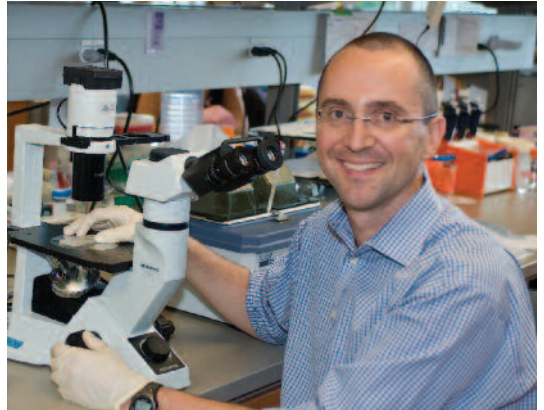




**The team believes that the process by which the immune system “learns” from the environment can be exploited to develop novel therapies. For example, a child may be treated with a vaccination in the early years to train the immune system and prevent or mitigate immune diseases, like asthma and allergies, later in life.**

# The Front Lines: Studying Asthma During Early Childhood Development

According to the 2010 survey *Asthma Insight and Management in Europe and Canada (EUCAN AIM)*, asthma has a significant impact on the Canadian healthcare system, with one in every six households across Canada having at least one family member diagnosed with this disease. This is a major concern among healthcare professionals and parents alike. Typically, our bodies do not react to everyday external stimuli like pollen or peanuts, but in the case of allergies and asthma our immune system mounts an over-enthusiastic response that can even be fatal. Researchers believe that understanding how the immune system develops in childhood and how it forms a response to different external stresses is the key to curbing this worrying trend.



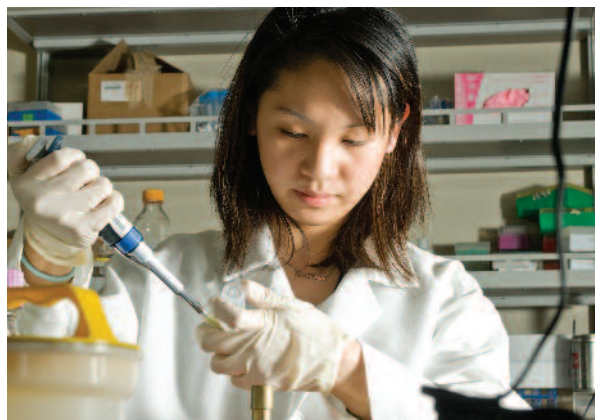
**Dr. Stuart Turvey, PhD, Associate Professor, University of British Columbia, Pediatric Immunologist, BC Children's Hospital, and Co-Director of the Immunity in Health & Disease research cluster, Child & Family Research Institute**

The early stages of a child's life play a vital role in their social, emotional and physical development. The role of the immune system in development, however, has yet to be defined and still remains a mystery. Through the advancement of technology and the networking approach of Allergen NCE Inc., a team led by Drs Tobias Kollmann and Stuart Turvey have been able to shed new light on how the immune system develops and reacts to stresses such as asthma and allergies during the early years of life. The team leaders believe that by studying the immune system as it develops, they can help ease the strain allergies and asthma cause later in life. That the early life immune system is not mature is a misconception, states Dr. Kollmann. He says "The early life immune system is not immature. It's just different." Kollmann goes on to explain that while there are some changes in the first month of a newborn's life, the innate immune system doesn't undergo major changes over a lifetime. Before birth, the immune system is geared to preventing an immune response while in the womb. At the time of birth, the immune system shifts focus to become more adept at fighting off threats from the external environment, such as bacterial and viral infections. By the time a child reaches five years of age, the immune system is very robust.

## Working Together

The team, led by Drs Kollmann and Turvey, examined the immune system of newborn infants to determine how, and

at what times, different genes are expressed during infancy. Drs Kollmann and Turvey want to figure out the extent to which changes in our immune system are pre-programmed and how genetic variation affects the process of change. They are also interested in determining how our immune system is influenced by the environment. To gather the necessary data, the team followed a cohort of babies from birth to two years of life, as part of the mini-CHILD Study, which was the pilot phase of Allergen's national birth cohort *The Canadian Healthy Infant Longitudinal Development (CHILD) Study*. Newborns are much more susceptible to infectious diseases than older children and adults. Many immune factors leading to allergy and asthma seem to be set in stone, or at least in motion, in early life. However, most work on vaccines and asthma is done at the adult level and as a result, very little is known about this crucial



**Kathleen Wee, PhD student, supervised by Dr. Stuart Turvey.**



Research conducted in Dr. Stuart Turvey's laboratory at the Child & Family Research Institute.

developmental stage in a child's life. Specifically, there is limited research on how the immune system changes throughout infancy. Dr. Kollmann feels that filling this knowledge gap is imperative for developing new medicines. He notes that, "the only way we are going to get better vaccines or change the way we treat asthma and allergy is by studying the early-life time period."

One of the long-term goals of this project is to develop better medicines that can prevent or treat asthma and allergy related illness. One of the discoveries made is that the early immune system may potentially be driven by environmental exposures. The team believes that the process by which the immune system "learns" from the environment can be exploited to develop novel therapies. For example, a child may be treated with a vaccination in the early years to train the immune system and prevent or mitigate immune diseases, like asthma and allergies, later in life. This project has far reaching potential and through AllerGen's networked approach, international collaborations have been formed to help study environmental

exposures towards realizing the long-term goal of developing vaccines and other new treatment options for allergy and asthma.

Many of the tools necessary for this project required refining and adapting to meet researchers' needs. Drs Kollmann and Turvey developed and standardized a new technique for high-throughput immune phenotyping essential to completing this project. This new technique, called Polychromatic Flow Cytometry, is quick and can be used to analyze a large number of targets using small amounts of blood. This screening process generates tremendous amounts of data that need to be analyzed in order to find the key pieces of information. By partnering with a team of global data analysis experts based in Vancouver called Visual Analytics, Drs Kollmann and Turvey hope to develop and use complex computer algorithms to detect patterns of gene expression and analyze them. Dr. Kollmann is convinced that this approach represents a groundbreaking platform that could change how data analysis is conducted in future studies.

## AllerGen NCE: Developing Relationships and Translating Knowledge

Dr. Turvey believes that this project provided a strong foundation for the CHILD Study, which has commenced and has the potential to fundamentally change the way we think about asthma and allergies." Dr. Turvey notes, "we've also begun training the next generation of investigators. People coming through my lab are enthusiastic about studying asthma and allergy." Four students helped develop this project, all of which started as Masters students and have since continued their studies in a PhD program or medical school. Another four new students have since joined the project and are developing the skills to become robust researchers. Internationally, four students from South Africa have also participated in the project.

addresses needs that have not been met anywhere else in the world. They are optimistic that, over the long-term, their results can be used to develop novel methods for asthma and allergy treatments and want to ensure that the knowledge gained from their research is disseminated as quickly as possible. Dr. Turvey believes that the long-term prospects of this study are immense. The genetics have been completed and Drs Kollmann and Turvey have helped find targets for modulators of the immune system. While this work is complete, more work will be needed in the future to have an impact on policy makers and to develop a commercially viable product.

Dr. Turvey believes in the value of a multidisciplinary approach to solving the complex challenges posed by allergic disease and feels that the AllerGen network has enabled

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**"I've learned that bringing together people with different skill sets allows them to do a much better job and allows us to ask questions that I wouldn't even have thought existed because I didn't know about them. We understand little about how the body works, but with new computer models, the workings of the immune system are becoming clearer." He emphasizes that, "the more you can invest in research, the better the outcome for everybody...."**

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Both Drs Kollmann and Turvey believe that, with the help of AllerGen NCE, the correct steps are being taken to ensure future success. "The AllerGen NCE network has positioned our project to achieve very tangible goals for commercialization of our research results." He is confident that AllerGen NCE has contributed to the success of this project, which has brought together a wealth of expertise from all over the world. Grants from the National Institutes of Health (NIH), the Canadian Institutes of Health Research (CIHR), and AllerGen NCE have enabled collaborations with scientists from leading Canadian research universities such as the University of British Columbia, McGill and McMaster Universities, as well as other institutions in the United States, Belgium and South Africa. These relationships have been beneficial to all involved and have enabled the teams to compare the immune systems of children and adults in different environments.

Drs Kollmann and Turvey both feel that the main goal of this study is the advancement of knowledge and research that

researchers from across the country and around world to collaborate. He stated that, "bringing people together is the ultimate success story." AllerGen NCE has also enabled him to work in fields that he may not have had access to in the past. "I've learned that bringing together people with different skill sets allows them to do a much better job and allows us to ask questions that I wouldn't even have thought existed because I didn't know about them. We understand little about how the body works, but with new computer models, the workings of the immune system are becoming clearer." He emphasizes that, "the more you can invest in research, the better the outcome for everybody, even if not immediate. In the long-term, research can result in new products, tools and services as well as generate improvements to health, quality of life and productivity that benefit the entire society." 