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Degradable emulsion as vaccine adjuvant reshapes antigen-specific immunity and ameliorates vaccine efficacy

Ming-Hsi Huang
National Health Research Institutes, Taiwan

Our research group is tasked with integrating immunology and bioengineering to facilitate the development of vaccine formulation and delivery for the induction of broadened and appropriate immune responses. During the past 10 years, we have systematically attempted to engineer materials to mimic danger/alarm signals (as immunoregulatory agents) in order to activate the immune cells, and engineer materials to create the vehicles (as depot/carriers) in order to deliver the designed signals along with antigens, thus effectively probing and manipulating the vaccine immunogenicity. Among these, we optimized a degradable emulsion comprised of a bioresorbable polymer PEG-b-PLACL, Span®85, and squalene to form a ready-to-use adjuvant, dubbed PELC. For vaccination feasibility studies, it is important to evaluate the properties of degradable emulsion-based adjuvants interacting with immune cells and to elucidate their roles in vaccine immunogenicity in vivo. Our hope is to investigate respective action mode between the physicochemical properties and the adjuvanticity of new-generation degradable emulsion in enhancing the immunogenicity of a model antigen in mice in the context of the efficacy in tuning the antigen-specific immune responses. We demonstrated that vaccination with PELC-adjuvanted antigen prolongs antigen retention, recruits and activates antigen-presenting cells, and reshapes antigen-specific humoral and cellular immunity, thus ameliorating the vaccine efficacy. The findings from the preclinical immunogenicity and immunotherapy efficacy studies provide support for their careful evaluation in clinical trials in humans.

Biography

Ming-Hsi Huang is currently working on the development of micro-/nano- encapsulation technology for a single-dose multivalent vaccine against emerging infectious diseases and investigations of sustained delivery against cancers and immune dysfunctions. His major research interest at National Health Research Institutes, Taiwan has been focused on the development of novel delivery vehicles for generating vaccine-induced long-term immunity as well as immunoregulatory agents for manipulating effective/harmful immune responses.

huangminghsi@nhri.org.tw

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