans (think evolution)?
4. What are *five* distinct ways that Zika can be transmitted? For each of the five ways, describe at least one strategy that can be used to prevent transmission.
5. Of the ten Zika-related achievements listed in the December 2016 *Morbidity Mortality Weekly Report* from the CDC (<https://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6552e1.pdf>), which three do you think were the most important? Use scientific data to support your choices.

Part II – The Present

Scientists have had to work at a fast pace to learn more about this destructive and versatile pathogen. Physicians have been on the front lines of dealing with the consequences of infection. Surprises have been around almost every corner. Of the major global pathogens transmitted by mosquitoes, Zika is the only one that has been shown to also be transmitted through sexual contact. While some viral infections can cause miscarriage, it is highly unusual to see a mosquito-borne illness cause birth defects the way that Zika does. To date, we have learned about several ways that the virus can cause disease and we have developed strategies for preventing infection, hopefully stemming the tide of this pandemic.

Imagine you are a physician that has just moved to an area where local Zika transmission is high. There is a high likelihood that you will start to see patients with signs of infection. You also anticipate that you will have patients who are worried about how they can protect themselves from infection. Delve into the scientific and medical literature to learn more about how to help your patients as you answer the following questions.

Questions

6. Zika infection can be asymptomatic. Sometimes, however, it can result in a set of signs and symptoms in children and adults that can last for several days. List these signs/symptoms. Briefly also describe how Zika infection is diagnosed.
7. What types of treatment are available for symptomatic Zika infection?
8. Two of the major complications associated with Zika virus are microcephaly and Guillain-Barré syndrome. Describe each of these conditions.
9. What is the current state of Zika vaccine research?

