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Silica nanocarriers for delivery of single dose – shelf stable nano vaccines

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We have developed a nano-carrier delivery system for vaccines that demonstrates strong adjuvant effects, potential for reducing dose number and elimination of cold chain requirements. The technology was developed to reduce the administration costs of vaccines and to improve compliance, a key factor undermining the effectiveness of multi-dose vaccines.

The novel hollow silica vesicles (SV) nano-carriers have a well-controlled diameter in the range 30-70 nm and a thin wall of just a few nanometres perforated by pores of controllable size in the range 6-20 nm. The large internal cavity acts as a high capacity reservoir for biologics such as proteins which are easily loaded through the large pores in the vesicle walls. The carrier vesicles are sized for effective endocytosis and display a strong adjuvant effect, potentially removing the requirement for dedicated adjuvants in a formulation.

The SV nano- carrier technology has been demonstrated in mouse trials, initially in an animal vaccine application targeting Bovine viral diarrhoea virus BVDV using the subunit vaccine E2 protein, an immunogenic fragment which is active for prevention of BVDV. Use of the E2/SV formulation significantly increased the humoral as well as cell mediated immune response over the formulation using the standard Quil A adjuvant. We have further shown that vaccination with non-freeze-dried and the freeze-dried E2/SV formulation elicited balanced immune responses for up to 6 months post the final second immunisation.

The technology is currently being developed for animal vaccine applications and has the potential for translation to human health.

Biography

Associate Professor Neena Mitter, at Queensland Alliance for Agriculture and Food Innovation, the University of Queensland (UQ) is one of Queensland's leading biotechnologists and has won prestigious awards like Women in Technology Queensland Biotechnologist Award, Queensland International Fellowship and Young Scientist Award by the Prime Minister of India. Her successes include a Gates Foundation grant on 'BioClay', a nanoparticle based delivery of RNA silencing for crop protection, which is now further supported by industr https://www.linkedin.com/pub/neena-mitter/10/4ab/13y and government. She is heavily invested in agricultural nanotechnology and currently leads a consortia of scientists from UQ, Washington State University, Zoetis and Department of Agriculture and Fisheries, Queensland to develop 'Nanovaccines for animal health'.

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