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Bacterial inclusions as platform for recombinant production of particulate vaccines

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The formulation of antigens as 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.

A variety of bacteria are able to intracellularly produce polyester (polyhydroxybutyrate=PHB) inclusions which serve as carbon and energy reserve. Bioengineering of this natural polyester bead production process enabled the design and production of novel particulate vaccine delivery systems. A cost-effective, scalable and versatile particulate vaccine production process could be developed. This new technology offers an unprecedented design space accompanied with accelerated prototype development. *Escherichia coli* and the food-grade endotoxin-free bacterium *Lactococcus lactis* were engineered to produce spherical (PHB) inclusions which abundantly displayed the hepatitis C virus core (HCc) antigen or the two TB antigens, ESAT6 and Ag85A, respectively. In mice, the immune response induced by this antigen delivery system was compared to that induced by vaccination with only the soluble antigen. Vaccination site lesions were minimal in all mice vaccinated with PHB beads. Antigen displaying PHB beads stimulated an antigen-specific type 1 and 2 immune response. Moreover, a protective immunity was obtained in mice vaccinated against TB. Overall, this novel bead technology offers a safe and efficient vaccine delivery platform suitable for vaccination against viral infections and intracellular pathogens.

Biography

Bernd H. A. Rehm has completed his Ph.D. at the age of 28 years from Ruhr-University of Bochum (Germany) and postdoctoral studies from University of British Columbia (Canada). He is the Chair of Microbiology at Massey University and Chief Science Officer of PolyBatics Ltd. He is named inventor on 7 patent families (2 granted). He has published more than 100 papers in reputed journals and serves as editorial board member of 11 international journals, Editor-in-Chief and Editor of 2 journals, respectively. Bernd Rehm is sole editor of five scientific books. His work has been cited >4000-times resulting in a h-index of 37.

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