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Inter-bilayer cross-linked multi-lamellar vesicles (ICMVs) for efficient co-delivery of antigen and adjuvant payloads

Alan R Shaw, Adrienne Li, Darrell Irvine, Jackson Eby and **Peter Demuth**
Vedantra Pharmaceuticals, USA

Vaccine development generally involves a lot of work on the antigen aspect, some effort on formulation, and the addition of an adjuvant in some form or another. These components are often elaborated separately and delivered as a mixture, sometimes in an emulsion or in a liposome, with the hope that some fraction of the material administered gets to the right place. Recent work on materials engineering at MIT has brought together novel assemblies of lipid nano particles loaded with antigen and adjuvant, "hardened" by chemical cross-links to create a system that co-delivers its payload to lymph nodes. We call these particles ICMVs (Inter-bilayer Cross-Linked Multi-Lamellar Vesicles. By sequestering the adjuvant and antigen in a particle, systemic exposure is limited. This should result in an improved safety and tolerability profile. In mice, the optimal dose of antigen is on the order of a microgram. Adjuvants, engineered to fit into the nano particle, allow the use of very low doses as well. The result is a potent, long lasting humoral response accompanied by a robust antigen specific $CD8^+$ T-cell response. ICMVs can be delivered by injection, but they may delivered by inhalation as well. Intratracheal delivery to the lungs results in a strong $CD8^+$ response on mucosal surfaces with no apparent pathology. The application of ICMV mediated malaria vaccines will be discussed.

Biography

Alan R Shaw PhD is Chairman and Chief Scientific Officer at VaxInnate Corporation where he is responsible for scientific and medical conduct of the company's efforts to develop new vaccines incorporating pathogen associated molecular patterns. He joined VaxInnate in 2005 following a 15year career at Merck Research Laboratories where he was responsible for R&D leading to the licensure of Varivax®, ProQuad®, Zostavax®, RotaTeq® and Gardasil®. Prior to joining Merck, he was a Senior Program Executive at Biogen S.A in Geneva, Switzerland where he led projects on hepatitis B vaccines, malaria vaccines, cytokines and their inhibitors, and cell trafficking. He was the Chairman of the International Federation of Pharmaceutical Manufacturers' Association Biologicals Committee and has extensive experience in national and international vaccine development and policy matters. He received his PhD in Molecular Biology and Biochemistry from the Medical College of Ohio, and was a Post-doctoral fellow at the International Institute for Cellular Pathology in Brussels and at the Rockefeller University in New York. His expertise is in the areas of virology, molecular biology, immunology and protein chemistry. He has served as an adjunct faculty member at Temple University in Philadelphia. He is currently a member of the NIH Board of Scientific Counselors.

alan.shaw@vedantra.com