Immune markers and correlates of protection for vaccine induced immune responses

Vaccines have been a major innovation in the history of mankind and still have the potential to address the challenges posed by chronic intracellular infections including tuberculosis, HIV and malaria which are leading causes of high morbidity and mortality across the world. Markers of an appropriate humoral response currently remain the best validated correlates of protective immunity after vaccination. Despite advancements in the field of immunology over the past few decades currently there are, however, no sufficiently validated immune correlates of vaccine induced protection against chronic infections in neither human nor veterinary medicine. Technological and conceptual advancements within cell-mediated immunology have led to a number of new immunological read-outs with the potential to emerge as correlates of vaccine induced protection. For TH1 type responses, antigen-specific production of interferon-gamma (IFN-γ) has been promoted as a quantitative marker of protective cell-mediated immune responses over the past couple of decades. More recently, however, evidence from several infections has pointed towards the quality of the immune response, measured through increased levels of antigen-specific polyfunctional T cells capable of producing a triad of relevant cytokines, as a better correlate of sustained protective immunity against this type of infections. Also the possibilities to measure antigen-specific cytotoxic T cells (CTL) during infection or in response to vaccination, through recombinant major histocompatibility complex (MHC) class I tetramers loaded with relevant peptides, has opened a new vista to include CTL responses in the evaluation of protective immune responses. Here, we review different immune markers and new candidates for correlates of a protective vaccine induced immune response against chronic infections and how successful they have been in defining the protective immunity in human and veterinary medicine.

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