



Infection of human cortical brain organoids (hBOs). A Photograph of "mini-brains" cultured in a rotating CelVivo Clinostar incubator. B IHC of viral antigen (4G4) for hBOs at 4 dpi. C Viral growth kinetics up to 4 dpi determined by CCID<sub>50</sub> assays of culture supernatants at the indicated hours post infection. D Mean percentage change in organoid area at 11 dpi vs. 9 dpi for each organoid. Credit: *npj Viruses* (2024). DOI: 10.1038/s44298-024-00025-5

Researchers have conducted the first comprehensive two-year laboratory characterization of the rare sub-type of the mosquito-borne Japanese encephalitis virus (JEV) that caused an unprecedented deadly outbreak in Australia in 2022.

The study, which was conducted in QIMR Berghofer's high biocontainment facility, showed the strain's potential to cause fatal brain infection and establishes technologies to test new vaccines to protect Australian populations.

QIMR Berghofer's senior research officer Dr. Daniel Rawle and research officer Dr. Wilson Nguyen found the new virus strain's impact on the brain is consistent with the seven human fatalities during the unprecedented 2022 outbreak, which involved 44 confirmed human cases across Victoria, New South Wales, South Australia, Northern Territory and Queensland.

Published in *npj Viruses*, [the research](#) found that miniature human brain organoids were destroyed when infected with the virus.

The research also looked at [blood samples](#) from individuals vaccinated against JEV, and found that while it did offer protection against the new Australian strain, more work was needed to tailor a new [vaccine](#) to the recent Australian outbreak strain.

"The more a virus mutates and the more it deviates from established vaccine targets, the less optimal the vaccine responses are likely to be. This is why COVID-19 and influenza vaccines are continuously updated, a process that may be needed for JEV," Dr. Rawle said.

"We don't have targeted treatments for JEV, with brain infections particularly difficult to treat, so a vaccine would be a key defense against a disease with potentially fatal consequences."

Dr. Rawle said the findings highlighted the urgent need for vigilance and preparedness in combating mosquito-borne diseases. Highlighting this, the World Health Organization (WHO) launched the Global Arbovirus Initiative in 2022, raising the global alarm on the increased risks of arboviral epidemics, and the potential for future arboviral pandemics. The team is now using the recent tools they've developed to test new vaccines against Japanese encephalitis virus.

**More information:** Wilson Nguyen et al, Characterisation of a Japanese Encephalitis virus genotype 4 isolate from the 2022 Australian outbreak, *npj Viruses* (2024). [DOI: 10.1038/s44298-024-00025-5](https://doi.org/10.1038/s44298-024-00025-5)

Provided by QIMR Berghofer

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