PRESS RELEASE

Emergex Generates Chikungunya Ligandome, a Milestone in the Development of its T cell Adaptive Vaccine

- *Peptides specific to Chikungunya (CHIKV) virus expressed on surfaces of infected cells (collectively termed the viral "ligandome") experimentally identified*
- *The peptides are derived from CHIKV viral proteins that are highly conserved across the Togaviridae viral family*
- *This demonstrates Emergex's ability to respond rapidly to infectious disease threats using its highly adaptable plug-and-play technology*

Abingdon, Oxon, UK, 28 November 2022 – Emergex Vaccines Holding Limited ('Emergex'), a clinical-stage biotechnology company addressing major global infectious diseases through the development of fully synthetic CD8+ T cell Adaptive Vaccines, announces today that it has generated a Chikungunya (CHIKV) ligandome, the first major milestone in the development of Emergex's CD8+ T cell CHIKV Adaptive Vaccine candidate.

Using an immunoproteomics approach, naturally presented MHC Class I-restricted peptides on the surface of a human leukocyte antigen (HLA)-typed cell line infected with CHIKV virus were extracted and identified. Over 120 viral peptides were identified exclusively from infected cells, 65 of which were common to two fragmentation techniques used for peptide analysis. Peptides (6 to 15 amino acids in length) were mainly derived from structural proteins (>90%) and included those with binding motifs indicating binding of several HLA alleles with a preponderance of predicted affinity to HLA-C. The viral peptides presented by MHC Class I molecules on the surface of infected cells can be recognized by CD8+ T cells that are able to destroy virally-infected cells. In addition to viral peptides, self-derived peptides/proteins were also identified in the ligandome. CHIKV infection was found to increase the diversity of self-peptides in the host cell by 4.9-fold and expression of self-proteins by 2.7-fold, indicating that viral infection may modulate cellular processes. Whole cell proteome analysis provides additional important information about cellular microenvironment changes upon viral infection, which includes potential alterations in the immunoproteasome and metabolism pathways.

The library of CHIKV ligandome peptides identified by Emergex will now enter the next phase of development. Candidate peptides will be selected, the vaccine construct generated at Emergex's in-house manufacturing facility near Oxford, and preclinical studies will be conducted in the laboratories at Emergex USA. Inclusion of the ligandome into the vaccine construct will require the selection of eight to twelve peptides from amongst the CHIKV peptide set (ligandome), all of which meet a number of specific criteria. *In vitro* efficacy studies will then need to be completed.

Laurens Rademacher, Chief Technology Officer at Emergex commented: "The ligandome identified allows the addition of a Chikungunya vaccine candidate to Emergex's pipeline. This is beneficial in both diversifying Emergex's product portfolio and providing a potential global solution to Chikungunya virus-related disease burden. The candidate will be advanced through our normal development pathway with Phase 1 human trials anticipated in Q1 2024. We would like to thank DHSC and Innovate UK Research and Innovation (IUK) for its support in this project."

Dr. Xiaofang Huang, Head of Immunoproteomics at Emergex USA commented: "To date only computer algorithm predictions or data from screening of virus construct infected cells have been used to infer the identity of the T cell epitopes on Chikungunya (CHIKV) virus. Neither approach can definitively conclude that a CD8+ T cell response against CHIKV infection has occurred. The ligandome library which contains viral and self MHC class I peptides has been established successfully by using the Emergex proprietary vaccine development platform, which provides a rational basis for CD8+ T cell

vaccine development. We believe this is a significant step towards an effective CHIKV vaccine and look forward to progressing our programme in the coming months."

This research was funded by the Department of Health and Social Care (DHSC) and delivered by IUK. DHSC is the UK Government department which is responsible for helping people to live more independent, healthier lives for longer. This investment is part of the UK Vaccine Network (UKVN). UKVN was established to provide funding to support the development of promising vaccines and vaccine technologies that will help combat infectious diseases that have epidemic potential in low and middle-income countries (LMICs). UKVN is a £190m UK Aid investment, which means all projects funded must support research primarily and directly for the benefit of people in low- and middle-income countries (LMICs).

Dr Phil Packer from UK Research and Innovation (UKRI) added: "Innovate UK has continually recognised the importance of investing in, and delivering innovative solutions to address the threat of infectious disease on global health and security. The initial findings of this Emergex project are highly encouraging and demonstrate that the UK continues to be at the cutting edge of vaccine research. IUK looks forward to seeing this product progress into the clinic."

The CHIKV virus is an RNA virus belonging to the viral family *Togaviridae*, and is spread to humans by the bite of infected mosquitos, with the potential for mother-to-child transmission. The disease, first identified in Tanzania in 1952, has spread rapidly over the past two decades and has since been reported in over 60 endemic countries throughout Africa, Asia, Europe, and the Americas.[1] Globalisation of the disease, including its import into Europe, can be attributed in large part to viraemic travellers, resulting in a number of localised outbreaks. The number of cases continues to rise, especially in temperate regions, with infection identified in nearly 40 countries[2] and imparting a high public health burden with more than two billion people currently at-risk for contracting the virus.[3] There is no vaccine on the market to prevent CHIKV infection, nor medicine to treat existing cases.

References

1. https://www.who.int/news-room/fact-sheets/detail/chikungunya
2. https://www.paho.org/en/topics/chikungunya
3. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7100975/

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About Emergex

Emergex, a clinical-stage, privately-held biotechnology company headquartered in Abingdon, UK, with an operating subsidiary in Doylestown, Pennsylvania, USA, is pioneering the development of 100% synthetic T cell Adaptive Vaccines that harness the body's natural T cell immune response to destroy

pathogen-infected cells in order to provide protection against some of the world's most urgent health threats: [i] viral infectious diseases, amongst which are Universal Coronavirus, Dengue Fever and Universal Influenza A, including pandemic influenza, as well as [ii] intra-cellular bacterial infectious disease.

Emergex has a growing proprietary pipeline of innovative CD8+ T cell Adaptive Vaccine and booster vaccine candidates that have the potential to deliver rapid, broad (mutation-agnostic) and long-lasting immunity to reduce serious illness associated with infectious disease. Emergex has a number of Phase I clinical trials underway, of which the most advanced programmes in development are [i] Dengue Fever (which may also be disease-modifying for other members of the *Flaviviridae* virus family, such as Zika and Yellow Fever) and [ii] Universal Coronavirus. Other programmes in development include vaccine candidates for Universal (pandemic) Influenza, Chikungunya, Hand, Foot, and Mouth Disease, Zika, and a booster vaccine for Yellow Fever. The programmes in the Discovery phase, for which our proprietary ligandome has been developed, include *Francisella tularensis* (intra-cellular bacterium), and a smallpox/monkeypox vaccine candidate.

Emergex's T cell Adaptive Vaccines candidates combine two proprietary technologies, [i] an empirically determined library of pathogen-derived protein fragments expressed on the surface of pathogen-infected cells (forming the MHC Class I expression "ligandome" library) using Immunotope Inc's immunoproteomics technologies to identify naturally processed and presented antigens only on infected cells, and [ii] a passivated gold nanoparticle carrier system designed to deliver the synthetic peptides to the skin-resident immune system (in combination with nociception) via micro-needles in order to elicit a robust, adaptive CD8+ T cell response. With potential stability at ambient temperatures, the vaccine candidates are intended to reduce the burden and the logistics of vaccine administration.

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