

Vaccine for rare but deadly mosquito-borne viruses shows promise in clinical trial

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Bite by an *Aedes* mosquito. This species can transmit EEEV to humans. Credit: NIAID

A vaccine for eastern equine encephalitis virus (EEEV), western equine encephalitis virus (WEEV), and Venezuelan equine encephalitis virus

(VEEV) was found to be safe, well-tolerated and induced a neutralizing antibody response in adult volunteers, according to newly published results from a Phase 1 clinical trial. The vaccine candidate was developed by scientists at the National Institute of Allergy and Infectious Diseases (NIAID) Vaccine Research Center (VRC), part of the National Institutes of Health. NIAID also sponsored and funded the clinical trial, which was conducted at the Emory Vaccine Center's Hope Clinic, part of Emory University in Atlanta. The study appears online today in *The Lancet Infectious Diseases*.

EEEV, WEEV and VEEV are spread to humans through the bites of infected mosquitoes. Horses are also susceptible to infection, but horses cannot transmit the viruses directly to humans. Infections in humans are rare but can lead to flu-like symptoms and, in some cases, severe neurological damage or death. The viruses have caused recurrent, small outbreaks in North, Central and South America, including an EEEV outbreak in 2019 in the northeastern United States that led to 38 confirmed cases and 15 deaths.

Under certain laboratory conditions, the viruses can transmit through the air by aerosol droplets and cause infection in humans and are therefore classified as priority pathogens, potential biological agents that pose a risk to national security and public health. NIAID Director Anthony S. Fauci, M.D., and colleagues have highlighted the possible utility of a vaccine for EEEV for people at high occupational risk of contracting the disease, including members of the military and laboratory workers.

Building on their successful development of a vaccine for [chikungunya virus](#), VRC researchers designed a virus-like particle (VLP) vaccine candidate (abbreviated WEVEE) that uses proteins from the outer shells of the EEE, WEE and VEE viruses to prompt an [immune response](#). VLPs do not contain the [genetic material](#) that the viruses need to replicate inside cells, so VLPs cannot cause infection.

For the Phase 1 clinical trial, 30 healthy adult volunteers ages 18 to 50 years received varying doses of the WEVEE vaccine (6, 30 or 60 micrograms) by intramuscular injection. Participants then returned to receive the same dose as a boost eight weeks later. Some participants also received a formulation of the experimental vaccine that contained an alum adjuvant added to increase immune responses. Investigators report that the vaccine was safe, well-tolerated and induced durable immune responses against all three viruses. The highest neutralizing antibody response was observed in participants who received the 30-microgram dose with adjuvant. The authors note that the findings support further clinical evaluation of the [vaccine](#) candidate.

NIAID has executed a commercialization license for the advanced development of the WEVEE [vaccine candidate](#) to the life sciences company Emergent BioSolutions in Gaithersburg, Maryland.

More information: Emily E Coates et al, Safety and immunogenicity of a trivalent virus-like particle vaccine against western, eastern, and Venezuelan equine encephalitis viruses: a phase 1, open-label, dose-escalation, randomised clinical trial, *The Lancet Infectious Diseases* (2022). [DOI: 10.1016/S1473-3099\(22\)00052-4](https://doi.org/10.1016/S1473-3099(22)00052-4)

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