BROAD-SPECTRUM THERAPEUTICS FOR VIRAL DISEASES: A MEDICAL COUNTERMEASURE PLATFORM FOR EMERGING THREATS

Non Ionic Surfactant Vesicles As Drug Delivery And Targeting Systems For Antimicrobials

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Most biothreat agents have the ability to reside in several different organs and cell types. Once within the host, they have evolved mechanisms to evade innate and adaptive immune defenses, thus making these pathogens highly virulent if left untreated.
Therefore there is a continued requirement to optimize delivery of antimicrobial drugs and to consider targeting specific organs and tissues. Non-Ionic Surfactants Vesicles (NISVs) are a well characterized and flexible drug delivery and vaccine platform. NISVs are formed from synthetic, non-ionic surfactant and can entrap both hydrophilic and lipophilic molecules and drugs. They are similar to liposomes, but much more stable and less toxic due to the absence of phospholipids. We have previously demonstrated enhanced oral administration of military relevant antibiotics (doxycycline, levofloxacin and ciprofloxacin) using Bilosomes (NISVs incorporating bile salts), leading to significantly increased survival in models of tularemia and melioidosis. More recent data have demonstrated that the NISV platform can be further adapted to aid tissue targeting, for example, by preferentially targeting the brain with glucosamine-decorated NISVs (gNISVs). gNISVs were used to entrap a mAb leading to reduced viral load in the brain and increased survival in a murine model of VEEV infection. Vaccine data has also demonstrated that the vesicles act as adjuvants, but also have anti-inflammatory properties which may have additional benefits for highly virulent pathogens. The ability of the NISVs to encapsulate a variety of types of antimicrobials and cargo means that the treatment of a broad spectrum of biothreat pathogens is possible by maximizing efficacy and minimizing drug toxicity.

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