Learning to Care for Those in Harm's Way

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New Vaccine Strategy Identified for Explosive Emerging Diseases

Bethesda, Md. – A 'designer' manganese-peptide antioxidant of the world's toughest bacterium, combined with radiation, have shown to be successful in the development of a vaccine to counter Venezuelan Equine Encephalitis Virus (VEEV), a biothreat agent, and Chikungunya virus, a mosquito-borne illness causing severe outbreaks around the world, according to a study "Deinococcus Mn2+-Peptide Complex: A Novel Approach to Alphavirus Vaccine Development," published online May 30 in the journal, Vaccine, published by Elsevier, http://www.sciencedirect.com/science/article/pii/S0264410X17306242.

Effective vaccines depend upon the human immune system recognizing a biological structure that is similar to that of a disease-causing organism. A manganese-peptide antioxidant complex of Deinococcus, developed by Uniformed Services University of the Health Sciences (USU) pathology professor Dr. Michael J. Daly and his team, has the remarkable property of protecting proteins from ionizing radiation damage but not protecting the genetic material (DNA or RNA) in viruses and bacteria. Using D. radiodurans, listed in the Guinness Book of World Records as "the world's toughest bacterium" and which can withstand 3,000 times the levels of gamma radiation that human cells can, Daly found that a disease-causing organism (pathogen) can be exposed to gamma radiation in the presence of a Deinococcus Mn complex, and rendered non-replicative (killed) by overwhelming genetic damage, but still maintain the shape of key surface proteins needed to mount a highly protective immune response. This approach was successfully implemented on viruses for the first time by scientists in the USU lab of the late Dr. Radha K. Maheshwari to produce vaccines against VEEV and Chikungunya virus.

This approach offers a simple, rapid, cost effective and potentially universal inactivation strategy that can be applied to any pathogen requiring immediate attention, for example, Ebola and Zika viruses.

"Application of this methodology has the potential to revolutionize all future vaccine development" says Dr. Paridhi Gupta, a scientist in the Maheshwari laboratory, and the study's co-lead author.

The vaccine study was a collaborative effort led by Maheshwari's and Daly's research teams, including Dr. Gupta, Dr. Manoshi Gayen, and Dr. Elena K. Gaidamakova; Dr. Pamela J. Glass's team from the U.S. Army Medical Research Institute for Infectious Diseases, including Dr. Elaine M. Morazzani, and Navy

Captain (Dr.) Barbara Knollmann-Ritschel at USU. The project was funded by the Defense Threat Reduction Agency.

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