PRESS RELEASE

Emergex Vaccines and George Mason University Identify T-Cell Epitopes Presented by SARS-Cov-2 Infected Cells

- *First detailed, empirical analysis of Class 1 epitopes presented by SARS-Cov-2 infected cells which define the T-Cell repertoire necessary for cytotoxic T-Cell function*
- *MHC expression library provides an accurate basis for COVID-19 T-Cell vaccine and related diagnostics development*

Doylestown PA, USA and Abingdon, Oxon, UK, 15 September 2020 – Emergex Vaccines Holding Limited ('Emergex'), a company tackling major global infectious disease threats through the development of synthetic 'set point' vaccines which prime the T-Cell immune response, today announces the determination of a Class I MHC expression library, or ligandome, for SARS-Cov-2 infected cells, in collaboration with George Mason University ('GMU'), National Center for Biodefense and Infectious Diseases, Virginia, USA.

During the collaboration researchers at GMU grew SARS-Cov-2, the virus which causes COVID-19, in human cells expressing ACE-2 representing six HLA supertypes. The MHC Class I peptide expression library for cell surface expressed Class I molecules and the precursors for internal Class I bound peptides feeding the surface pool were determined using Emergex's proprietary immunoproteomics 2-D liquid chromatography mass-spectrometry platform at Emergex Vaccines, USA.

The library of approximately 30,000 Class I bound viral-derived peptides contains the first detailed empirical data for Class I epitopes that are presented by a SARS-Co-2 infected cell (potential T-Cell target cell) and therefore defines the T-Cell repertoire necessary for $CD8^+$ cytotoxic T-Cells to perform their kill-and-clear function of an infected cell.

The most abundant viral derived subset of peptides (COVID-19 ligandome) was determined by reference to all possible positive and negative strand RNA derived peptides without sequence bias. The library also provides a search tool to determine the physical presence of any predicted expression of a SARS-Cov-2 derived peptide sequence at mass accuracy of approximately 10 ppm. Details of the library have potentially significant implications for the development of T-Cell targeted COVID-19 vaccines and also T-Cell memory diagnostic reagents which can definitively determine the pre-exposure history of COVID-19. The data revealed "hot spots" of Class I peptide derived from open reading frames (ORFs) of the proteome not previously identified in the literature and demonstrated the lack of concordance between the empirical method and *in silico* or inference (megapools) methodologies.

Emergex will apply the insight gained in this study in its onoing programme to generate a second generation COVID-19 vaccine which is intended to generate a lasting and safe cellular immune response. Emergex's next generation vaccines have been designed to expand the body's natural immune response by programming $CD8^+$ T-Cells to rapidly recognise and respond to pathogens. This approach is aimed at providing effective prevention of disease while eliminating the allergic, autoimmune or antibody mediated side effects associated with traditional vaccines. Clinical trials of the first Emergex COVID-19 vaccine candidate are intended to start in Q4 2020.

Professor Thomas Rademacher, CEO and co-founder of Emergex, commented: *"It is increasingly clear that T-Cell responses to SARS-Cov-2 are the major if not dominant factor in the immune response to COVID-19 infection and a vaccine which can safely and effectively harness this*

response could be critical to controlling the pandemic. Studies on T-Cell memory recall to predicted peptides in convalescent COVID-19 individuals have inferred the presence of a strong T-Cell response in these patients. However, some studies suggest healthy and asymptomatic individuals also appear to have a previous T-Cell memory response to COVID-19 making the origin and diversity of this memory response ambiguous."

Dr. Xiaofang Huang, Leading Scientist, Emergex Vaccines USA, commented: *"To date only computer predictions or data from screening of 15-20-mer pools and megapools of peptides derived from spike protein or extensive regions of the SARS-Cov-2 proteome for recall responses have been used to infer the identity of the CD4 T-Cell epitopes on SARS-Cov-2. Neither approach can definitively conclude that a $CD8^+$ T-Cell response against SAR-Cov-2 infection has occurred, since the actual viral targets are unknown and computer predictions are required to anlayze the pools for Class I epitopes.*

"Our empirically determined library provides a rational basis for $CD8^+$ T-Cell vaccine and T-Cell diagnostics development. We believe this is a significant step towards an effective vaccine and look forward to progressing our programme in the coming months."

Dr. Aarthi Narayanan, Associate Professor of Systems Biology in George Mason University's College of Science, added: *"This is an exciting and highly pertinent approach to develop a vaccine against SARS-CoV-2 which takes into account the critical need for a robust and targeted T-Cell response to elicit functional immunity. We are excited to be working with Emergex on this venture."*

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About Emergex

Emergex, a UK-based biotechnology company headquartered in Abingdon, UK, is pioneering the development of synthetic 'set point' vaccines which prime the T-Cell immune response to address some of the world's most immediate health threats such as COVID-19, Dengue Fever, Zika, Ebola, pandemic flu and serious intra-cellular bacterial infections.

These set-point vaccines modify the initial immune status of recipients in a way that 'primes' their immune systems to recognise subsequent infectious agents much like a natural infection would do, preventing an acute or severe manifestation of the disease.

Emergex combines validated technologies together with the very latest scientific insights to develop its vaccines, including using synthetic peptide codes determined on actual infected cells and using a proprietary gold nanoparticle carrier system for programming.

The Company has a growing pipeline of vaccine candidates. The most advanced development programme is a vaccine for Dengue Fever, which may also be disease modifying for other Flaviviruses such as the Zika and Yellow Fever viruses. Emergex also has programmes in development for a universal Influenza vaccine and a universal Filovirus vaccine (including viruses such as Ebola and Marburg) and discovery programmes for a Yellow Fever Booster vaccine and a Chikungunya vaccine.

Emergex has partnered with the Institute of Molecular and Cell Biology (IMCB) of Singapore to develop a vaccine for the emerging threat of Hand, Foot and Mouth (HFM) disease and has signed a Memorandum of Understanding (MoU) with Brazil-based Oswaldo Cruz Foundation 'Fiocruz' for the development of viral vaccines. This initially covers the development of a vaccine that universally

targets diseases within the flavivirus family such as Dengue Fever, Zika and Yellow Fever but could be expanded to include the development of vaccines to target other viral families that are endemic to the region.

Find out more online at www.emergexvaccines.com.

About George Mason University

George Mason University is Virginia's largest public research university. Located near Washington, D.C., Mason enrolls more than 37,000 students from 130 countries and all 50 states. Mason has grown rapidly over the last half-century and is recognized for its innovation and entrepreneurship, remarkable diversity, and commitment to accessibility.

The Institute for Biohealth Innovation (IBI) promotes and supports biohealth-related research activities of faculty, staff, and students at George Mason University. The IBI connects Mason researchers in biohealth with potential collaborators, both within the university and externally, to advance human health research. Learn more and hear more from our researchers at **ibi.gmu.edu.**

The College of Science at Mason is a leader in scientific discovery creating innovative solutions for the rapidly-changing needs of today's world. Mason's College of Science blends traditional science education with sought-after programs in disciplines as diverse as personalized medicine, infectious diseases, geoinformatics, climate dynamics, materials science, astronomy, forensic science, and applied mathematics. The College encourages meaningful education and research at all levels offering innovative undergraduate programs, minors, certificates, and graduate degree opportunities, as well as global, transfer-focused, and online, or hybrid, programs that allow professionals the opportunity to reskill or change careers. Learn more at **science.gmu.edu.**

George Mason University Biomedical Research Laboratory is one of thirteen Regional Biocontainment Laboratories constructed with funding support from the National Institute of Allergy and Infectious Diseases/National Institutes of Health (NIAID/NIH). The BRL is a state-of-the-art laboratory with biosafety level 3 and aerosolization capabilities where scientists perform pioneering research of infectious diseases, both emerging and potential bio threat agents. Learn more at **ncbid.gmu.edu**