To the AllerGen NCE,

I would like to thank you once again for the support you have shown me, most recently with the research skills award to attend the 6th Lower Saxony Summer Academy in Immunology at the Medizinische Hochschule Hannover (MHH). Not only did I learn about various topics and techniques in immunology, but I also had the chance to build connections with up-and-coming researchers from across the globe.

The program begins with 1 week of instruction in a lecture format by the faculty and guest lecturers invited from abroad. This year, they invited Dr. Michael Sixt, from IST Austria, to speak about processes for cell motility; Dr. Paola Romagnoli, from the Physiopathology Center of Toulouse-Purpan, to speak about the development and compartmentalization of regulatory T cells; Dr. Florent Ginhoux, from the Singapore Immunology Network, to speak about the macrophage and dendritic cell classification, ontogeny, and function; and Dr. Doreen Cantrell, from the University of Dundee, to speak about the interaction between immune metabolism and regulation of T cell differentiation.

Although the lectures were structured to cater to the different backgrounds of those present, they provided an introduction to a number of topics ranging from the development of therapeutics for atopic dermatitis to neuroinflammatory processes. Moving forward, I will be able to draw upon a larger knowledge base and apply a more integrated approach in my research pursuits. I also learned how different variables may affect experimental outcomes through discussion of different papers and apparently conflicting results. For example, I had not considered how housing conditions may affect mouse phenotypes due to microbiota profiles, or how strains of mice from different vendors behave differently despite similar protocols. I have become more mindful of applying the same careful mentality to the design of future experiments.

Following the first week of lectures, the students were split into one week lab rotations, which allowed me to learn more in-depth about different techniques and research areas. During my first lab rotation, the members of Dr. Immo Prinz's lab showed me their research regarding the contribution of Vγ4 γδ T cells to wound-healing processes and the functional implications of diversity in the γδ TCR repertoire. I learned more about different microscopy techniques, such as two-photon microscopy and light sheet microscopy, which allowed them to either visualise γδ localization in real-time or in situ in larger tissues without sectioning in models of wound healing and nerve injury. I also learned more about bioinformatics approaches applied to TCR diversity through the tcR package, which allows for analysis of links between γδ TCR sequence and clinical outcomes using data from high-throughput TCR sequencing. I hope to apply similar approaches along with my previous bioinformatics experiences to new research questions.

During my second lab rotation, I joined Dr. Detlef Neumann, who is interested in the effects of the histamine H4 receptor in experimental allergic asthma and colitis models. One cell type that expresses the H4 receptor is the intestinal epithelium, and because of its role as a first-line defense mechanism, it is an attractive target to explore the effects of the H4 signalling pathway. However, since intestinal epithelium does not appear to be readily cultured as a monolayer, they have begun to employ an organoid culture system with wild-type and H4

knockout mice to perform their functional analyses. They gave me the chance to try out prepare colonoid culture de novo. They also invited me to observe how they use the flexiVent, and it was interesting to see how others perform the technique to assess different respiratory mechanics. Although other organoids such as lungs require iPSCs to generate, it was still interesting to see organoid culture model, as they are useful models for drug development, and their 3D structure allows for more complex cell culture approaches.

Finally, I had the chance to visit the lab of Dr. Tim Sparwasser, where they study infection immunology, especially in the context of dendritic cells and T cells. There, I learned more about dendritic cell subsets and their functional roles, particularly CDC1, CDC2, and pDCs. I also learned about the GM-CSF and Flt3L culture that they developed, which results in dendritic cells that resemble CDC1 cells more closely than does GM-CSF alone. Previously I'd only learned about dendritic cells as a mobile antigen-presenting cell that moves to lymphatic tissue to activate T cells. This allowed me to consider how shifts in dendritic cell subsets may affect disease pathogenesis and made me aware of newer culture methods may better recapitulate phenotypes seen in vivo throughout my current project concerning dendritic cell phenotype and function in allergic asthma. I also learned more about interactions between the immune system and metabolism, specifically how biasing T cell metabolism can affect their effector functions. As we assess metabolism in non-immune cell types in our lab, it would be easy to integrate similar methods to characterize immune cell activity in allergic asthma.

Perhaps even more valuable than that was the chance to interact with other students from across the world: over 25 countries were represented in our group of 32 students. During my time at the MHH, I learned more about how epidemiological differences focus research in different countries, how other international institutions approach scientific research, and what their research environments is like in terms of ethics and resources. Furthermore, the summer academy allowed to build contacts across the world, and form collaborative relationships to support each other in future. Already, I have shared the expertise I gained through the AllerGen Undergraduate Summer Studentships with my fellow attendees, ranging from flow cytometry analysis to airway epithelial cell biology.

Overall, I think it was rewarding experience that helped me to learn about diverse subjects and allow me to draw upon larger knowledge base when attempting to explain phenomena. Again, I would like to thank the AllerGen NCE for supporting my development toward a career in biomedical research.

Sincerely,

Michael Chen