Zika epidemic likely to end within three years, research suggests

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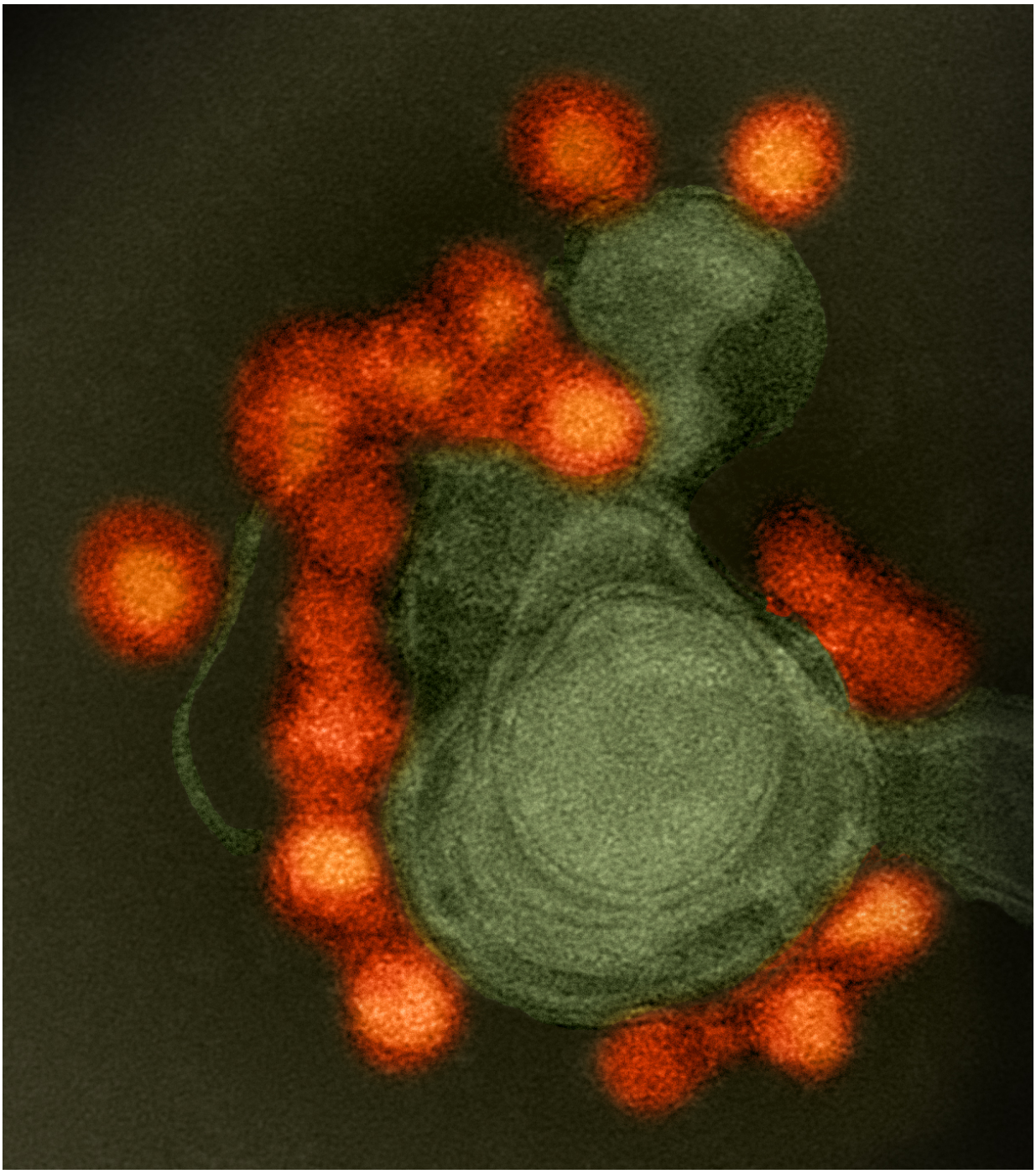

Transmission electron microscope image of negative-stained, Fortaleza-strain Zika virus (red), isolated from a microcephaly case in Brazil. The virus is associated with cellular membranes in the center. Credit: NIAID

The current Zika epidemic in Latin America is likely to burn itself out within three years, suggests new research.

The findings, from scientists at Imperial College London, also conclude that the epidemic cannot be contained with existing control measures. The team, who published their findings in the journal *Science*, predict the next large-scale epidemic is unlikely to emerge for at least another ten years - although there is a possibility of smaller outbreaks in this time.

Professor Neil Ferguson, lead author of the research from the School of Public Health at Imperial, explained: "This study uses all available data to provide an understanding of how the disease will unfold - and allows us to gauge the threat in the imminent future. Our analysis suggests that Zika spread is not containable, but that the epidemic will burn itself out within 2-3 years."

In the study, Professor Ferguson and colleagues from the Medical Research Council Centre for Outbreak Analysis and Modelling at Imperial, collated all existing data for Zika transmission across Latin America. The team then used this information, alongside data on similar viruses such as dengue, to build a mathematical model to represent the current epidemic, and future waves of transmission.

Using this model, the team calculated the current epidemic would end within two to three years, due to the fact people are unlikely to be infected with Zika twice.

Professor Ferguson explained: "The current explosive epidemic will burn itself out due to a phenomenon called herd immunity. Because the virus is unable to infect the same person twice - thanks to the immune system generating antibodies to kill it - the epidemic reaches a stage where there are too few people left to infect for transmission to be sustained.

Using our model, we predict large-scale transmission will not restart for at least another ten years - until there is a new generation in the population who have not been exposed to the Zika virus. This mirrors other epidemics, such as chikungunia - a similar virus to Zika - where we have seen explosive epidemics followed by long periods with few new cases. "

The Zika virus is carried by the Aedes aegypti mosquito, but the team cautioned any large-scale government programmes to target the mosquitoes may have limited impact. "The virus is very similar to the dengue virus, and transmitted by the same mosquito. But previous experience with dengue has shown controlling spread to be incredibly difficult. Also, efforts to contain the epidemic would have needed to have been implemented much earlier in the current Zika epidemic to have a major effect - but by the time we realised the scale of the problem it was too late. "

He added any efforts to slow spread of the virus may in fact prolong the current epidemic: "Slowing transmission between people means the population will take longer to reach the level of herd immunity needed for transmission to stop. It might also mean that the window between epidemics - which we predict may be over a decade - could actually get shorter."

And while the potential end of the epidemic is no doubt positive, it does raise issues for vaccine development, adds Professor Ferguson: "If our projections are correct, cases will have dropped substantially by the end of next year, if not sooner. This means by the time we have vaccines ready to be tested, there may not be enough cases of Zika in the community to test if the vaccine works."

He suggests one option may be to recruit 'sleeper sites' for vaccine trials across the globe. These centres would obtain, in advance, the lengthy

legal and ethical approval needed for a trial. Then if there is a Zika outbreak in its area, a centre would be ready to begin a vaccine trial straight away.

However, Professor Ferguson highlighted there are still many questions to answer about Zika - and therefore many caveats to making predictions: "In a worst case scenario Zika would become endemic in Latin America in the long-term, which would mean smaller, frequent outbreaks. A key issue is we don't understand why the Zika virus affected Latin America in such an explosive way. One possibility is climate may have in some way aided spread of the virus, as spread coincided with an El Nino event. Genetic mutation of the virus might also have played a role, although early data currently give limited support for this hypothesis."

Professor Ferguson added that previous exposure to dengue might also have played an important role in the current Zika epidemic. Some research, including recent studies from an Imperial team, has suggested prior dengue exposure may amplify Zika infection in a person.

"This is an effect called Antibody Dependent Enhancement and is of significant concern. It is too early to say whether dengue exposure affects the risk of getting Zika or the clinical consequences of infection, but this needs to be urgently examined in future research. We also need to understand why South East Asia, which also has high rates of dengue, has not experienced a similar Zika outbreak."

He added more research is urgently needed. "One research priority is to fully understand the extent of Zika transmission, and what proportion of people in Latin America - and across the globe have been infected. To do this we need to assess past exposure to Zika by testing blood from representative samples of at-risk populations for the presence of antibodies to the virus. We and other groups are working on such studies

at the moment."

"There are currently more questions surrounding Zika than answers - and only through a coordinated global research effort will we find the answers we desperately need."

More information: "Countering Zika in Latin America," *Science*, science.sciencemag.org/lookup/ … 1126/science.aag0219

Provided by Imperial College London