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Plant-Produced mAbs Against Chikungunya Virus

Chikungunya virus (CHIKV) is a mosquito-borne alphavirus, characterized by fever and severe joint pain. The joint pain is often debilitating and can vary in duration, sometimes lasting for years. There are currently no vaccines or therapeutic treatments for CHIKV, instead symptom relief is the primary focus with administration of bed rest, antipyretics/analgesics and fluids. Continued outbreaks of CHIKV and the risk of further spread underscore a need for the development of novel medicines to treat or prevent this debilitating virus.

Researchers at the Biodesign Institute of Arizona State University have developed novel glycovariant monoclonal antibodies specific for CHIKV as well as plant-based production methods. These plant-derived antibodies exhibit mammalian-type GnGn glycans with

high uniformity and could be used for both prophylactic and postexposure treatment of CHIKV infection. When tested in the WT C57BL/6 murine model, these antibodies showed superior therapeutic efficacy compared to wild type antibody. The antibodies significantly reduced titres of virus in blood at 2dpi, further highlighting their potential utility as post-exposure therapeutics. Additionally, no antibody-dependent enhancement of infection (ADE) for Dengue virus was observed.

These antibodies show equivalent potency to their mammalian cell-produced counterparts at a fraction of the production costs and with favorable yields making them excellent therapeutic CHIKV candidates.

Potential Applications

- Postexposure treatment of CHIKV
- Prophylactic treatment of CHIKV

Benefits and Advantages

- Plant based production methods are robust and cost-effective (the upstream production cost could be reduced to as low as \$1-2/kg protein)

- o Could also be adapted for other expression systems
- The expression level are estimated to be 130 µg/g leaf fresh weight (LFW), however with some optimization they could be produced up to 0.8–4.8 mg/g LFW
- Rapid production – generation of 1kg of antibody within 2 weeks from the delivery of the expression vectors
- The antibodies are readily extracted and purified from leaves with a scalable process that is compliant to cGMP regulations
- Able to be purified from plant leaves to 90% homogeneity
- Mammalian type GnGn N-glycan structure with a high degree of uniformity (>95%)
- The mean EC50 values of these plant-derived antibodies are comparable to those of a mammalian cell-produced orthologue (mCHKVmab EC50 = 154 ng/mL)
- Did not promote ADE for Dengue virus
- The antibodies significantly reduced titres of virus in blood at 2 dpi

For more information about this opportunity, please see

[Hurtado et al - Plant. Biotechnol J. - 2020](#)

For more information about the inventor(s) and their research, please see

[Dr. Chen's departmental webpage](#)