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Antigen-displaying polyester particles manufactured by engineered bacteria

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A novel polyester particle technology platform was developed by harnessing the natural capacity of bacteria to produce spherical polyester inclusions ranging in size from 50-1000 nm. These polyester particles are formed within the bacterial cell mediated by the enzyme, polyester synthase. The polyester synthase covers the surface of the polyester beads and has been extensively engineered to incorporate proteins of interest such as enzymes, binding domains and antigens. Here the focus will be on recombinant production of tailor-made polyester beads displaying antigens of interest. A bioprocess has been developed for industrial production of these beads. The use of antigens associated with particles in a size range mimicking infectious viruses and bacteria offers advantages over soluble antigens such as facilitated uptake by antigen-presenting cells (APCs), depot formation as well as co-delivery of antigens and immunomodulatory compounds to the same APC potentially controlling the type of immune response. Besides its use as particulate antigen, diagnostic applications, such as e.g. TB skin test reagent, are currently being developed.

This new technology offers an unprecedented design space accompanied with accelerated prototype development. Genetic engineering is applied to express hybrid genes encoding fusions of the polyester synthase with antigen(s). Antigen examples are the hepatitis C virus core (HCC) antigen, various TB antigens (ESAT6, CFP10, Rv3615c, Ag85A) and antigens from *Streptococcus pneumoniae* and *Neisseria meningitidis*. The immune response induced by this antigen-bead delivery system was compared to that induced by vaccination with only the soluble antigen. Antigen displaying beads were safe and stimulated an antigen-specific type 1 and 2 immune response resulting in protective immunity. In addition a highly specific TB skin test reagent was developed which shows promise in clinical trials.

Antigen-displaying polyester beads manufactured by recombinant bacteria could serve as safe and efficient particulate vaccines as well as show promise for diagnostic applications.

Biography

Charani Ranasinghe completed her PhD from University of Western Australia. She is the Group Leader of the Molecular Mucosal Vaccine Immunology Group at the JCSMR, Australian National University. She was the first to discover that IL-13 plays an important role in modulating CD8 T cell avidity in a vaccine route dependent manner. Her team has recently developed two novel IL-4R antagonist and IL-13Ra2 adjuvanted vaccine platforms that can induce high quality systemic/ mucosal CD8 T and B cell immunity.

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