Rethinking the Pertussis vaccine: Formulation of lipid nanoparticles with vaccine adjuvants to achieve enhanced immunity.

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Pertussis is an infection of the lungs and pulmonary airways. This potentially fatal disease is globally endemic. Recent outbreaks of pertussis have revealed that effectiveness of the current acellular vaccine is suboptimal, hence it is essential to make improved vaccines. A triple adjuvant consisting of a TLR agonist [poly(I:C)] , an immunostimulant host defense peptide (IDR-1002) and polyphosphazene has achieved stronger, faster and long-lasting immune responses [1]. Formulation of this triple adjuvant into cationic lipid nanoparticles for intranasal delivery of pertussis vaccines may provide efficient mucosal adhesion and induce enhanced mucosal and systemic immune response [2]. The triple adjuvant (Triadj) was prepared by mixing the three components in an experimentally optimized ratio (1:2:1) and followed by complexation to cationic liposomes to form L-TriAdj. Addition of acellular pertussis antigens namely Pertussis Toxin Mutant (PTM), Pertactin (PRN) and Fimbriae 2/3 (Fim 2/3) at the TriAdj assembling stage allowed for complete incorporation of antigens into the L-TriAdj system as cationic lipid nanoparticles. Characterization included particle sizing (254±51nm), zeta potential (+55±3.5) and transmission electron microscopy (TEM), showing discrete amorphous particles. In vivo assessment is planned. This lipid-based triple adjuvant formulation can have broad applications for various therapeutic and vaccine formulations.