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B-cell responses after pertussis vaccination

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ABSTRACT

Despite years of vaccination efforts, whooping cough, or pertussis, is not under control. Although immunization has greatly reduced the disease incidence, thousands of children die of whooping cough each year. Therefore, there is an urgent need to improve the available vaccines as well as our understanding of the immunological mechanisms required for optimal protection against pertussis. The focus of this thesis was on B-cell responses after pertussis vaccination within the scope of two clinical trials.

The B-cell ELISpot protocol was optimized to ensure sensitive detection of B-cell responses. In paper I, the superiority of the novel protocol was demonstrated with regard to B-cell activation, detection sensitivity, antigen consumption, and assay time in comparison to an established protocol.

The first trial evaluated the safety and immunogenicity of a novel live, attenuated, whole-cell vaccine named BPZE1 in a phase 1 clinical setting (reported in papers II and III). This vaccine strain is genetically modified and is designed for intranasal administration and a subsequent nonpathologic infection in the immunized subjects. The second trial was a phase 4 booster study of a fifth consecutive dose of an acellular pertussis vaccine in adolescents. Memory B-cell and serological responses are reported in paper IV. In both studies, strong serological and B-cell responses were detected with ELISA and ELISpot. Colonization was crucial for the BPZE1 study, whereas both antigen content and concentration influenced the responses in the booster study.

Immunity against pertussis is still not fully understood. Evaluating several parameters of the immune response will give a better understanding of the immunological activities following pertussis infection or vaccination. More knowledge will enable better vaccines and contribute to the control of pertussis.