Whatever happened to the Zika virus?

September 7 2017, by Claire Donald

Credit: AI-generated image (disclaimer)

If I asked if you'd heard of the Zika virus before 2015, chances are the answer would be no. In fact, many scientists working in the field of mosquito-transmitted diseases probably wouldn't have heard of it. If they had, it would have been regarded as something obscure from the history books.

First discovered in Uganda in the late 1940s, documented infections

were rare until 2007 when the first large outbreak in humans occurred on the Pacific Island of Yap in Micronesia. The team of scientists involved in the initial discovery included the University of Glasgow's Professor Alexander John Haddow, and the university's archives hold 25 years of Haddow's data which is now being meticulously catalogued as part of project funded by the Wellcome Trust.

Further Zika virus outbreaks occurred during 2013-2014 on other Pacific islands – French Polynesia, Easter Island, the Cook Islands and New Caledonia – before it reached the Americas in 2015. What exactly led to this explosive outbreak is still not completely understood, but the virus suddenly became a very real health concern requiring urgent research.

Caught on the hop

The outbreak in 2015 caught researchers and public health officials on the back foot as very little had been done to understand it since its initial discovery. However, the rate at which it spread, coupled with its association with neurological conditions like Guillain-Barré syndrome (muscle weakness caused by the immune system attacking the peripheral nervous system), and birth defects such as congenital Zika syndrome (disorders caused by the infection) and microcephaly (decreased brain development and smaller head size in babies) made it a frightening disease.

Currently, the most effective method of preventing virus transmission is sustainable control of mosquito populations. This is achieved by eradicating standing water sources used as breeding sites and the use of insecticides and repellents, combined with public education programmes.

Recent outbreaks of Zika virus and chikungunya virus (which causes

rash, fever and severe joint pain) – both transmitted by the Aedes mosquito – have raised concern in the US. Like other mosquito-transmitted viruses, these infections are seasonal and cases rise and fall with the activity of mosquito populations.

In southern American states like Florida and Texas, mosquito season begins in early February/March and peaks at the height of the summer during July/August. With high humidity and temperatures, the tropical climate in these states is particularly conducive to mosquito breeding and egg laying.

Brownsville, Texas, and Miami-Dade County, Florida, have previously been designated "cautionary areas" where local mosquito-borne Zika virus transmission has been identified, although this status was lifted last month, meaning there are no longer any precautionary travel recommendations in place for these areas.

Further north, many eastern and midwestern cities have seen an increase in the average annual length of their mosquito season over the last couple of decades due to increasing local temperatures. The growing number of days suitable for mosquito breeding increases the risk of cases of several mosquito-transmitted diseases.

Sex and other routes of transmission

However, the concern over Zika virus infections is not limited to mosquito bites, as sexual contact is also a viable route of transmission, as are blood transfusions, organ transplants and mother-to-baby transmission.

Credit: AI-generated image (disclaimer)

Sexual transmission has not previously been reported for other mosquito-transmitted viruses and is yet another twist for experts trying to get a handle on this virus. Although these are not the main routes of transmission, they increase the risk of virus infections in areas where mosquitoes are absent.

In November 2016, the World Health Organisation (WHO) declared an end to the Zika Public Health Emergency of International Concern which had been in place since February 2016. It stated that downgrading the response did not reduce the importance of the virus and pledged a long-term response to Zika virus control, emphasising that the crisis was not over.

Local surveillance is still ongoing and precautions should still be taken

when travelling to and from areas were the virus is being transmitted, in particular by pregnant women. Wearing long-sleeved clothing and insect repellent is prudent in endemic areas and consistent and careful condom use or sexual abstinence will prevent spread by sexual contact.

A significant sum of research money has been made available to scientists across the globe to figure out as much as possible about this extraordinary virus. To facilitate the rapid generation of information, multiple cross-discipline collaborations have been formed and previously untapped alliances established, allowing fundamental advances such as disease modelling, virus evolution tracking and epidemiological surveillance to be made with unprecedented speed.

A safe and effective vaccine

Leading researchers and public health organisations from around the world have joined forces on a unique scale to better understand Zika virus and the clinical symptoms resulting from infection. Prime among their tasks has been the development of a safe and effective vaccine – particularly to protect an unborn child against infection.

Several potential vaccines are currently under development, with some showing promise in phase one human trials. Single dose, live-virus vaccines are proving effective but are not suitable for pregnant women, while non-replicating virus vaccines may be safer for expectant mothers, but multiple doses are required.

Unfortunately, to make matters more complicated, vaccine development needs to take other Aedes mosquito-transmitted viruses, dengue fever and chikungunya, into account. These have similar symptoms, circulate in the same areas and are often confused, resulting in misdiagnosis.

Previous infections can have an effect on the efficacy of a vaccine and

need to be taken into account. A suitable product for market is still a good way off and it will take more time and effort to develop sufficient pharmaceuticals that can be delivered to the vulnerable populations that need them most.

Thanks to increased urbanisation and globalisation, including widespread travel and transport of goods and a changing climate, it is likely that mosquito-transmitted diseases will continue to have the means to spread.

The growing links between societies around the globe makes universal public health an important worry for developed, as well as developing countries. A coordinated response at local community level is vital to limit the global spread of emerging and reemerging mosquito-borne diseases.

So long as socio-economic conditions facilitate mosquito life cycles, the risk of importing viruses from endemic areas is a viable threat we should all be prepared for.

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