

# Zika virus: The latest pandemic

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## The first 70 years

The 62-acre Zika forest near Entebbe, Uganda, is home to at least 40 endemic species of mosquitoes. Thus, the forest (Zika means “overgrown” in the local dialect) has been an ideal venue to study both emerging viruses and mosquito vectors. As part of an early surveillance program for yellow fever, investigators in 1947 isolated a virus from a sentinel rhesus macaque monkey, and the newly discovered Zika was later shown to circulate normally in African primates. Subsequently, Zika

reported in 2008 in the wife of a U.S. biologist returning from work in Senegal, and in 2016 a male-to-male case of sexual transmission was reported in Dallas. In 2014, over 3 percent of asymptomatic blood donors in endemic areas were reported to have blood positive for Zika by PCR. We now know that the virus can be found in semen for several weeks and in the blood for at least a week.

The global public health alarm sounded in 2015 with the reports from Brazil of cases of microcephaly and

shortage in Puerto Rico, the FDA has approved an experimental screening test for blood donors though it is not yet approved for commercial use.

Couples are advised to avoid unprotected sexual activity for weeks after one or both have returned from an endemic area: The use of condoms is recommended for vaginal, anal and oral sex. The optimal duration of condom use in asymptomatic people is unclear, but some experts recommend eight-10 weeks. However, CDC advised couples with men who have confirmed Zika to consider using condoms for any penetrative sex for at least six months after symptoms began. Since the vast majority of infections are asymptomatic, this may appear to be a contradictory message.

Travelers returning from endemic areas should also avoid being bitten by mosquitoes (that could subsequently transmit the virus) for three weeks. Pregnant women should be tested on return if they travel to endemic areas. This is especially important, since 80 percent of infections cause no symptoms, and pregnant women would usually not be aware of an infection unless tested. In cases of GBS, physicians must now take careful travel histories and consider testing for the Zika-related polyneuropathy. Currently, no vaccine or effective drug is available to prevent or treat this infection, although the FDA approved a phase 1 test of a new vaccine.

*Aedes aegypti* — the primary mosquito vector for Zika — can now be found in 26 states but *Aedes albopictus* which can carry the virus has been found in 40 states in the U.S. A concern for public health is if the virus becomes easily adapted to the wider ranging *A. albopictus*. It bites humans less often than its better-known cousin, though it is an aggressive feeder when it does bite. One problem for control is that mosquito eradication programs with pesticides are regional — not overseen by CDC — and have widely varying resources available. Importantly, both mosquitoes bite in the daytime, so that the standard evening pesticide spraying programs may be less effective. Plans for assiduous mosquito control should be in place with a special emphasis on our southern border, home to *A. aegypti*. Nevertheless, the U.S., with its widespread use of screens and air conditioning, insect repellents and resources for insecticides, would not expect an ongoing cluster of infections.

In a recent issue of *Consumer Reports* — which does not allow outside advertising in its magazine and pays for all testing of products — author Sue Byrne listed the ratings of mosquito repellents that are best for Zika protection. The most effective products

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virus was isolated from the mosquito *Aedes africanus*, serological studies showed evidence of human infection in Uganda and Tanzania and the first virus isolation in a patient occurred in the mid-1950s from a young girl in Nigeria with fever and headache. From the 1960s to the 1980s, Zika infection expanded to equatorial Asia and by 2007 to Micronesia in the Pacific. Specifically, in the Caroline Islands archipelago on the island of Yap in the Western Pacific Ocean — with limited resources for screens and air conditioning, 75 percent of residents were found to have been infected. Most had rash, conjunctivitis and arthralgia.

The first sexual transmission was

soon thereafter from El Salvador of an unusual rise in rates of Guillain-Barré syndrome (GBS). Now, 70 years after its discovery, both microcephaly and GBS are linked to pandemic infection with the Zika virus.

## Public health recommendations

Just as a large outbreak of Zika involving over 7,000 cases has been reported in Cabo Verde in Western Africa, the virus is marching closer to home through South and Central America and the islands in the Caribbean. Early in 2016, the U.S. issued a travel warning, advising pregnant women to avoid going to endemic areas. In response to a blood donation

evaluated were Sawyer Picaridin and Natrapel 8 hour (both contain 20 percent *picaridin*) and Off! Deep Woods VIII, which contains 25 percent DEET. Both kept *Aedes* mosquitoes from biting for eight hours (only females bite). Of interest, the report stated that the Sawyer product was the only one that kept *Culex* mosquitoes, the vector of West Nile virus, and *Ixodes* deer ticks, the vector of Lyme, away for eight hours.

In early August, the CDC issued an unprecedented advisory recommending that pregnant women avoid part of Miami where 14 locally-acquired cases of Zika were discovered. Several days later, a 15th case was recognized out of the high-risk zone.

#### **Aedes adapts to humans**

A recent perspective by Anthony Fauci and David Morens in *The New England Journal of Medicine* outlined the history of the vector mosquito. *Aedes mosquitoes* and others emerged about 1,000 years ago in Northern Africa when villagers began to store water in their dwellings. Subsequent research showed that specific fatty acids in the water emanating from bacteria therein stimulate females to lay their eggs there. The mosquito adapted its behavior and laid its eggs in the water containers, and people became

infected by the new viruses carried by the vector. The name, *Aedes*, is derived from ancient Greek, meaning “unpleasant” or “odious” — an understatement in today’s experience.

We now know that rainwater needs to be cleared from all containers — large and small — as an essential part of control measures. It should be noted that *A. aegypti* can transmit yellow fever, dengue, chikungunya and Zika. Yellow fever, dengue and Zika are in the same family of viruses called flavivirus, named originally for yellow fever. (Flavus is Latin for yellow.) It should not be surprising that viruses in one family carried by the same mosquito and endemic to the same region would have serological cross reactions. Such is true for Zika, dengue and chikungunya. Thus, more specific testing may be needed to confirm Zika, and this is managed via the State Health Department: If the screening IgM antibody test for Zika is positive, the blood would be sent to CDC for specific tests for Zika and other flaviviruses.

#### **Emergency funding**

With the need urgent for a vaccine, effective therapy, safe mosquito control methods favorable to the environment, a better understanding of the

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### Home Care – Using an Agency or an Independent caregiver?

In-home care is rapidly becoming the most commonly asked for service among today’s aging population. For

many seniors and adults requiring care, having an in-home care provider is the difference between staying at home and being admitted into a nursing home. A professional, full employer agency, employ their caregivers and provide a series of screens and operational checks and balances. There are many licensing requirements for professional agencies that protect the consumer. A Registered Nurse will develop a personalized care plan and supervise care when the care is considered “hands on” or personal care. Many long term care insurance policies will not reimburse policy holders if the care is not provided by a licensed home care agency.

Some families may consider hiring an individual private caregiver instead of a full employer agency. In that case, you are now the employer. There are many risks and obligations that come with being an employer that many do not realize. These include federal and state tax withholding, quarterly tax reporting, social security, unemployment tax, overtime pay requirements, workers’ compensation insurance, liability insurance, “live in” caregiver record keeping requirements, etc. Most homeowners’ policies do not cover the expenses associated with an injury or damages sustained while a caregiver is in your employ. It is also important for your own safety and security that you procure appropriate background checks, driving record checks, and validation that the candidate is a capable, appropriately trained, quality care provider. Is there a backup caregiver in the event the primary caregiver is ill? Is there professional supervision of how well the caregiver is meeting the needs of the individual?

Consumers who are considering directly employing caregivers should seek the advice of an attorney and human resource professional to review their specific situation.

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biology of both Zika virus infection and virulence factors, both NIH and CDC have asked for \$1.9 billion in emergency funding. The issue became even more urgent with the discovery of the cluster of cases in South Florida, where costly eradication efforts were ramped up. House Republicans asked the White House to divert \$600 million from Ebola support to Zika, but this was quickly denounced by Dr. Anthony Fauci of NIH and Dr. Tom Frieden at CDC. Fauci suggested that \$1.9 billion was only an estimate and would not be enough. (How this funding conflict would be resolved remained unclear as of this writing in September.)

#### The latest pandemic

What has not been emphasized enough is that repeated pandemics are a part of life, the interactions of people with animals and the insect vectors of infection, crowding, poverty and rapid global travel. Traditionally what is observed are the isolated individual disease responses by developed countries. Instead, what should be developed are ongoing surveillance programs and rapid responses to emerging pathogens before they become pandemic. Some platform for a universal management program, with special adaptations to the specific microbe, is needed with ongoing funding for research infrastructure and responses. Global partners for the new preparedness platform might

include the World Health Organization and CDC, the World Bank and International Monetary Fund, the United Nations and key individual countries and organizations (such as Google) capable of developing ongoing dynamic tracking of infections

and control measures. All of this is to suggest an ongoing, proactive safety program for emerging pathogens, replacing a reactive crisis mode series of responses to individual new pandemics. Zika is just the latest microbial reminder of this need. **R**

**“There have been as many plagues as wars in history; yet always plagues and wars take people equally by surprise.”**

*Albert Camus, “The Plague”*

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