DENNIS HOVING

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Research for which the funding/prize was received

For this collaborative study with Prof. Daniela Ferreira's group (University of Oxford and Liverpool School of Tropical Medicine), we characterized the antigen-specific B cell responses in a pneumococcal vaccine trial. Participants were vaccinated with either the pneumococcal polysaccharide vaccine (PPV23), the conjugate vaccine (PCV13) or saline control, and samples were taken at baseline and 3 weeks post-vaccination. We used our recently developed method to quantitate and phenotypically characterize serotype antigen-specific B cells via spectral flow cytometry, using polysaccharide-streptavidin multimers and a staining panel with 23 cellular markers for phenotypic assessment. This allowed us to discriminate between 14 different specificities, including all PCV13 covered serotypes. We revealed that PCV13 induced significantly higher expansion of serotype-specific memory B cells in peripheral blood for all vaccine-covered specificities, compared to PPV23. PCV13-induced memory also showed a distinct phenotype, with increased IgG/IgA class-switching and increased expression of activation markers. Serotype antigen-specific IgG antibody titers were comparable between both vaccination groups, highlighting the importance of including the analysis of cellular responses to fully comprehend vaccine-mediated immunogenicity, booster capacity and potential efficacy, in clinical trials.

What made your research unique?

To date, the cellular compartment is greatly understudied in (pneumococcal) vaccine studies, despite the evidence that antigen-specific B cells may be a correlate of protection against colonization of Streptococcus pneumoniae in the experimental human challenge model. Few studies have analysed these cells, limited to the quantitation of antigen-specific B cells by ELISPOT, which is an indirect and semi-quantitative approach. We developed a novel high-throughput method to, for the first time, comprehensively quantitate and phenotypically characterize serotype antigen-specific B cell memory ex vivo. PCV13 and PPV23 are classified as non-inferior, based on clinical trial studies that show both vaccines induce comparable seroconversion. However, we are the first to show that there are significant quantitative and phenotypic differences in the cellular memory compartment between the two vaccine groups.

What do you see as the biggest challenge in Immunology?

I believe that one of the biggest challenges in immunology is achieving a complete comprehension of the complexity of the immunity at the systems- and population level. Comprehensive multi-organ analysis in animal studies, novel minimally-invasive tissue sampling methods for clinical studies and the integration of high-throughput tools, multi-omic approaches and predictive modelling have tremendously advanced the understanding of immune development and systems immunology. However, full comprehension remains challenging, and may be affected by multiple factors, including gender, age, genetics, environment, microbiota, comorbidities, etc.

What is your most important advice to young immunology researchers?

I would recommend young immunology researchers to ensure their science is curiosity-driven, and to work collaboratively and cross-disciplinary for more efficient, higher-quality and enjoyable science.

How do you take care of a good work-home balance?

Prioritize, set realistic goals and plan accordingly. What personally works for me, is to push hard in high-demanding moments, and compensate by making more space for personal life outside of these peaks. However, it is an ongoing work in progress.

To read more about Dennis' work, you can access the full paper here:
https://doi.org/10.1038/s42003-023-05444-3