
AllerGen
Innovation from cell to society
2014.2015
NCE RCE
Networks of Centres of Excellence of Canada
Réseaux de centres d'excellence du Canada

AllerGen NCE Inc. is hosted at McMaster University, Hamilton, Ontario, Canada.

AllerGen NCE Inc. is supported by the Government of Canada through the Networks of Centres of Excellence (NCE) program.

Created in 1989, the NCE program is a joint initiative of the Natural Sciences and Engineering Research Council, the Social Sciences and Humanities Research Council, the Canadian Institutes of Health Research, and Industry Canada.

AllerGen NCE Inc.
McMaster University
Michael G. DeGroote Centre for Learning
1280 Main Street West, Room 3120
Hamilton, ON L8S 4K1

Telephone: (905) 525-9140 ext. 26502
Fax: (905) 524-0611
E-mail: info@allergen-nce.ca
web: allergen-nce.ca

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Aussi disponible en français

Throughout 2014-2015, AllerGen accelerated its research productivity, publication rates, knowledge mobilization and commercialization activities, generating global interest in the Network's research results among stakeholders across sectors.

Corporate Profile

AllerGen NCE Inc. (AllerGen), the Allergy, Genes and Environment Network, is a national research network that aims to reduce the morbidity, mortality and socioeconomic impacts of allergy, asthma, anaphylaxis and related immune diseases.

AllerGen was established in 2004 by Industry Canada through the Networks of Centres of Excellence (NCE) Program to help Canadians address the challenges of living with asthma and allergic disease.

Led by internationally recognized Canadian researchers with expertise across 50 disciplines, AllerGen's research projects and strategic initiatives employ cross-sectoral, multidisciplinary approaches to accelerate the development of new diagnostic tests, better medications, accessible patient education tools and effective public policies relevant to allergic disease.

In 2014-2015, AllerGen received $4,216,500 in funding from the NCE program. Through strong partnerships, AllerGen secured additional funding from other sources to achieve an annual NCE leveraging ratio of 1:2.17.

Throughout the year, AllerGen engaged 95 Network investigators and collaborated with 133 partner organizations across academia, industry, not-for-profit and government sectors. The Network also trained 353 students, research staff, trainees and new professionals, seeding the next generation of researchers, innovators and clinician-scientists.

2014-2015 At-a-Glance

353 Trainees, young professionals, research associates and technicians

133 Partner organizations across academia, industry, not-for-profit and government sectors

123 Full-time equivalent Network participants

95 Network investigators

38 Active research projects and strategic initiatives

AllerGen's Vision

To create an enduring network of allergy and immune disease experts whose discovery and development efforts contribute to reducing the impact of allergic and related immune diseases nationally and globally.

AllerGen's Mission

To catalyze and support discovery, development, networking, capacity building, commercialization and knowledge translation to reduce the morbidity, mortality and socioeconomic burden of allergy, asthma and anaphylaxis for the benefit of Canadians and the global community.

Message from the Board Chair and Scientific Director

Throughout 2014-2015, AllerGen accelerated its research productivity, publication rates, knowledge mobilization and commercialization activities, generating global interest in the Network's research results among stakeholders across sectors.

The Canadian Healthy Infant Longitudinal Development (CHILD) Study has emerged as a valuable resource and model emulated by birth cohort planners around the world. In 2014, CHILD Study researchers published evidence that traffic-related air pollution (TRAP) increases the risk of children becoming sensitized to inhalant and food allergens at one year of age; identified differences in babies' intestinal bacteria that can help predict future development of food allergies and asthma; and assessed indoor and outdoor environmental exposures for 3,217 Canadian babies—an unprecedented accomplishment for any birth cohort.

The AllerGen Clinical Investigator Collaborative (CIC)—a world leader in Phase II clinical trials for asthma and allergic disease—published groundbreaking findings in the *New England Journal of Medicine* and *Science Translational Medicine* that open the door to developing new antibody treatments for people living with asthma.

Also in 2014, Canadian Food Allergy Strategic Team (CanFAST) researchers published the first-ever data estimating the prevalence of food allergy among vulnerable Canadians from low-income, immigrant and Aboriginal populations. This research has vastly improved the characterization of the prevalence and experience of food allergy in Canada, and gives patients, their families, healthcare professionals and policymakers a broader understanding of the health, social and economic burdens of food allergy in this country.

AllerGen investigators in the Gene-Environment Interactions, Biomarkers and Bioinformatics, and Patients, Policy and Public Health Enabling Platforms have generated critical early-life exposure data on epigenetics, maternal/family stress, chemicals and TRAP, which accelerated and enhanced CHILD Study analyses and positioned Canadian investigators for successful grant applications, such as CIHR's Environment and Health Signature Initiative and Developmental Origins of Health and Disease (DOHaD) program. Working in crossdisciplinary and international teams, these scientists have also generated decision-support data and tools to inform personalized health recommendations and interventions used by individuals, health professionals and policymakers.

AllerGen's HQP program is one of the Network's most impactful and immediately transformational accomplishments. Trainees are seizing the full range of the Network's scientific and "soft skills" development programs to augment their academic training: attending conferences globally, participating in international research exchanges, presenting research posters to, and interacting with, patients, clinicians, and professionals in industry and government. As a result, AllerGen trainees are securing high-value jobs within Canada's knowledge economy; in 2014-2015 alone, 33 trainees found jobs across sectors in academia, industry/the private sector, government, and healthcare.

The Network's knowledge mobilization (KMb) strategies continue to respond to "pull" from our stakeholders through an integrated KMb approach to the design of research projects and strategic initiatives. AllerGen is also leveraging key partner-

ships to disseminate research findings through partner organization "hubs," including Health Canada, Environment Canada, Anaphylaxis Canada, the Asthma Society of Canada, the Canadian Society of Allergy and Clinical Immunology, and national media outlets such as *Allergic Living*.

AllerGen maintains enduring relationships with priority partners, both in Canada and abroad, who are helping us to achieve the Network's legacy goals to 2019 and beyond. This year, AllerGen established new international Memoranda of Understanding with Changzhou University (China) and Stanford University (USA) to allow collaborative research and scientific activities, student exchanges and training.

We would like to thank AllerGen's Board of Directors, Research Management Committee and advisory committee members for their ongoing contributions of time and expertise, which ensure the success of AllerGen and enable its many achievements.

In particular, we wish to thank Dr. Douglas Barber, who retired from AllerGen's Board of Directors in November 2014, for his valuable contributions over 10 years of service. A founding member of AllerGen's Board of Directors, Dr. Barber has provided AllerGen, and Canadians, with a decade of commitment, expertise and service towards reducing the morbidity, mortality and socio-economic impact of allergic disease.

We are also delighted to welcome Dr. Pieter Cullis (Professor of Biochemistry and Molecular Biology, The University of British Columbia) and Donald Green (Chair & CEO, Greenfleet Ltd.) to the AllerGen Board of Directors. They will contribute to AllerGen's strategic impacts in the areas of personalized medicine and commercialization, respectively.

Finally, we extend our sincere thanks to the entire AllerGen community of researchers, trainees, national and global collaborators, stakeholder organizations, research partners and healthcare providers. This year's accomplishments are a testament to their ongoing commitment and contributions to the achievement of our NCE mandate and mission.

Dr. Howard Bergman, MD, FCFP, FRCPC
Chair,
AllerGen Board of Directors,
AllerGen NCE Inc.

Dr. Judah Denburg, MD, FRCP(C)
Scientific Director and CEO,
AllerGen NCE Inc.

During the Pan Am and Parapan Am Games in July and August 2015, the research team placed *AirSENCE* monitors around Toronto and displayed the results in an interactive map on their AirSensors website.

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2014-2015 Impacts

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"Being able to accurately measure and map air pollution in real time has interesting implications for individuals, communities and policymakers," adds Dr. Brook, who is also a Senior Research Scientist at Environment Canada.

Air pollution sensors piloted during Pan Am Games

A new device developed by an AllerGen research team at the University of Toronto (U of T) helped athletes, visitors and local residents monitor their exposure to air pollution during the Toronto 2015 Pan Am and Parapan Am Games.

AirSENCE (Air SENsor for Chemicals in the Environment) is a sensing device that measures the air quality health index (AQHI) and estimates concentrations of a number of harmful air pollutants in real time.

AirSENCE was co-developed by AllerGen investigators Dr. Greg Evans, a chemical engineering professor, Dr. Jeffrey Brook, an adjunct professor in the Dalla Lana School of Public Health, and PhD student and AllerGen trainee Natalia Mykhaylova.

During the Pan Am and Parapan Am Games in July and August 2015, the research team placed *AirSENCE* monitors around Toronto and displayed the results in an interactive map on their AirSensors website. "Website visitors could click on locations to see hourly AQHI readings and the concentrations of key air pollutants over the previous three days," says Dr. Evans. "Clicking on multiple sites allowed comparisons across locations close to Pan Am venues."

The tool also allowed users to compare *AirSENCE* data to air quality readings from the Ontario Ministry of Environment and Climate Change, and from the Southern Ontario Centre for Atmospheric Aerosol Research (SOCAAR).

"*AirSENCE* devices use an array of 14 sensors to estimate concentrations of five air pollutants: nitrogen oxides, ozone, particulate matter, carbon monoxide and carbon dioxide," explains Dr. Evans. "This helped residents and visitors at the 2015 Games—especially those with allergies, asthma or other respiratory conditions—to gauge air quality and to plan the timing and location of their activities."

Drs Evans and Brook began developing the *AirSENCE* prototype in 2012, as part of the AllerGen-funded project *Better Exposure Avoidance Measures* (BEAM). The monitor is less expensive and more portable than most commercially available alternatives. By mounting the device outdoors, placing it in homes, or even carrying a handheld version, individuals can obtain information on pollution levels at specific locations.

"In 2016, we will launch *AirSENCE* devices in Beijing and compare the readings to Canadian

cities," says Dr. Evans. "Ultimately, we believe that *AirSENCE* will enable users worldwide to measure their personal exposure to outdoor or indoor air pollutants, and to identify and avoid areas where pollution levels are dangerously high."

"Being able to accurately measure and map air pollution in real time has interesting implications for individuals, communities and policymakers," adds Dr. Brook, who is also a Senior Research Scientist at Environment Canada. "From the zoning of new schools, daycare centres and retirement homes to decisions about where to purchase a home, this information is critical to reduce both the risk of exacerbations of pre-existing health conditions, like asthma, and of development of chronic disease through long-term exposure."

Exposure assessment for 3,200 Canadian babies improves capacity to link early-life environment to health

Researchers from the Canadian Healthy Infant Longitudinal Development (CHILD) Study have assessed indoor and outdoor environmental exposures for 3,217 Canadian babies—an unprecedented accomplishment for any birth cohort.

The CHILD Study is examining how a child's environment during pregnancy and in the first years of life interacts with genetics to affect the risk of developing allergies, asthma, type 2 diabetes and other chronic diseases.

As part of the Study, investigators carefully inspected over 3,200 babies' homes, analyzing exposure to dust, mould, furry pets, chemicals, cleaning products, cooking emissions, second-hand smoke and traffic-related air pollution.

No other study has sampled the home environment of so many participants in such detail, and with the ability to learn about epigenetic changes and the potential role of the microbiome in health and disease.

A paper in the March 2015 *Journal of Exposure Science and Environmental Epidemiology* outlines which environmental factors were measured and how, and the ways the data might be analyzed further to link exposures to health outcomes from infancy to age five.

The paper provides an initial look at the exposure characteristics of the CHILD Study cohort across four Canadian sites. Among many observations, it found that: 57% of participant families in Edmonton own furry pets versus 40% in Toronto; 32% in Toronto cook with a gas stove compared to 4% in Manitoba; 34% in Vancouver use spray air freshener versus 59% in Manitoba; and 22% of Manitoba CHILD Study mothers are exposed to dust, fumes or chemicals on their skin during the prenatal period, either from work or hobbies.

"Asthma is the most common chronic childhood disease and many cases may be preventable," says Dr. Tim Takaro, a professor at Simon Fraser University and the paper's lead author. "The CHILD Study is helping us to gain a better understanding of the link between environment and health, which may help us to intervene early in life to prevent asthma from occurring."

The CHILD Study—which is both broad in its assessment of risk, and longitudinal, measuring both pre- and post-natal environmental exposures at multiple time points—provides insight into the role of critical "windows" of exposure in relation to immunological, physiological and microbiome development.

"The Study's size and the rigour with which we assess exposures will increase our capacity to detect associations between environmental factors and health outcomes," says Dr. Takaro. "We expect it will offer considerable improvement over many other birth cohort studies in assessing the complex contribution of the mother's and baby's environment to the development of allergy, asthma, and other chronic diseases."

Allergy and Asthma Portal opens "digital doors" to the global research community

AllerGen's *Allergy and Asthma Portal* (AAP), launched in September 2014, is the world's most comprehensive database of the genes, proteins, biomolecular interactions and pathways associated with immunity and allergic disease.

The first resource of its kind, the AAP helps scientists understand how allergy, asthma and other immune diseases develop, and, ultimately, how to treat and prevent them.

The AAP is built upon *InnateDB*, an AllerGen-enabled database that catalogues the network of all known molecular interactions involved in the innate immune response of humans, mice and bovines. The AAP integrates an additional 900 allergy and asthma interactions gleaned from the scientific literature and AllerGen research to produce a highly sophisticated database specifically geared to the study of allergy and asthma.

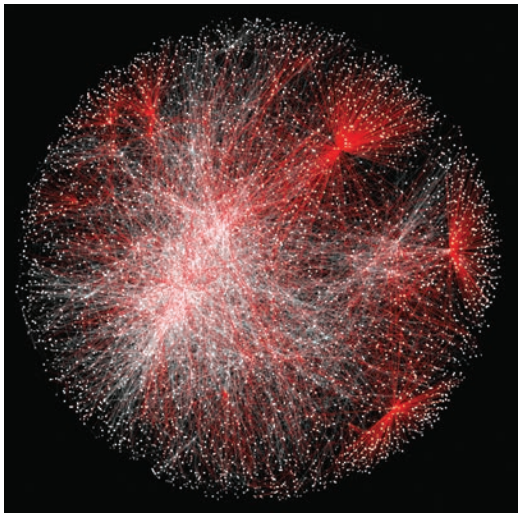
Both *InnateDB* and the AAP were developed with AllerGen support by Network investigator Dr. Fiona Brinkman, a professor in the Department of Molecular Biology and Biochemistry at Simon Fraser University. Dr. Brinkman is an expert in bioinformatics—the use of computers to gather, store, analyze and integrate biological and genetic information, which can then be used to study how diseases develop.

Most previously established databases consider molecules and molecular pathways in isolation, rather than as part of a system. The AAP is unique because it catalogues the genes and proteins involved in allergy and asthma, as well as all of their known interactions and connections to other molecules.

"The AAP can help researchers go beyond therapeutic target discovery," says Dr. Brinkman. "For example, the portal's unique visualization tools allow researchers to quickly see things like molecular 'hubs' in an immune response, which may help tease out the molecular interactions that predict a more severe allergic response or shed light on which groups of patients are more likely to respond to an allergy or asthma therapy, and which ones may need closer follow-up."

Researchers using the AAP's parent database, *InnateDB*, have already made a molecular discovery that led to a new medication, currently undergoing clinical trials, for patients suffering from a severe malaria-induced inflammatory disease—illustrating the potential of the AAP to enable similar advances in the field of asthma and allergy.

Dr. Brinkman has her sights set on expanding the AAP beyond the molecular level. "AllerGen researchers have rich clinical and epidemiological data regarding other key players in the development of allergy and asthma, such as microbes in people's bodies, and environmental data about where people live in relation to pollution sources," she points out. "We are assessing this data to see how we can use it to expand and enrich the AAP even further."



***InnateDB*: Expanding the network of known molecular interactions (white) with those more relevant to allergy and asthma (red).**

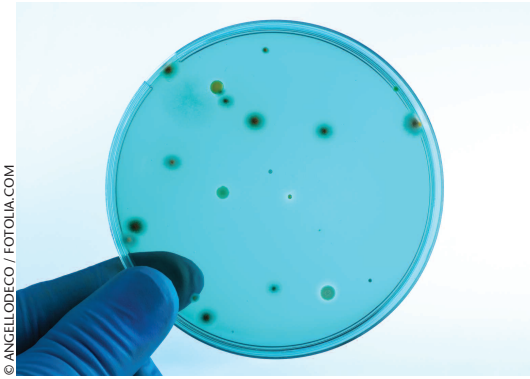
As the AAP maps out more complicated interrelationships, it will become an even more valuable research, discovery and development tool. "Such a powerful tool is crucial, considering its potential for bringing us closer to a true understanding of what allergy and asthma are—and potentially uncovering novel ways in which these conditions can be avoided or controlled," says Dr. Brinkman.

AllerGen maintains enduring relationships with priority partners, both in Canada and abroad, who are helping us to achieve the Network's legacy goals to 2019 and beyond.

AllerGen's Integrated Research Program

AllerGen represents Canada's largest commitment to date to address the social, economic and health impacts of allergies, asthma and allergic disease.

Led by internationally recognized Canadian researchers with expertise across a wide range of disciplines, the Network's 38 active research projects and strategic initiatives aim to map a coordinated response to reduce the morbidity, mortality and socioeconomic costs of these illnesses.



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Through strong partnerships, AllerGen leveraged its research investments to generate an additional $9.1 million in cash and in-kind support from partner and stakeholder organizations over the year—a leveraging ratio of 1:2.17.

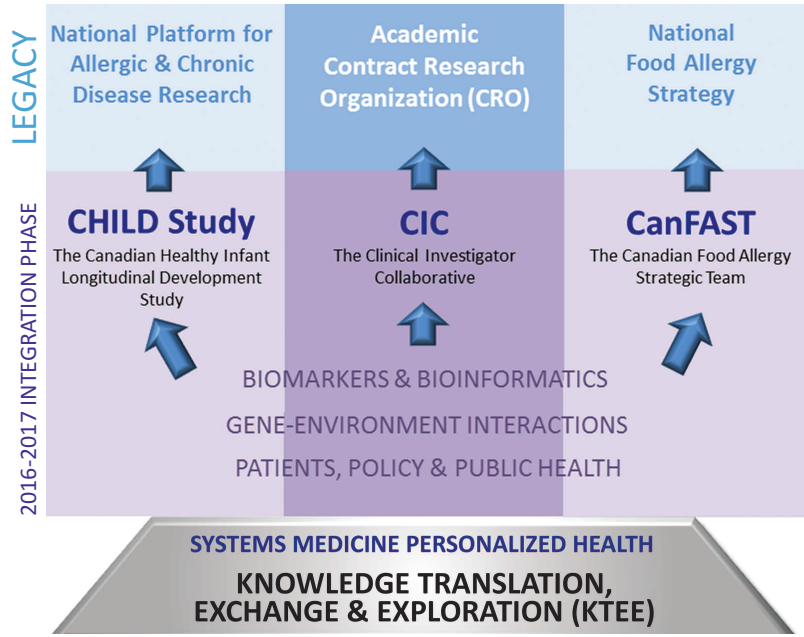
AllerGen's Integrated Research Strategy

Three Legacy Projects:

- The Canadian Healthy Infant Longitudinal Development (CHILD) Study;
- The Clinical Investigator Collaborative (CIC); and
- The Canadian Food Allergy Strategic Team (CanFAST).

Three Enabling Platforms:

- Gene-Environment Interactions;
- Biomarkers and Bioinformatics; and
- Patients, Policy and Public Health.



Malcolm Sears, MB

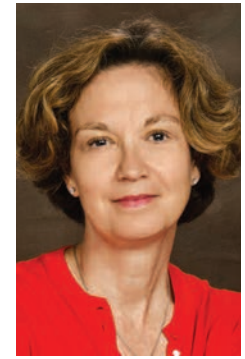
Padmaja Subbarao, MD

Paul O'Byrne, MD
CIC-Allergic Asthma

Parameswaran Nair, MD, PhD
CIC-Severe Asthma

Anne Ellis, MD, M.Sc.
CIC-Allergic Rhinitis

Jean Marshall, PhD



Ann Clarke, MD, M.Sc.

The Canadian Healthy Infant Longitudinal Development (CHILD) Study

Research Leaders:

Dr. Malcolm Sears, Professor, Division of Respirology, Department of Medicine, McMaster University

Dr. Padmaja Subbarao, Staff Respirologist, The Hospital for Sick Children; Assistant Professor, Department of Paediatrics, University of Toronto

Strategic Focus:

- a unique birth cohort study following over 3,300 Canadian children and their families from pre-birth to age five
- involves over 40 investigators from 30 disciplines
- collects immunological, physiological and genetic data; dietary, housing and socioeconomic information
- through national and international collaborations, the CHILD Study facilitates groundbreaking discoveries about the early-life origins of allergy, asthma and other chronic, non-communicable diseases (NCDs)

The Clinical Investigator Collaborative (CIC)

Research Leaders:

Dr. Paul O'Byrne, Professor and Chair, Department of Medicine, McMaster University

Dr. Parameswaran Nair, Canada Research Chair and Professor of Medicine, Division of Respirology, McMaster University

Dr. Anne Ellis, Associate Professor and Chair, Division of Allergy and Immunology, Department of Medicine, Queen's University

Strategic Focus:

- a multi-centre, Canadian-based Phase II clinical trials group
- helps pharmaceutical and biotechnology companies to evaluate new asthma therapies in their product pipeline and identify the most promising molecules for further development
- supports start-up Canadian biotechnology companies, providing business and commercialization insights on which to base future investment decisions

The Canadian Food Allergy Strategic Team (CanFAST)

Research Leaders:

Dr. Jean Marshall, Professor and Head, Microbiology and Immunology, Dalhousie University

Dr. Ann Clarke, Professor, Division of Rheumatology, Department of Medicine, University of Calgary; The Arthritis Society Chair in Rheumatic Diseases

Strategic Focus:

- a highly innovative, nationally networked research team studying food allergy and anaphylaxis
- contributes to our understanding of the origins, causes, prevalence and treatment of food allergy
- forms the foundation of a cross-sectoral team working to establish a National Food Allergy Strategy (NFASt) that will prioritize "bundling" and disseminating the best evidence on diagnosis, treatment, and management of food allergy and anaphylaxis to meet the needs of patients and policymakers


Andrew Sandford, PhD


Jeffrey Brook, PhD


Kelly McNagny, PhD


Dean Befus, PhD


John Gordon, PhD


Allan Becker, MD


Susan Elliott, PhD

Gene-Environment Interactions

Research Leaders:

Dr. Andrew Sandford,
Associate Professor,
Department of Medicine,
The University of British Columbia

Dr. Jeffrey Brook,
Senior Scientist,
Air Quality Research Branch,
Environment Canada; Assistant Professor,
Division of Occupational & Environmental Health, Dalla Lana School of Public Health,
University of Toronto

Strategic Focus:

- a collection of national and international teams focused on genetic, environmental and epigenetic research that promotes advancements in personalized health
- generates critical early-life exposure data on epigenetics, maternal/family stress, chemicals and traffic-related air pollution
- aims to discover novel therapies and diagnostics, and facilitate the development of public health interventions and policies relevant to asthma and allergies

Biomarkers and Bioinformatics

Research Leaders:

Dr. Kelly McNagny, Professor,
Department of Medical Genetics,
Co-Director, The Biomedical Research Centre, The University of British Columbia

Dr. Dean Befus, Professor,
Division of Pulmonary Medicine,
Department of Medicine,
University of Alberta

Dr. John Gordon, Professor,
Division of Respirology, Critical Care & Sleep Medicine, Department of Medicine,
University of Saskatchewan

Strategic Focus:

- an integrated, world-leading systems-biology approach to the discovery, development and commercialization of diagnostic tests and treatments for asthma and allergies
- focuses on predicting disease susceptibility, enabling early diagnosis, discriminating disease sub-types, monitoring disease prevention and drug response, and identifying novel therapeutic targets
- integrates bioinformatics and data to facilitate advanced studies of allergic disease

Patients, Policy and Public Health

Research Leaders:

Dr. Allan Becker, Professor and Head,
Section of Allergy and Clinical Immunology,
Department of Pediatrics & Child Health,
University of Manitoba

Dr. Susan Elliott, Professor,
Department of Geography and Environmental Management,
University of Waterloo

Strategic Focus:

- a platform integrating interdisciplinary expertise to focus on the translation of AllerGen research that has policy, ethical, legal and/or social implications
- focuses on knowledge translation and knowledge mobilization to leverage the Network's research expertise to generate new policies, practices, products and services
- aims to inform public policy, public health practices, patient and health professional outreach, and educational disease management tools

"We found that anaphylaxis accounted for a substantial number of ED visits, the most common trigger was food, and there is non-adherence to guidelines recommending epinephrine use for all cases of anaphylaxis."

Research Highlights

New C-CARE findings on anaphylaxis

Almost half the adults seen in an emergency department (ED) for an anaphylactic reaction are not given epinephrine in or outside of the hospital, according to 2014 findings from AllerGen's Cross-Canada Anaphylaxis REgistry (C-CARE) project.

"Our study tracked adult ED visits for anaphylaxis at a Montreal hospital over a one-year period," says Dr. Moshe Ben-Shoshan, a pediatric allergist at Montreal Children's Hospital and lead investigator for C-CARE. "We found that anaphylaxis accounted for a substantial number of ED visits, the most common trigger was food, and there is non-adherence to guidelines recommending epinephrine use for all cases of anaphylaxis."

The study's findings were published in the *International Archives of Allergy and Immunology* in August 2014. Of roughly 37,000 ED visits, 0.26% fulfilled the definition of anaphylaxis. Food was the suspected trigger for over 60% of these anaphylactic reactions, with shellfish being the most common trigger (12.9% of all food-triggered reactions). "In contrast, a C-CARE study conducted in a pediatric ED found that peanut is the major food trigger in children," says Dr. Ben-Shoshan.

Almost 40% of the adult anaphylactic reactions occurred outside the home and almost half of those in restaurants. "A troubling finding is that epinephrine was not administered in almost half of moderate-to-severe anaphylaxis cases," adds dermatologist Dr.Yuka Asai, an AllerGen trainee and first author of the paper. "Our results reveal poor adherence to guidelines stipulating the use of epinephrine for anaphylaxis. We believe that this may be related to concerns about the side effects of epinephrine in adults."

In another C-CARE study published in February 2015, researchers found that the annual incidence of recurrent anaphylaxis in children was 29%. "That rate is higher than previously reported in retrospective studies," says Dr. Andrew O'Keefe, an allergist from St. John's, Newfoundland.

"This study highlights that, once diagnosed, children with allergies and their families need to remain vigilant," he says. "Patients, parents, and families should work with their healthcare providers to ensure that they understand the appropriate use of, and technique to administer, their epinephrine auto-injector in case of an anaphylactic reaction."

CIC discoveries offer hope for patients with asthma

Breakthrough findings from AllerGen's Clinical Investigator Collaborative (CIC)—a multicentre clinical trials consortium—provide new hope for people living with asthma.

In May 2014, CIC researchers discovered that an antibody can block a specific protein in the lungs and reduce the symptoms of inflammation and bronchoconstriction experienced by those with mild allergic asthma.

The study, published in the *New England Journal of Medicine* (May 2014), was conducted at five CIC sites across the country and involved AllerGen Network researchers Drs Gail Gauvreau and Paul O'Byrne (McMaster University), Louis-Philippe Boulet (Laval University), Donald Cockcroft and Beth Davis (University of Saskatchewan), Mark FitzGerald (The University of British Columbia), and Richard Leigh (University of Calgary).

Epithelial cells in the lungs' airways produce a protein called thymic stromal lymphopoietin (TSLP) that causes inflammation. This study proved for the first time that airways continually produce TSLP in humans with asthma, and that blocking

TSLP with an antibody can reduce the symptoms triggered by environmental allergens.

"While we studied patients with allergic asthma, this research opens the door to developing new antibody treatments not only for this population, but for those diagnosed with severe asthma as well," says Dr. O'Byrne, CIC research leader and Chair of the Department of Medicine at McMaster University.

In July 2014, the CIC further demonstrated that a new Genentech drug (quilizumab) successfully reduces the production of an immune system protein, reducing the symptoms of allergic asthma.

Quilizumab is a monoclonal antibody that targets a receptor on immature blood cells to block the production of immunoglobulin E (IgE), a key protein involved in the allergic response. While other drugs bind to circulating IgE, quilizumab was developed to deplete the cells responsible for IgE production, according to Dr. Gauvreau, lead author of the study.

"The reduction of IgE in the blood was sustained for at least six months after the last dose of quilizumab, suggesting a long-lasting effect on IgE production," says Dr. Gauvreau. "These findings may have implications for patients with severe asthma or other diseases which are caused by high levels of circulating IgE."

The Phase II study was conducted over a two-year period at six Canadian universities and one international site, and published in the July 2, 2014, issue of *Science Translational Medicine*.

Diesel exhaust affects genes within hours

Just two hours of exposure to diesel exhaust can cause genetic changes in patients with asthma, according to research from AllerGen investigators at The University of British Columbia (UBC).

The study, published in *Particle and Fibre Toxicology* in December 2014, found that inhaling diesel exhaust fumes affected the chemical coating of certain genes involved in allergic disease—a process called methylation, which can alter a gene's function without affecting the underlying DNA.

Drs Christopher Carlsten (Associate Professor of Medicine, Canada Research Chair in Occupational and Environmental Lung Disease) and Michael Kobor (Professor of Medical Genetics, Canada Research Chair in Social Epigenetics) conducted the research, adding to their growing body of work on the relationship between exposure to diesel exhaust and asthma. AllerGen trainees Drs Meaghan Jones and Francesco Sava, and Ruiwei Jiang—the paper's first author—were also on the research team.

As part of the study, 16 adults with asthma were placed in an enclosed booth at UBC's Air Pollution Exposure Laboratory (APEL) and asked to ride an exercise bike intermittently over two hours. While they rode, they were exposed to either diluted diesel exhaust—air quality similar to that of a highly polluted city or an underground mine—or filtered, clean air.

"We found that within a matter of hours, exposure to diesel exhaust caused changes to DNA that may have long-term implications," says Dr. Carlsten.

Epigenetics research has shown that, while genes map out the blueprint of how we develop, genes can be modified—switched on or off, dialled up or down—by environmental factors. Exposure to diesel exhaust, the study found, is one such factor.

With the team's discovery that genetic changes are triggered within hours after exposure, come the inevitable questions: "How do these changes impact health?" and "Can we reverse these changes or prevent them from occurring?"

Answering these questions is an important next step, according to the researchers. "Over an

individual's lifetime, an accumulation of short-term epigenetic changes can lead to long-term diseases associated with air pollution," adds Dr. Carlsten. "By understanding these acute dynamics, we hope to gain insight into longer-term consequences and potential preventive measures."

The study's findings were reported extensively by North American media—including *Global News, The Globe and Mail, The Vancouver Sun, The Huffington Post, Science Daily* and *Radio Canada International*—as well as by international outlets.

CHILD Study sheds new light on factors that cause children to develop allergies

The Canadian Healthy Infant Longitudinal Development (CHILD) Study birth cohort has shed new light on the factors that cause children to develop allergies.

A study led by AllerGen investigator Dr. Michael Brauer and published in *Environmental Health Perspectives* (March 2015), showed that exposure to outdoor air pollution during the first year of life increases the risk of developing allergies to food, mould, pets and pests.

"With allergy rates increasing among children in Canada and elsewhere, we were interested in

determining if traffic-related air pollution (TRAP) might be partially responsible," says Dr. Brauer, a professor in the School of Population and Public Health at The University of British Columbia. "This is the first study to find a link between air pollution and measured allergic sensitization during the first year."

The researchers collected data from 2,477 children participating in the CHILD Study who were tested at one year of age for sensitivity to common allergens, including cat, dog, dust mite, cockroach, fungus, milk, egg, soy and peanut. TRAP exposure was assessed by modelling nitrogen dioxide (NO_2) levels at each child's home address. Individual exposures were estimated by incorporating changes in air pollution concentrations over time and space, and evaluating the time each child spent away from home, including at daycare.

"We also found that children who attended day-care or who had older siblings were less likely to develop allergic sensitization, suggesting that exposure to other children can be protective," says AllerGen trainee Dr. Hind Sbihi, the study's first author.

In a separate study published as the "Editor's Choice" in *Clinical & Experimental Allergy* (February 2015), CHILD Study researchers identified differences in babies' intestinal bacteria that can help predict future development of food allergies and asthma.

The study found that infants with lower bacterial diversity and an elevated ratio of certain gut bacteria at three months are more likely to become sensitized to foods such as milk, egg or peanut by one year of age.

Senior authors and AllerGen investigators Dr. Anita Kozyrskyj (University of Alberta), and Dr. James Scott (University of Toronto), note that gut bacterial patterns during infancy may serve as biomarkers for future disease. "At the end of the day, we want to know if infants who show changes to normal gut bacteria composition will go on to develop food or other allergies, or even asthma," says Dr. Kozyrskyj.

Dr. Meghan Azad of the University of Manitoba, the study's first author, believes that the research could eventually help doctors and parents prevent the onset of illness. "Ultimately, we hope to develop new ways of preventing or treating allergies by modifying the gut microbiota," says Dr. Azad.

National survey finds fewer food allergies among Canadians with low education and new immigrants

New AllerGen research provides a picture of the food allergy landscape in Canada that is more complete than ever before. In September 2014, AllerGen investigators published results of the first nationwide survey to estimate the prevalence of food allergy among vulnerable Canadians, including those with low income, those with low education, new Canadians and individuals of Aboriginal identity.

Data from the study, *Surveying Prevalence of Food Allergy in All Canadian Environments* (SPAACE), was published in the *Journal of Allergy and Clinical Immunology: In Practice*. The study surveyed 5,734 Canadian households—representing over 15,000 individuals—and concluded that Canadians with lower education and new Canadians (individuals who immigrated to Canada within the previous 10 years) have fewer food allergies than the general population.

The research was conducted by a team of AllerGen investigators led by Dr. Ann Clarke, a professor in the Department of Medicine at the University of Calgary, and Dr. Susan Elliott, a professor in the

Department of Geography and Environmental Management at the University of Waterloo.

The reasons for the lower prevalence of food allergy among vulnerable Canadians are not clear; at play are a range of factors that the authors believe require further research.

In a subsequent March 2015 publication, SPAACE researchers adjusted the vulnerable population data to provide an estimate of food allergy prevalence for the general Canadian population. They reported overall food allergy prevalence to be 7.5% for all ages, 7.7% for adults and 6.9% for children under 18 years of age.

The SPAACE study's findings also revealed under-use of epinephrine auto-injectors (EAI) in Canada. Less than half of those surveyed with a diagnosed food allergy—particularly in households with lower educational levels—reported having an EAI prescription, and almost half of those prescribed the device do not carry it.

These findings will help researchers to identify and address gaps in education, healthcare and public policy, and to ensure equal opportunity for all Canadians to receive appropriate care related to food allergies.

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Dr. Lianne Soller, an AllerGen trainee and first author of the study, says the research "enables us not only to better characterize the prevalence and experience of food allergy in Canada, but also to understand how the environment may influence its development."

AllerGen continues to leverage its strong international partnerships to deliver new therapeutics, clinical guidelines, research, programs, and knowledge to diverse global audiences. These partnerships enrich training and skill acquisition opportunities for Network students, new professionals and researchers.

Network Partners, Collaborators and Knowledge Users

The impact of AllerGen's research is bolstered by the strength of the Network's relationships with partner organizations, research collaborators and knowledge users, both in Canada and abroad. These stakeholders play an integral role in shaping and enhancing research outcomes, and in facilitating the mobilization and commercialization of Network technologies, products and services.

In 2014-2015, AllerGen worked with 133 partners, engaging an average of 3.5 partners per research project.

2014-2015 Partners List (n=133)

Universities (n=34)
(19 Canadian, 15 International)

Changzhou University
Charité-Universitätsmedizin Berlin
Dalhousie University
Harvard University
Karolinska Institute
Lakehead University
McGill University
McMaster University
Memorial University of Newfoundland
Northwestern University
Queen's University
Simon Fraser University
Southern Methodist University
Sean N. Parker Center for Allergy & Asthma Research—Stanford University
The University of British Columbia
The University of Newcastle
The University of Queensland
The University of Western Australia
Université de Montréal
Université du Québec à Chicoutimi
Université Laval
University of Alberta
University of Calgary
University of Copenhagen
University of Groningen
University of Manitoba
University of Nebraska
University of Ottawa
University of Saskatchewan
University of Toronto
University of Waterloo
University of Wisconsin
Utrecht University
Western University

Hospitals and Health Centres (n=11)

Centre Hospitalier universitaire (CHU) Saint-Justine, Montreal
Hôpital du Sacré-Cœur de Montréal, Montreal
Hospital Nacional General de Neumologia y Medicina Familiar "Dr. Antonio Saldaña," San Salvador, El Salvador
Institut universitaire de cardiologie et de pneumologie de Québec (IUCPQ), Quebec City
IWK Health Centre, Halifax
Kingston General Hospital, Kingston
Montreal Children's Hospital, Montreal
St. Joseph's Healthcare Hamilton
St. Michael's Hospital, Toronto
The Hospital for Sick Children, Toronto
The McGill University Health Centre, Montreal

Industry (n=34)
(32 Canadian, 2 International)

Adiga Life Sciences Inc.
AIM Therapeutics Inc.
ArrowCan Partners Inc.
AstraZeneca Canada Inc.
Axikin Pharmaceuticals Inc., USA
Boehringer-Ingelheim
Carr-Gordon Limited
CHENOMX Inc.
CTI Life Sciences Fund
David Brener & Associates Inc.

Deborah Danoff Consulting
Greenfleet Ltd.
Kanata Allergy Services Ltd.
Kincora Innovation
Leap Learning Technology Inc.
Lincoln Diagnostics Inc./ALK, USA
Lumira Capital
Mark Bisby Consulting
McDonald's Restaurants of Canada Limited
Merck Canada Inc.
Norlien Foundation
Northtaste Flavourings Ltd.
Novartis Pharmaceuticals Canada Inc.
Pfizer Canada Inc.
Pro-Bio Associates
Roche Canada
Sanhueza & Associates Inc.
Sanofi Pasteur Ltd.
Shoppers Drug Mart Corporation
Sylviane Duval Consulting
TEC Edmonton
Teva Pharmaceutical Industries Ltd.
Trudell Medical International
TVM Capital

Federal Agencies (n=6)
Canadian Institutes of Health Research
Chemical Management Plan (Health Canada)
Environment Canada
Health Canada – Food Directorate
Natural Sciences and Engineering Research Council of Canada
Office of the Privacy Commissioner of Canada

Provincial Agencies (n=8)
Alberta Health Services
Fonds de recherche du Québec
Healthy Child Manitoba
Michael Smith Foundation for Health Research
Ontario Ministry of Health and Long-Term Care
Province of Nova Scotia
Public Health Ontario
Research Manitoba

Non-Profit, Networks and Professional Associations (n=34)
Allergy/Asthma Information Association (AAIA)
American Academy of Allergy, Asthma & Immunology (AAAAI)
Anaphylaxis Canada
Association Québécoise des Allergies Alimentaires (AQAA)
Asthma Society of Canada
British Columbia Lung Association
Canadian Allergy, Asthma and Immunology Foundation (CAAIF)
Canadian Anaphylaxis Initiative
Canadian Institute for Health Information
Canadian Lung Association/Canadian Thoracic Society
Canadian Perinatal Network
Canadian Respiratory Research Network
Canadian Society of Allergy and Clinical Immunology (CSACI)
Cancer Stem Cell Consortium
Centre for Drug Research and Development (CDRD)
Centre of Excellence for Prevention of Organ Failure (PROOF)
Chanchlani Research Centre
Childhood Asthma Foundation
Compute Canada
Dairy Farmers of Canada
Dietitians of Canada
Family Physician Airways Group of Canada
Grand Challenges Canada
JP Bickell Foundation
Mitacs
National Institutes of Health, USA
Ontario Lung Association
Quebec Lung Association
Réseau Québécois de l'asthme et de la MPOC
Stem Cell Network
The Banff Centre for Continuing Education
The DeGroote Family Foundation – William J. Walsh Professorship in Medicine
The Hospital for Sick Children – SickKids Foundation
The Sandbox Project

Research Institutes (n=6)
Alberta Centre for Child, Family and Community Research
Centre de recherche du Centre hospitalier de l'Université de Montréal (CHUM)
Helmholtz Zentrum München, Germany
James Hogg Research Centre
Munich Allergy Research Center (MARC), Germany
The Children's Hospital Research Institute of Manitoba

International Partnerships

AllerGen continues to leverage its strong international partnerships to deliver new therapeutics, clinical guidelines, research, programs, and knowledge to diverse global audiences. These partnerships enrich training and skill acquisition opportunities for Network students, new professionals and researchers.

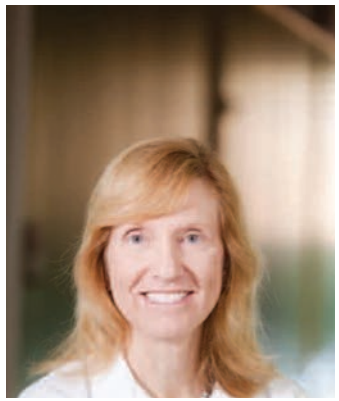
In April 2014, AllerGen signed a Memorandum of Understanding (MOU) with the Institute for Biomedical Engineering and Health Sciences at Changzhou University in China. Led by Dr. Linhong Deng, the Institute is engaged in the research of pathogenesis for asthma and the regulatory mechanisms of airway smooth muscle.

This agreement is AllerGen's seventh international MOU based on a shared interest in promoting allergy, asthma, and immune disease health research and related capacity building.

AllerGen Institutional Memoranda of Understanding (n=7)

Institution	Country
Munich Allergy Research Center (MARC) Technische Universität München (TUM) and Helmholtz Zentrum München German Research Centre for Environmental Health	Germany
The Allergie – Centrum – Charité Charité – Universitätsmedizin Berlin	Germany
The University of Newcastle The Priority Research Centre for Asthma and Respiratory Disease	Australia
Karolinska Institutet Centre for Allergy Research (CfA)	Sweden
The University of Queensland Faculty of Medical and Biomedical Sciences	Australia
Changzhou University Institute for Biomedical Engineering and Health Sciences	China
Sean N. Parker Centre for Allergy & Asthma Research Stanford University	United States

AllerGen Scientific Director Dr. Judah Denburg meets with officials from Changzhou University, April 29, 2014.



"This collaboration is a perfect example of two organizations coming together to help mentor future scientists and physicians in the field of allergy and immunology. We are very excited about our work with AllerGen now and in the future."

Dr. Kari Nadeau
Stanford University
Sean N. Parker Center for Allergy & Asthma Research

AllerGen-Stanford collaboration to advance food allergy research

In June 2014, AllerGen and Stanford University launched a new collaboration that allows a young Canadian scientist (MD or PhD) with an interest in developing new and safe therapies for food allergies to pursue academic research training with Dr. Kari Nadeau at the Sean N. Parker Center for Allergy & Asthma Research at Stanford University.

The *Stanford/AllerGen Research Fellowship Award* provides a salary/stipend of up to $50,000 for one year of study. The award is aligned with AllerGen's strategic goal to contribute to an understanding of the origins, causes, prevalence and treatment of food allergy and to inform the development of improved clinical management strategies and public health measures.

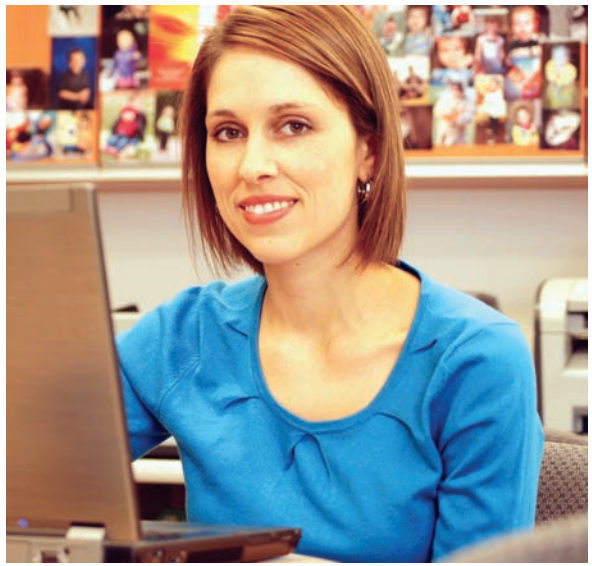
Dr. Nadeau is one of North America's foremost experts in adult and pediatric allergy. She has pioneered research that desensitizes the immune system by gradually exposing patients to incremental doses of a food allergen over time—a treatment called oral immunotherapy. The Sean N. Parker Center for Allergy & Asthma Research at Stanford is an interdisciplinary research centre named after technology billionaire and principal donor Sean Parker.

AllerGen partners with Canadian Respiratory Research Network to support new investigators

In 2014, AllerGen partnered with the Canadian Respiratory Research Network (CRRN) on the *Emerging Research Leaders Initiative* (ERLI). Led by the Canadian Lung Association and the Heart & Stroke Foundation, this multi-partnered initiative supports training awards in cardiovascular, cerebrovascular, and respiratory health research.

The CRRN/AllerGen research allowance grant, valued at up to $150,000 over a three-year period, assists new investigators in respiratory research to demonstrate the productivity necessary to secure major funding from national and international granting agencies.

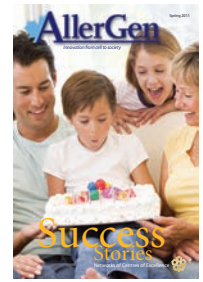
Dr. Meghan Azad, Assistant Professor, Department of Pediatrics and Child Health, University of Manitoba, is the recipient of the inaugural *CRRN/AllerGen ERLI Award*. Dr. Azad's research investigates the effect of breastfeeding on asthma development, and explores how these effects are influenced by breast milk composition and maternal characteristics.



"The ERLI award is funding my research projects as a new Principal Investigator and connecting me with AllerGen and CRRN investigators across the country. This support and networking is critical to launching my career as an independent scientist."

Dr. Meghan Azad
Recipient of inaugural
CRRN/AllerGen ERLI Award

"We don't have all the answers about food allergy, but we know enough to tackle this large and growing public health problem," says Dr. Susan Elliott, a University of Waterloo professor and head of an AllerGen initiative to develop a National Food Allergy Strategy for Canada. "In terms of addressing food allergies, Canada is at a tipping point."



Knowledge and Technology Exchange and Exploitation (KTEE)

AllerGen supports high-impact and transformative research, and the translation of this research into tangible benefits for Canadian families, educators, healthcare providers and policymakers dealing with asthma and allergies.

AllerGen invests in targeted, strategic knowledge mobilization and commercialization initiatives to improve the relevance, uptake and application of its research results by partner organizations, stakeholders and receptor communities across the country.

Knowledge Mobilization

AllerGen *Success Stories*

AllerGen has published and distributed eight issues of *Success Stories* to over 1,200 Network participants, partners and knowledge users since 2010. Written for Canadian families and health-care providers, *Success Stories* offers those living and dealing with allergic conditions and related immune diseases practical information about the latest research results.

In addition to diverse topics in the areas of asthma and allergies, *Success Stories*, available in English and French, features the accomplishments of the Network's Highly Qualified Personnel.

National Food Allergy Strategy: A "tipping point"

"We don't have all the answers about food allergy, but we know enough to tackle this large and growing public health problem," says Dr. Susan Elliott, a University of Waterloo professor and head of an AllerGen initiative to develop a National Food Allergy Strategy for Canada. "In terms of addressing food allergies, Canada is at a tipping point."

On June 23, 2015, Dr. Elliott hosted a meeting with stakeholders from community and patient groups, government, healthcare, and the pharmaceutical and food industries to kick-start a national dialogue about food allergy. Twenty-two pan-Canadian

organizations, including Health Canada, Dietitians of Canada, McDonald's Canada and Anaphylaxis Canada, participated in the event. "This stakeholder meeting was an important first step in developing a strategy that maximizes choice and minimizes risk for food allergic Canadians," says Dr. Elliott.

A National Food Allergy Strategy aims to create widespread awareness of, and capacity to avoid, allergic triggers; improve access to epinephrine auto-injectors in public spaces and schools; and improve diagnosis, treatment and management of food allergy and anaphylaxis in primary-care offices, specialty practices and emergency departments. It also aims to develop a framework for mandatory allergy training for school, daycare and restaurant personnel.

In Fall 2015, Dr. Elliott and Dr. Ann Clarke, an AllerGen researcher and professor at the University of Calgary, will launch AllerGen's third population survey of food allergies. The survey findings will inform the emerging national strategy and answer the questions: "Is food allergy on the rise?" and "How are the prevalence, perception and experience of food allergy in Canada changing over time?"

Scenes from Francophone forum on asthma, May 2014.

AllerGen hosts Francophone forum on asthma

In May 2014, AllerGen convened a panel of Montreal's leading asthma experts in a dynamic public forum about asthma: what provokes it, what exacerbates it, and what can be done to control and prevent it.

This French-language event, the first of its kind to be organized by AllerGen, was held in Mont-Royal, QC, to provide parents, families and educators with an opportunity to learn more about seasonal asthma in children and how to manage it.

Expert speakers included Dr. Francine Ducharme (pediatric allergist, CHU Ste-Justine); Dr. Marie-Josée Francoeur (pediatric allergist, Hôpital Charles LeMoyne, Université de Sherbrooke); Dr. Louis Jacques (prevention and public health specialist, Direction de santé publique de Montréal); and Jocelyne Bouchard (RN/asthma educator, CHU Ste-Justine).

The event was co-moderated by AllerGen Scientific Director Dr. Judah Denburg and Dr. Reza Alizadehfar of McGill University.

The program included expert presentations, an interactive Q&A session and an exhibition of community partners' resources. The event was promoted through the Quebec Lung Association, National Asthma Patient Alliance, CHU Ste-Justine, Montreal Children's Hospital, Hôpital Charles LeMoyne, Quebec Food Allergy Association, and the Quebec Network of Asthma Education Centres.

The future of personalized health

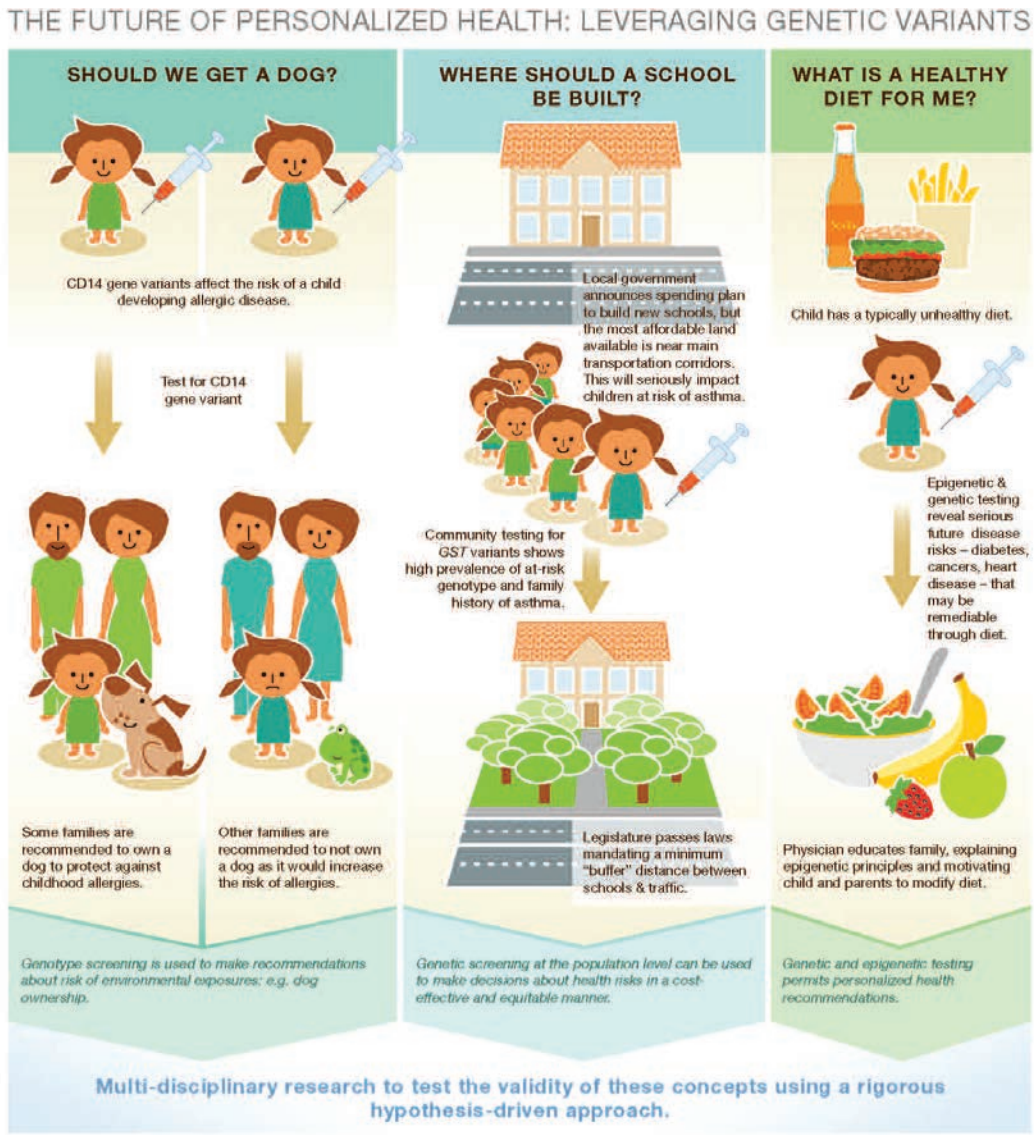
The tendency to focus on an individual's genes as the basis for a "personalized medicine" approach to healthcare does not adequately incorporate the important role of environmental factors in health and disease, according to AllerGen experts in gene-environment interactions, biomarkers and bioinformatics.

"Genes, the environment and personalized medicine," published by *EMBO reports* in June 2014, proposes a new framework of personalized medicine, one that demonstrates a greater appreciation of environmental factors and their effects on the epigenome and disease risk in order to maximize personal and population health.

"A narrow, DNA-focused view of personalized medicine has become pervasive," says Dr. Chris Carlsten, who led the AllerGen team that prepared the report. "We believe that genetics should be just one of a suite of personalized tools to achieve healthier living, rather than an all-powerful method to reliably predict future disease."

Established in 2000, *EMBO reports* publishes advances in molecular biology, assisting scientists around the globe to discover, assess and use research.

Carlsten *et al.* Genes, the environment and personalized medicine. *EMBO reports*, June 6, 2014.



Anaphylaxis and allergic reactions in the emergency department

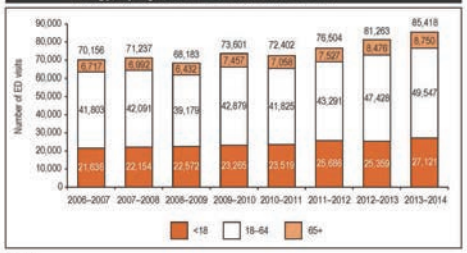
How many Canadians visit emergency departments (ED) for allergic reactions and anaphylaxis each year?

Anaphylaxis and Allergy in the Emergency Department

Up to 30% of people are affected by some kind of allergy.[1] Anaphylaxis is a serious allergic reaction that is rapid in onset and may cause death.[2] Anaphylaxis symptoms can range from mild to severe and typically involve at least 2 body systems (e.g., respiratory, cardiovascular). This information is intended to build awareness and support policy development around anaphylaxis and severe allergy.

Each year, 1% of all emergency department (ED) visits are for an allergic reaction (including anaphylaxis). 8% of these visits are for anaphylaxis specifically.

Figure 1: Number of visits to the ED for anaphylaxis and severe allergy, by age, 2006–2007 to 2013–2014



Note
Includes Ontario and Alberta.
Sources
National Ambulatory Care Reporting System, 2006–2007 to 2013–2014, Canadian Institute for Health Information; Alberta Ambulatory Care Reporting System, 2006–2007 to 2009–2010, Alberta Health Services.

- In Ontario and Alberta alone, there were more than 85,400 ED visits for an allergic reaction (including anaphylaxis) in 2013–2014.
- Extrapolating to all of Canada means there would have been more than 171,000 visits to the ED for allergy that year.

www.cihi.ca
At the heart of data
Canadian Institute for Health Information
Institut canadien d'information sur la santé

Are the numbers growing? In which months are anaphylactic emergencies most common? How have prescription patterns for epinephrine auto-injectors changed over time?

A September 2015 fact sheet from the Canadian Institute for Health Information (CIHI) answers these questions using data collected from EDs in several provinces and prescription medication records in British Columbia, Saskatchewan and Manitoba.

In 2014, AllerGen experts Drs Moshe Ben-Shoshan, Ann Clarke and Susan Elliott were invited to collaborate with CIHI to develop the fact sheet, which provides the latest snapshot of Canadian anaphylaxis statistics.

The results are intriguing. For example, visits for allergic reactions represent 1% of all ED visits and have been relatively stable over time; however, visits specifically coded as anaphylaxis have increased 90% between 2006-2007 and 2013-2014.

CIHI is a not-for-profit organization that maintains 27 national databases capturing health information across the country. CIHI fact sheets can be downloaded from the organization's website.

Dr. Stuart Turvey (left) and Dr. Andrew O'Keefe host AllerGen Visiting Professor workshops in St. John's, NL, June 12-13, 2014.

Workshops aim to attract doctors to allergy and clinical immunology specialty

Canadians are faced with long wait times to see allergists/clinical immunologists, and many communities are under- or un-serviced by these specialists.

Since 2005, AllerGen's initiatives to promote the subspecialty have contributed to a 34% increase

in allergy/clinical immunology specialists in Canada, and to the establishment of three additional accredited training programs at Canadian medical schools (The University of British Columbia, Dalhousie University, Université de Montréal).

In June 2014, AllerGen hosted Visiting Professor workshops at Memorial University of Newfoundland in St. John's, NL, to expose medical students and residents in internal medicine and pediatrics to career opportunities within the specialty.

The workshops were led by Visiting Professor Dr. Stuart Turvey, an associate professor of pediatrics at The University of British Columbia, a pediatric immunologist at BC Children's Hospital, and the Director of Clinical Research at the Child & Family Research Institute. Dr. Turvey is an AllerGen investigator and leads the Vancouver site for the Canadian Healthy Infant Longitudinal Development (CHILD) Study.

The workshops featured case studies in food allergy, anaphylaxis and immunology, and aimed to create a heightened understanding of the growing prevalence of allergic disease, as well as the need to boost allergy and immunology expertise in Canada.

Dr. Andrew O'Keefe, a St. John's-based allergist and a former AllerGen trainee, joined Dr. Turvey as a workshop co-presenter.

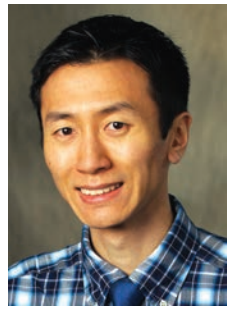
Student videos highlight "what's new" in Canadian allergy research

In early 2015, AllerGen challenged members of its AllerGen Students and New Professionals Network (ASNPN) to create videos highlighting their research in an exciting way and to make their projects accessible to a wide public audience.

AllerGen's 2015 HQP Video Competition generated 11 unique videos that have received over 6,000 YouTube views. In them, AllerGen HQP describe their research, spanning topics from childhood asthma to the swine flu to underuse of epinephrine. Their goal? To enhance public awareness of allergic disease research in Canada and to sharpen their own science communication skills in the process.

Videos were evaluated by an expert panel and through public online voting. The creators of the two winning videos each received a cash award of $1,000.

2015 HQP Video Competition Winners



Asthma and H1N1 Swine Flu

David Ngan
The University of British Columbia

"It's rewarding to realize you've gained a far larger reach than you could through traditional scientific avenues. My success in the competition led my research centre to recruit me to host workshops on making knowledge translation videos."

Epinephrine 4 Life

Rishma Chooniedass & Saiful Huq
University of Manitoba

"AllerGen took an important step towards highlighting knowledge translation and its importance in research. It was great to get a glimpse of the many interesting projects from across Canada."

Commercialization

CIC facilitates drug development and SME success among Canadian biotechnology companies

AllerGen's Clinical Investigator Collaborative (CIC) has helped pharmaceutical companies, including Genentech, Amgen, Wyeth, Novartis, AstraZeneca, Schering Plough and Pfizer, to evaluate new asthma therapies in their product pipeline and identify the most promising molecules for further development.

Using a unique set of standardized operating procedures (SOPs) that are harmonized across multiple sites, as well as a well-defined clinical model, the CIC conducts Phase II clinical trials that accurately predict whether or not an early-stage drug should be pursued for further development. In 2014, a CIC partnership with Amgen identified one of the most exciting new asthma therapies to date, with findings published in the *New England Journal of Medicine*.

Since 2005, the CIC has undertaken 24 clinical trials with pharmaceutical and biotechnology partners and sold 20 SOP licenses—seven licenses have been sold since 2012 alone.

The CIC provides much more than a "fee-for-service" clinical trials group. It offers academic leadership in drug development research, conducts add-on

experiments to establish the mechanism of action for experimental drugs, and publishes novel data in high-impact, peer-reviewed journals.

The CIC has also facilitated small and medium enterprise (SME) development in Canada by providing start-up Canadian biotechnology companies, including Asmacure, Topigen/Pharmaxis, and AIM Therapeutics, with business and commercialization insights on which they have based investment decisions.

Talking business with scientists: AllerGen's KTEE Mentorship Program

AllerGen investigators want their research results to translate into real-world benefits for Canadians living with asthma and allergic disease—whether through the commercial development of a new therapeutic or technology, or by bringing new evidence to bear on public policy.

To help researchers achieve these goals, AllerGen enhanced its Knowledge and Technology Exchange and Exploitation (KTEE) Mentorship Program in 2014.

The Mentorship Program is an integral component of AllerGen's overall commercialization strategy, which aims to identify and exploit commercial opportunities for Network projects and initiatives.

AllerGen's Managing Director Dr. Diana Royce presented at the NCE Annual General Meeting in Ottawa, ON, on March 31, 2015. Dr. Royce's presentation, "Defining and Demonstrating Performance and Impact," highlighted the use of Key Performance Indicators (KPIs) to support effective decision making and investments.

The program matches experienced mentors with early-stage AllerGen innovators. In addition to members of AllerGen's Network-Supported Intellectual Property (NSIP) Advisory Committee and Research Management Committee (RMC), the mentor pool incorporates individuals external to the network who were recruited based on their talents in business acceleration, technology transfer, venture capital, biotechnology, marketing and knowledge translation.

Researchers and their teams consulted KTEE mentors throughout 2014, using a customized online platform to facilitate matchmaking and exchange. In 2015, mentor-delivered webinars on commercialization and knowledge mobilization topics will further support AllerGen researchers to move their ideas to the marketplace—assisting them to patent their products and services, identify potential markets, build business communities, and seek investors.

AllerGen's *Travel Awards Program* is the Network's most highly subscribed HQP program. Travel awards facilitate learning, research dissemination, and networking by supporting HQP to participate in national and international conferences, symposia and workshops.

Tomorrow's Leaders: AllerGen's Highly Qualified Personnel (HQP)

"For a PhD student there are two critical facets to success: building a network and developing professional skills. AllerGen has provided me with the opportunity to achieve both of them."

Vivek Gandhi, PhD (c)
AllerGen HQP, University of Alberta

AllerGen's HQP program is one of the Network's most impactful and transformational accomplishments, providing skill acquisition and capacity-building opportunities for students beyond the training and mentorship provided within individual research projects and teams.

The HQP program has increased Canada's research capacity, launching the careers of numerous young investigators and clinician-scientists, and producing highly employable graduates working in diverse sectors.

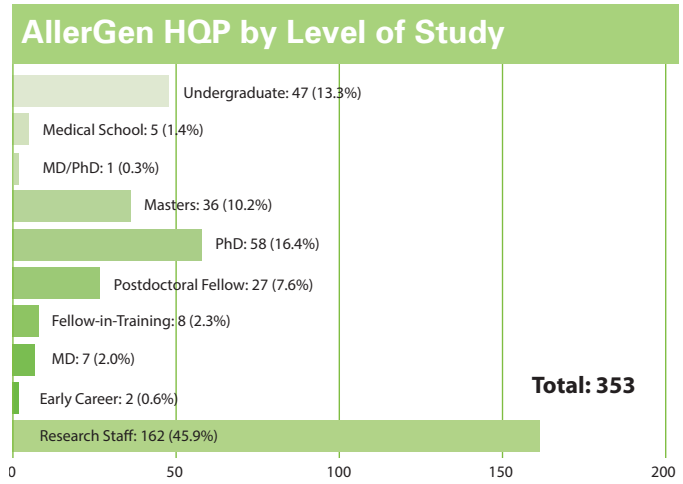
AllerGen trainees are seizing the full range of the Network's scientific and "soft skills" development programs to augment their academic training: attending conferences globally; participating in international research exchanges; and presenting research posters to, and interacting with, patients and clinical, industry and government professionals.

AllerGen Students and New Professionals Network (ASNPN)

The AllerGen Students and New Professionals Network (ASNPN) is open to trainees (undergraduate students to postdoctoral fellows), research staff and early-career researchers working in the field of allergic disease in Canada. Since 2005, AllerGen has provided education and training to 1,315 trainees, research staff and early career professionals, and invested over $7 million in trainee awards, grants, fellowships and research support.

The ASNPN is governed by an elected Executive Committee, which meets five times per year by teleconference. The ASNPN President sits as an observer on the AllerGen Board of Directors and is a full voting member of the Advanced Education and Training Opportunities Advisory Committee (AETOAC). The ASNPN Vice-President sits as an observer on AllerGen's Research Management Committee (RMC).

In 2014-2015, there were 353 ASNPN members: 282 HQP actively involved in Network research, and 72 students and new professionals working in related research areas.



HQP's publication productivity breaks new ground

AllerGen's HQP program supports students' research skills and career advancement through a consistent emphasis on scientific productivity.

Since 2005, over 1,900 journal articles, specialized publications and posters emerging from AllerGen research have been first-authored by AllerGen trainees, research staff and early-career researchers. Among these, 52% of the peer-reviewed articles appearing in refereed journals have an AllerGen HQP as first author.

In 2014-2015 alone, trainees, research staff and young professionals working on AllerGen-funded research were named as lead author on 24 peer-reviewed articles, resulting in enhanced publication productivity, recognition, and impact.

Dr. Matthew Gold (PhD), an AllerGen HQP at The University of British Columbia (UBC), provides an outstanding example of trainee publication productivity. Dr. Gold has published 18 first-author research papers and reviews, and is the lead author on several pending papers focused on inflammatory and allergic airway disease.

"The number and quality of publications that Dr. Gold has produced as an AllerGen trainee is monumental, and almost unprecedented for such an early-stage career," comments Dr. Kelly McNagny, his AllerGen supervisor at UBC.

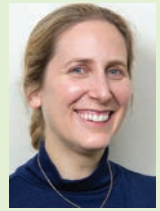
Dr. Matthew Gold (left) with AllerGen Scientific Director Dr. Judah Denburg

Enhancing expertise with *Research Skills Awards*

AllerGen's *Research Skills Awards* fund individual training opportunities outside local training environments, responding to the specific needs of the Network's trainees. Awards, matched 1:1 with non-AllerGen funding, provide for advanced research skill acquisition and employment-relevant training

AllerGen trainees become Network investigators

Dr. Meghan Azad
University of Manitoba



Dr. Elinor Simons
University of Manitoba

Dr. Jeremy Hirota
The University of British Columbia

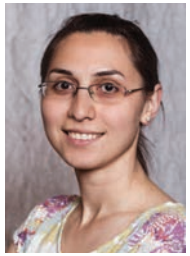
Drs Meghan Azad and **Elinor Simons**, University of Manitoba, and **Dr. Jeremy Hirota**, The University of British Columbia, were approved as Network investigators by AllerGen's Board of Directors in 2014–2015.

AllerGen's HQP training program funds young investigators for three years while they transition from postdoctoral positions to independent research programs.

with the world's top allergy and asthma clinician-scientists and researchers.

In 2014-2015, AllerGen funded seven *Research Skills Awards*, supporting advanced training in the following areas:

- science communications
- institutional ethnography
- computational methods for studying biological samples
- DNA extraction and sequencing
- role of CD34 in the development of allergic airway inflammatory diseases
- CD34 family proteins and the transgenic mice available to allergic disease
- analysis of next generation sequence data



"With an AllerGen *Research Skills Award*, I had the opportunity to work with Dr. James Scott at the University of Toronto, which was extremely valuable. I helped his team process fecal samples collected from infants in the CHILD Study. The data will be used for future grant submissions and will inform my postdoctoral research."

Petya Koleva, Postdoctoral Fellow
University of Alberta

AllerGen awards third *Emerging Clinician-Scientist Research Fellowship*

In October 2014, **Dr. Marylin Desjardins** (McGill University Health Centre-Montreal Children's Hospital) received the prestigious AllerGen *Emerging Clinician-Scientist Research Fellowship*. Valued at $250,000, this fellowship addresses the shortage of allergy and clinical immunology expertise in Canada, and advances AllerGen's goal to support Canadian allergists/clinical immunologists in the pursuit of research training and a combined career as a clinician and academic researcher.

AllerGen's Emerging Clinician-Scientists: The future of allergy research in Canada

Front row (left to right): Dr. Moshe Ben-Shoshan; AllerGen Scientific Director Dr. Judah Denburg; Dr. Marylin Desjardins; Dr. Philippe Bégin. Back row (left to right): AllerGen Research Leaders Dr. Dean Befus and Dr. Allan Becker.

Dr. Desjardins's research focuses on interleukin-21 (IL-21), a protein that plays a key role in stimulating the body's immune system and antibody production. A better understanding of how IL-21 works, and the role it plays in the development of autoimmune diseases and inflammatory disorders, could contribute to new treatment options for individuals with allergies, asthma and immune deficiencies.

Dr. Desjardins trains under the supervision and mentorship of AllerGen investigator Dr. Bruce Mazer, the Deputy Executive Director/Deputy Chief Scientific Officer of the Research Institute of the McGill University Health Centre and Head of Child Health Research at the Montreal Children's Hospital.

This is the third *Fellowship* awarded by the AllerGen network. **Dr. Philippe Bégin**, from the Centre hospitalier de l'Université de Montréal (CHUM) and the Centre hospitalier universitaire Sainte-Justine (CHU Sainte-Justine), received the fellowship in 2013. **Dr. Moshe Ben-Shoshan**, a pediatric allergist from McGill University and the Montreal Children's Hospital, received the inaugural fellowship in 2010 and is now an AllerGen Principal Investigator.

A spotlight on the 2014 Lindau Nobel Laureate Meeting

AllerGen trainee and gut microbiome researcher **Dr. Meghan Azad** was one of 600 aspiring young researchers from 80 countries to attend the 64th Lindau Nobel Laureate Meeting in Lindau, Germany, from June 29 to July 4, 2014.

The 2014 Laureate Meeting allowed Nobel Prize winners and the world's brightest young scientists to discuss topics such as global health, challenges to medical care in developing countries, and future research approaches to medicine.

Dr. Azad completed a postdoctoral fellowship in Epidemiology and Pediatrics at the University of Alberta, under the supervision of AllerGen investigator Dr. Anita Kozyrskyj. In July 2014, Dr. Azad became an assistant professor at the University of Manitoba and a research scientist at the Children's Hospital Research Institute of Manitoba.

Dr. Azad's research uses samples from AllerGen's Canadian Healthy Infant Longitudinal Development (CHILD) Study to investigate the impact of antibiotics, breastfeeding and environmental factors on infant gut microbiota and the subsequent development of allergic disease.

Dr. Meghan Azad with Dr. Brian Schmidt in Lindau, Germany.

"The meeting was an incredible, once-in-a-lifetime opportunity to meet and learn from dozens of Nobel Laureates and accomplished young scientists from around the world! I have now established an international network of new friends and potential collaborators."

Dr. Meghan Azad
University of Manitoba

Summer studentships prepare trainees for graduate studies

In 2014, AllerGen funded 10 outstanding undergraduate students from nine Canadian universities and related research institutes to work in research teams alongside AllerGen investigators. For each student, AllerGen provided up to $3,000 in support, matched 1:1 by Canadian partner organizations for a total program award value of $60,000.

The *Summer Studentship* program aims to foster interest in allergic and related immune disease research among students at the undergraduate level, potentially leading to advanced studies and a career in related research or clinical practice. Forty summer studentships have been awarded since 2012.

With additional support through AllerGen's *Travel Awards* program, *Summer Studentship* recipients have presented their research at national and international conferences, such as the American Thoracic Society International Meeting, and published papers in peer-reviewed scientific journals, resulting in a superior undergraduate experience.

"My AllerGen summer studentship allowed me to improve my leadership, critical thinking and presentation skills. I also improved my laboratory techniques in flow cytometry, cell culture and working with mice. These skills will be an asset when pursing my Master's degree."

Julyanne Brassard
4th year B.Sc. student
Université Laval

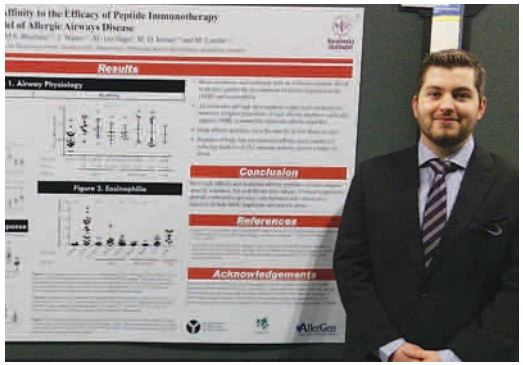
AllerGen 2014-2015 *Undergraduate Summer Studentships* Recipients

Institution	AllerGen Funding	Partner Funding	Total Award Value
Dalhousie University Stephanie Legere	$3,000	$3,000	**$6,000**
Queen's University Elizabeth Lee	$3,000	$3,000	**$6,000**
The Hospital for Sick Children Laura Feldman	$3,000	$3,000	**$6,000**
The University of British Columbia Angie Lam	$3,000	$3,000	**$6,000**
Université du Québec à Chicoutimi Anne-Marie Boucher-Lafleur	$3,000	$3,000	**$6,000**
Université Laval Julyanne Brassard	$3,000	$3,000	**$6,000**
University of Alberta Britt Voaklander	$3,000	$3,000	**$6,000**
University of Calgary Giselle Morean Abid Qureshi	$3,000 $1,550	$3,000 $1,550	**$9,100**
University of Saskatchewan Bahar Bahrani	$3,000	$3,000	**$6,000**
Total	**$28,550**	**$28,550**	**$57,100**

Travel Awards bring HQP research to the world

AllerGen's *Travel Awards Program* is the Network's most highly subscribed HQP program. Travel awards facilitate learning, research dissemination, and networking by supporting HQP to participate in national and international conferences, symposia and workshops.

Travel awards provide trainees and investigators with an opportunity to share their research results during poster and oral presentations, and to network with leading experts in allergic disease research.



AllerGen HQP Dan Moldaver (McMaster University) presents his research at the 2015 AAAAI in Houston, Texas.

In 2014-2015, AllerGen bestowed 32 awards to support attendance at 10 high-profile conferences, including the American Academy of Allergy, Asthma and Immunology (AAAAI), Collegium Internationale Allergologicum (CIA), and the European Academy of Allergy and Clinical Immunology World Allergy and Asthma Congress (EAACI), among others.

Trainees excel in AllerGen and CSACI poster competitions

From the impact of air pollution on physician office visits to the characterization of IgE receptor expression in asthmatic epithelial cells, AllerGen's 2014 Poster Competition showcased the outstanding research of Network trainees at a national gathering of Canada's top allergists and clinical immunologists.

Hosted in partnership with the Canadian Society of Allergy and Clinical Immunology (CSACI) at its Annual Scientific Meeting in Ottawa, ON, (October 23-26, 2014), the competition provided a unique opportunity for AllerGen trainees to share the results of their research with a diverse audience of clinicians and researchers in the field of allergic disease.

The Poster Competition featured two-minute oral presentations, poster viewing and adjudication,

2014 Poster Competition Award Winners

Left to right: Philippe Bégin, Laura Feldman, Amrit Singh, Ali Hosseini, Claire Unruh, Vivek Gandhi, Gurpreet Singhera, Pia-Lauren Reece. Absent: Sarah De Schryver.

2014 AllerGen Poster Competition Award Winners					
Place	**Category**	**Name**	**Institution**	**Supervisor**	**Abstract Title**
1st	**Master's**	**Laura Feldman**	The Hospital for Sick Children	Dr. Teresa To	Impact of air pollution on physician office visits for common childhood conditions in Ontario, Canada
2nd	**Master's**	**Ali Hosseini**	The University of British Columbia	Dr. Chris Carlsten	Co-exposure to allergen and diesel exhaust enhances inflammatory responses in human airway submucosa
1st	**PhD**	**Amrit Singh**	The University of British Columbia	Dr. Scott Tebbutt	Blood biomarkers of the late phase asthmatic response using RNA-Seq
2nd	**PhD**	**Philippe Bégin**	Université de Montréal	Dr. Elie Haddad	Deep TCR repertoire sequencing reveals relative change in peanut specific clonotype in subjects undergoing rush oral immunotherapy
1st	**Open**	**Pia-Lauren Reece**	McMaster University	Dr. Judah Denburg	IL-4 and IL-13 regulate toll-like receptor expression and eosinophil-basophil differentiative function of cord blood CD34+ progenitor cells
2nd	**Open**	**Gurpreet Singhera**	The University of British Columbia	Dr. Del Dorscheid	IgE receptor expression in asthmatic and non-asthmatic airway epithelial cells
2014 CSACI Poster Competition Award Winners					
1st	**Food Allergy/ Anaphylaxis**	**Sarah De Schryver**	McGill University	Dr. Moshe Ben-Shoshan	C-CARE: Comparing three years of anaphylaxis in children treated at the Montreal Children's Hospital
1st	**Basic Science/ Immunology**	**Vivek Gandhi**	University of Alberta	Dr. Harissios Vliagoftis	Growth factors regulate Proteinase Activated Receptor – 2 (PAR-2) on Airway Epithelium
2nd	**Allied Health**	**Claire Unruh**	University of Manitoba	Dr. Allan Becker	Teenagers and Food Allergy Education: A Systematic Review

Russell Horwitz of KWELA Leadership and Talent Management leads problem-solving and decision-making workshop at AllerGen's 2014 Trainee Symposium.

and, for the first time, oral presentations were integrated into the CSACI conference plenary and special interest meetings.

AllerGen awards were presented in three categories: Master's, PhD and Open, which included postdoctoral fellows, research staff and young professionals.

AllerGen trainees also competed successfully in the CSACI Poster Competition, winning several awards, including first place honours in the *Basic Science/Immunology* and *Food Allergy/Anaphylaxis* categories.

Mock Grant Review Panel a highlight of 2014 Trainee Symposium

The 9th Annual AllerGen Trainee Symposium was held in Richmond, BC, from April 30-May 2, 2014. Fifty-one HQP representing 14 academic institutions and related research centres attended. Half of the participants were new to AllerGen and attending the event for the first time.

At the Symposium, a grant review panel workshop provided trainees with an inside look at how scientists from across the country review grant applications for scientific and technical merit. The panel was organized by Dr. Peter Paré, an AllerGen investigator and a professor of Respiratory Medicine and Pathology at The University of British Columbia.

The session provided trainees with a unique opportunity to experience the Canadian Institutes of Health Research (CIHR) peer review process, and gain insights that will improve their grant applications and increase their chances of receiving grant support.

The Trainee Symposium also featured a *Networking for Success* Dinner, as well as *Junior and Senior Investigators' Panels*. These events provided trainees with the opportunity to learn from and network with researchers in the field of allergic disease.

Network delivers highly employable graduates

Since 2005, 182 graduate students and postdoctoral fellows directly involved in AllerGen-funded research projects have found employment across sectors—industry, policy development, health-care and academia.

In 2014-2015 alone, 33 AllerGen HQP secured employment, making contributions in diverse areas, including:

Industry

Claudia Hui (PhD) is employed as a **Scientific Analyst** at **Bloom Burton & Co** in Toronto, ON.

Ruiwei Jiang (M.Sc.) is a **Data Scientist** at **Boeing Canada** (Advanced Analytics Group) in Richmond, BC.

Pia Reece (PhD) was hired as a **Patent Agent Trainee** at **SIM & McBURNEY** and **SIM, LOWMAN, ASHTON & McKAY LLP** in Toronto, ON.

Clinical practice

Alicia Pawlowski (M.Sc.) is a **Project Coordinator** for the **Fetal Alcohol Spectrum Disorder (FASD) Research Group** at the **University of Alberta** where she is responsible for researching, designing and writing the best practices for FASD Service Delivery for the Supports and Services Council of Alberta.

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Marcelo Menezes (MD, PhD) is employed as a **staff respirologist** at **Ribeirão Preto Medical School Hospital**, University of São Paulo – Ribeirão

Drs Andrew O'Keefe and Alison Haynes opened an allergy and immunology clinic in St. John's, NL.

Preto, where he works as both a physician and researcher.

Andrew O'Keefe (MD) opened an **allergy and immunology clinic** in St. John's, NL, and is accepting referrals for adult and pediatric patients.

Academia

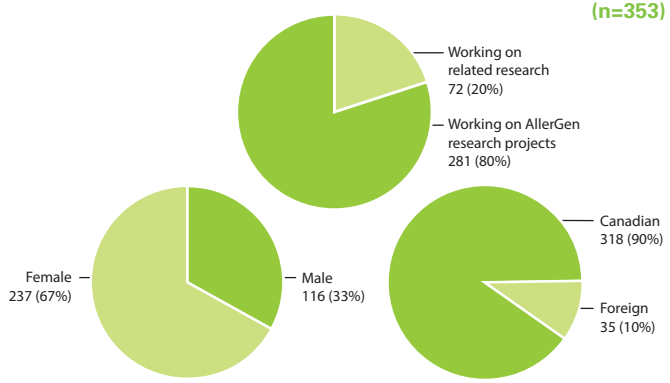
Meghan Azad (PhD) was appointed **Assistant Professor** at the **University of Manitoba** and the affiliated George & Fay Yee Centre for Health-care Innovation.

Jeremy Hirota (PhD) was appointed **Assistant Professor** in the Division of Respiratory Medicine, Department of Medicine, at **The University of British Columbia**, and **Co-Director** of the Chan-Yeung Centre for Occupational and Environmental Respiratory Disease.

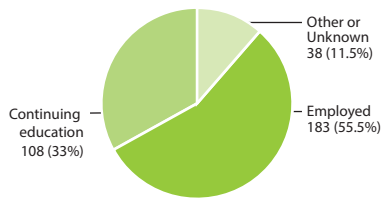
Luisa Giles (PhD) is an instructor in the **Sports Science Department** at **Douglas College** in New Westminster, BC.

A Snapshot of AllerGen HQP 2014-2015

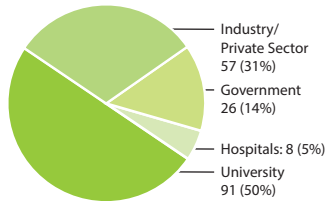
(n=353)



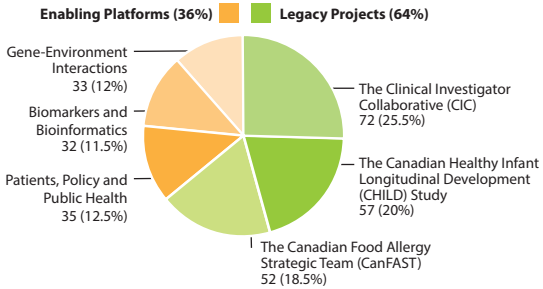
AllerGen HQP Graduates 2005-2015 (n=329)



AllerGen HQP Employment by Sector 2005-2015 (n=182)



AllerGen HQP by Research Program 2014-2015 (n=281)



Trainees, New Professionals, Research Associates and Technicians by Province

By Province (n=353)	All (including ASNPN)	
Ontario	115	33%
Alberta	75	21%
British Columbia	73	21%
Quebec	57	16%
Manitoba	18	5%
Saskatchewan	6	2%
Nova Scotia	5	1%
Other	4	1%
Total	353	100%

Trainees, New Professionals, Research Associates and Technicians by University

The University of British Columbia	69	19.5%
McMaster University	52	14.7%
University of Alberta	42	11.9%
University of Calgary	34	9.6%
McGill University	28	7.9%
Université Laval	19	5.4%
University of Manitoba	17	4.8%
Queen's University	10	2.8%
University of Toronto	10	2.8%
University of Saskatchewan	6	1.7%
University of Waterloo	5	1.4%
Dalhousie University	5	1.4%
Université du Quebéc à Chicoutimi	4	1.1%
Simon Fraser University	3	0.9%
Université de Montréal	2	0.6%
Lakehead University	1	0.4%
University of Winnipeg	1	0.4%
Outside Canada	4	1.1%
Affiliated Institutions & Organizations	41	11.6%
Total	353	100.0%

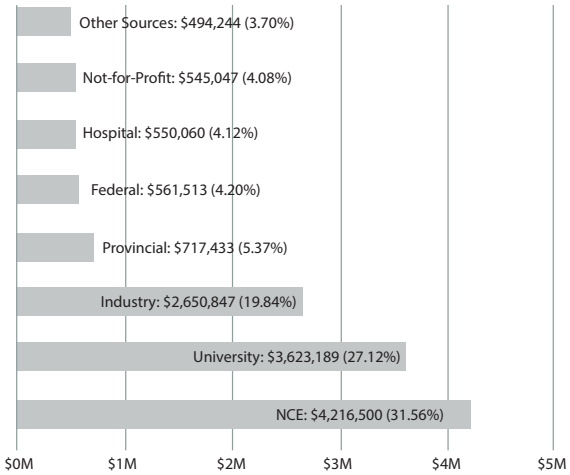
Through strong partnerships, AllerGen secured additional funding from other sources to achieve an annual NCE leveraging ratio of 1:2.17.

Financial Overview

AllerGen NCE Inc. Financial Summary 2014-2015

	2014-2015 (Year 10)	Percentage	2013-2014 (Year 9)	Percentage
Revenues (Cash)				
NCE Award	4,216,500	90.00%	5,604,865	91.09%
Non-NCE Funds	468,655	10.00%	548,538	8.91%
	4,685,155	**100.00%**	**6,153,403**	**100.00%**
Expenditures (Cash)				
Research Programs	3,491,984	65.91%	3,859,854	69.31%
Networking	144,399	2.73%	210,333	3.78%
Training	394,765	7.45%	315,373	5.66%
Communications	66,908	1.26%	71,088	1.28%
Administration	1,199,904	22.65%	1,112,484	19.98%
	5,297,959	**100.00%**	**5,569,132**	**100.00%**
Committed Amounts for Future Research	1,072,726		1,210,140	

All Revenue Sources (Cash and In-Kind) 2014-2015 NCE and Non-NCE (n=$13,358,832)



All Revenue Sources (Cash and In-Kind) 2014-2015 NCE and Non-NCE

	Cash	In-Kind	Total	Percentage
NCE	4,216,500	–	4,216,500	31.56%
University	718,340	2,904,849	3,623,189	27.12%
Industry	2,401,020	249,827	2,650,847	19.84%
Provincial	153,233	564,200	717,433	5.37%
Federal	422,613	138,900	561,513	4.20%
Hospital	210,000	340,060	550,060	4.12%
Not-for-Profit	20,000	525,047	545,047	4.08%
Other Sources	441,132	53,112	494,244	3.70%
Total	**$ 8,582,837**	**$ 4,775,995**	**$ 13,358,832**	**100.00%**

In 2014-15, AllerGen's income from all sources (cash and in-kind) was $13,358,832. Of this amount, AllerGen received a base grant from the NCE in the amount of $4,216,500. AllerGen secured an additional $9,142,232 from other sources.

This represents a leveraging of NCE funding at a rate of 1:2.17

Working in crossdisciplinary and international teams, these scientists have also generated decision-support data and tools to inform personalized health recommendations and interventions used by individuals, health professionals and policymakers.

Network Participants

Investigators (n=95)

Name	Affiliation
Edmond Chan	BC Children's Hospital
Heather Castleden	Dalhousie University
Jean Marshall	Dalhousie University
Jeff Brook	Environment Canada
Sébastien La Vieille	Health Canada
Wade Watson	IWK Health Centre
Celia Greenwood	McGill University
Lawrence Joseph	McGill University
James Martin	McGill University
Bruce Mazer	McGill University
Ciriaco Piccirillo	McGill University
Moshe Ben-Shoshan	McGill University Health Centre
Sonia Anand	McMaster University
Russell de Souza	McMaster University
Judah Denburg	McMaster University
Gail Gauvreau	McMaster University
Manel Jordana	McMaster University
Paul Keith	McMaster University
Anthony Levinson	McMaster University
Joseph Macri	McMaster University
Parameswaran Nair	McMaster University
Helen Neighbour	McMaster University
Paul O'Byrne	McMaster University
Malcolm Sears	McMaster University
Susan Waserman	McMaster University
Carlo Marra	Memorial University
Anne Ellis	Queen's University
Ryan Allen	Simon Fraser University
Fiona Brinkman	Simon Fraser University
Timothy Takaro	Simon Fraser University
Sharon Dell	The Hospital for Sick Children
Theo Moraes	The Hospital for Sick Children
Felix Ratjen	The Hospital for Sick Children
Sanja Stanojevic	The Hospital for Sick Children
Padmaja Subbarao	The Hospital for Sick Children
Wendy Ungar	The Hospital for Sick Children
Michael Brauer	The University of British Columbia
Chris Carlsten	The University of British Columbia
Denise Daley	The University of British Columbia
Del Dorscheid	The University of British Columbia
Mark FitzGerald	The University of British Columbia
Jeremy Hirota	The University of British Columbia
Michael Kobor	The University of British Columbia
Tobias Kollmann	The University of British Columbia
Larry Lynd	The University of British Columbia
Kelly McNagny	The University of British Columbia
Peter Paré	The University of British Columbia
Andrew Sandford	The University of British Columbia
Scott Tebbutt	The University of British Columbia
Stuart Turvey	The University of British Columbia
Elie Haddad	Université de Montréal
Catherine Lemière	Université de Montréal
Catherine Laprise	Université du Québec à Chicoutimi
Jamila Chakir	Université Laval
Marie-Renée Blanchet	Université Laval – IUCPQ
Louis-Philippe Boulet	Université Laval – IUCPQ
Dean Befus	University of Alberta
Stuart Carr	University of Alberta
Timothy Caulfield	University of Alberta
Catherine Field	University of Alberta

Name	Affiliation
Malcolm King	University of Alberta
Anita Kozyrskyj	University of Alberta
Piush Mandhane	University of Alberta
Irvin Mayers	University of Alberta
Miriam Stewart	University of Alberta
Dilini Vethanayagam	University of Alberta
Harissios Vliagoftis	University of Alberta
Tavis Campbell	University of Calgary
Ann Clarke	University of Calgary
Gerry Giesbrecht	University of Calgary
Bonnie Kaplan	University of Calgary
Richard Leigh	University of Calgary
Nicole Letourneau	University of Calgary
Katherine Wynne-Edwards	University of Calgary
Meghan Azad	University of Manitoba
Allan Becker	University of Manitoba
Marni Brownell	University of Manitoba
Mariette Chartier	University of Manitoba
Kent HayGlass	University of Manitoba
Jeffrey Masuda	University of Manitoba
Elinor Simons	University of Manitoba
Darryl Adamko	University of Saskatchewan
Don Cockcroft	University of Saskatchewan
John Gordon	University of Saskatchewan
Peter Hull	University of Saskatchewan
Miriam Diamond	University of Toronto
Greg Evans	University of Toronto
Richard Hegele	University of Toronto
Wendy Lou	University of Toronto
James Scott	University of Toronto
Jeremy Scott	University of Toronto
Frances Silverman	University of Toronto
Peter Vadas	University of Toronto
Kathi Wilson	University of Toronto
Susan Elliott	University of Waterloo

Participating NCE Standard Agreement Signatories (n=21)

Centre de Recherche du CHUM
Dalhousie University
Hôpital du Sacré-Coeur de Montréal
Laval University –
Institut universitaire de cardiologie et de pneumologie de Québec (IUCPQ)
Lakehead University
McGill University
McGill University Health Centre
McMaster University
Queen's University
Simon Fraser University
St. Joseph's Healthcare Hamilton
St. Michael's Hospital, Toronto
The Hospital for Sick Children
The University of British Columbia
Université du Québec à Chicoutimi
University of Alberta
University of Calgary
University of Manitoba
University of Saskatchewan
University of Toronto
University of Waterloo

HQP and Research Staff (n=353)

Shelley Abercromby
Daniel Adams
Omid Aghamirian
Loubna Akhabir
Kim Allan
Mustafa Al-Saiedy
Vidyanand Anaparti
Yasmin Arfeen
Jason Arnason
Muhammad Asaduzzaman
Yuka Asai
Susan Attridge
Séverine Audusseau
Hana Awad
Jane Awawias
Meghan Azad
Dunia Azzara
Salma Bahreinian
Tieghan Baird
Jyoti Balhara
Susan Balkovec
Kendra Barrick
Tahira Batool
Shirley Beauchamp
Suzanne Beaudin
Daniel Beaurivage
Philippe Bégin
Emilie Bernatchez
Mylène Bertrand
Jean-Christophe Bérubé
Hilary Bews
Catherine Biggs
Cai Bing
Litsa Blanis
Martine Bordeleau
Anne-Marie Boucher-Lafleur
Marie-Ève Boulay
Jodie Bousfield
John Bousfield
Katie Bowden
Miranda Bowen
Ayanna Boyce
Julyanne Brassard
Sarah Bridgman
May Brydges
Lianna Butler
Hilary Caldwell
Maureen Campbell
Francesca Cardwell
Sylvie Carette
Simone Chaboillez
Deborah Chan
Sarah Charlesworth
Raymond Chen
Roy Chen
Wenjai Chen
Jasmine (ZiJin) Cheng
Michael Cheng
Sabrine Cherkaoui
Stephen Cheuk
Joyce Chikuma
Rick Chin
Rishma Chooniedass
Angela Chow
Derek K. Chu
Tin-Shan (Timothy) Chung
Laura Churchman
Marianne Clarke
Rachel Clifford
Victoria Cook
Marie-Ève Côté
Melanie Courtot
Fiona Cowley
Melanie Cowley
Rowena Cua
Beth Davis
Wojciech Dawicki
Bassel Dawod
Carlo de Olim Rugginenti
Sarah De Schryver
Phillip Deng
Alizée Dery
Francine Deschesnes
Marylin Desjardins
Alotaibi Dhaifallah
Julie Dixon
Zheng Dong-Jun
Aimee Dubeau
Curtis Dumonaceaux
Judy Durocher
Rachel Edgar
Laura Feldman
Penelope Ferrie
Mike Filia
Yahya Fiteih
Ryan Fiter
Jennifer Fitzpatrick
Amir Foroushani
Tosha Freitag
Silvia Frias
Elaine Fuertes
Cathy Fugère
Myriam Gagné
Valérie Gagné-Ouellet
Vivek Gandhi
Nicole Garcia
Tresa George
Sagal Ghelle
Matt Gold
Susanna Goncharova
Ethel Gonzalez
Melissa Gordon
Susan Goruk
Celia Greenwood
Christina Gu
Qingdong Guan
Pampa Guha
Annahita Hadioonzadeh
Ian Haidl
Michelle Halbrich
Mona Hamada
Martha J. Hart
Brenda Helpard
Delia Heroux
Angela Hillaby
Jeremy Hirota
Barnaby Hobsbawn
Ali Hosseini
Doug Houlbrook
Karen Howie
Chynna Huang
Henry Huang
Michael Hughes
Claudia Hui
Linda Hui
Saiful Huq
Robyn Hyde-Lay
Ingrid Ikomiak
Kyla Jamieson
Vai Jayakumar
Cheol-Heon Jeong
Aruni Jha
Ruiwei Jiang
Yayuk Joffres
Meaghan Jones
Lawrence Joseph
Taruna Joshi
Cynthia Kanagaratham
Michael Kariwo
Hessam Kashani
Tosha Kells
Amir Khakban
Katie Killorn
Young Wonng Kim
Nofar Kimchi
Miranda Kirby
Melanie Kjarsgaard
Jacob Klugsberg
Linda Knox
Jordan Koe
Petya Koleva
Joshua Kong
Tedd Konya
Krzystof Kowalik
Joyce Kum
Erika Ladouceur
Austin Laing
Salma Lalji
Angie (Yan Chi) Lam
Chynace Lambalgen
Anick Langlois
Miriam Larouche
Amanda Lau
Flora Lau
Lynda Lazosky

Elizabeth Lee
Diana Lefebvre
Stephanie Legere
Duncan Lejtenyi
Johane Lepage
Claire Lepine
Elizabeth Leung
Marie Levesque
Sara Levine
Kathy Li
Huifang Lim
Bernard Lo
Ingrid Loewen
Jemma Loki-Vuzi
Cristina Longo
Katherine Lortie
Eric Lu
Zihang Lu
Fiona Luke
Zdravko Lukic
Alexandra Lyttle
Julie MacIsaac
Catherine Maheux
Thomas Mahood
Navneet Makker
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Jasjit Singh Mankoo
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Andrea Marrin
Mary Ann Mauro
Suzanne McCollum
Spencer McMullin
Pascal Mercier
Christopher Mill
Jennifer Mill
Joanne Milot
Danielle Minor
Daniel Moldaver
James Monkman
Tae Chul Moon
Giselle Morean
Andréanne Morin
Gregory Moullec
Manali Mukherjee
Natalia Mykhaylova
Kaare Naelapea
Drew Nahirney
Stephanie Nairn
David Ngan
Sergei Nikitenko
Michelle North
Dominik Nowak
Ma'en Obeidat
Caitlin Obminski
Seamus O'Byrne
Megan O'Connor
Jennifer O'Hara
Andrew O'Keefe
Joseph Okeme
John-Paul Oliveria
Hong Ouyang
Popi Panaritis
Nils Pavey
Faye Pedersen
Oliver Perel-Winkler
Ryan Persaud
Keegan Phillips
Samantha Pollard
Audrey Poon
Phaedra Propp
Jennifer Protudjer
Francoise Proust
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Shannon Russell
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Mena Soliman
Lianne Soller
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Nutan Srivastava
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Lisa Steacy
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Tonje Steensen
Yvan St-Pierre
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Hélène Villeneuve
Britt Voaklander
Samuel Wadsworth
Heather Waldhauser
Terry Walker
Brandie Walker
Alethea Wallace
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Ting-I (Tina) Wang
Linda Warner
Stephanie Warner
Brittany Watson
Rick Watson
Yi-Song Wei
Beth Whalen
Michele Willits
Juliana Xie
Dong Yan
Chen Xi (Yolanda) Yang
Jasemine Yang
Yarden Yanishevsky
Madelaine Yona
Zafar Zafari
Xiaobei Zhang
Jenny Zhou
Fay (Yifei) Zhu
Michael Zulyniak

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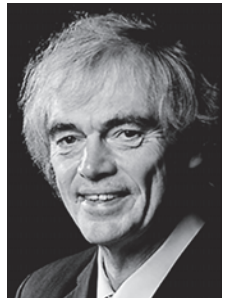
Ottawa, ON, Vice-Chair
(on leave from Mar 2015)

Douglas Barber, PhD
Hamilton, ON
(to Oct 2014)

Glenna Carr, ICD.D
Toronto, ON



Pieter Cullis, PhD
Vancouver, BC
(from July 2014)

Deborah Danoff, MD, FRCP(C), FACP
Ottawa, ON

Patrick Deane, PhD
Hamilton, ON

Judah Denburg, MD, FRCP(C)
Hamilton, ON

Charles Frankish, MD, FRCP(C)
Ottawa, ON

Donald Green
Burlington, ON
(from July 2014)

Christine Hampson, PhD
Toronto, ON

Jean-François Leprince
Montreal, QC

Mark Lundie, PhD
Toronto, ON

Donald Stark, MD, FRCP(C)
Vancouver, BC

Lorne Tyrrell, OC, AOE, MD, PhD, FRCP, FRSC
Edmonton, AB

Harissios Vliagoftis, MD, PhD
Edmonton, AB

Lisa Drouillard
Ottawa, ON
observer
(to May 2014)

Diana Royce, EdD
Burlington, ON
observer

Lianne Soller, PhD (c)
Montreal, QC
observer

Wendy Street
Ottawa, ON
observer
(from May 2014)

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Harissios Vliagoftis, MD, PhD	Associate Professor and Director, Division of Pulmonary Medicine, Department of Medicine, University of Alberta
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Lianne Soller, PhD (c), *observer*	President, ASNPN; McGill University
Wendy Street, *observer*	Senior Program Manager, NCE Secretariat *(from May 2014)*

AllerGen Committees

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Randall Yatscoff, PhD	Executive Vice-President, TEC Edmonton
Lisa Drouillard, *observer*	Program Deputy Director, NCE Secretariat *(to May 2014)*
Pia Reece, PhD, *observer*	Vice-President, ASNPN; McMaster University
Diana Royce, EdD, *observer*	Managing Director and COO, AllerGen NCE Inc.
Wendy Street, *observer*	Senior Program Manager, NCE Secretariat *(from May 2014)*

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Judah Denburg, MD, FRCP(C)	Scientific Director and CEO, AllerGen NCE Inc.
Sylviane Duval	Knowledge Transfer Specialist *(from February 2015)*
Neal Lemon, PhD, MBA	Technology Transfer Officer (Health Sciences), Industry Liaison Office, University of Saskatchewan
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Kevin O'Brien Fehr, PhD	Consultant
Brian Underdown, PhD	Managing Director, Lumira Capital
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Oxana Latycheva, PhD	Interim Director of Primary Health Care, Parkdale Community Health Centre
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Meghan Azad, PhD	Events Director (University of Alberta) *(to June 2014)*
Leah Shaver M.Sc. (c)	Events Director (University of Waterloo) *(from June 2014)*
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Sami Shariff, M.Sc. (c)	Regional Director: West-Central (University of Calgary) *(to June 2014)*
Vivek Gandhi, PhD (c)	Regional Director: West-Central (University of Alberta) *(from June 2014)*
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Stephanie Nairn, PhD (c)	Regional Director: Quebec/Atlantic (McGill University)
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Laura Feldman, MPH (c)	Member-at-Large (University of Toronto) *(from June 2014)*

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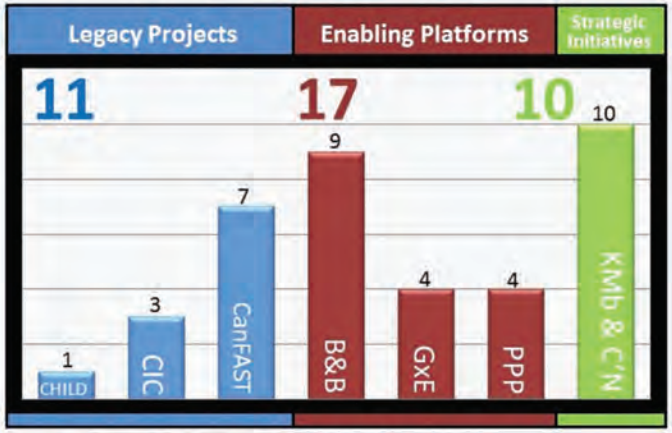
Diana Royce, EdD	Managing Director and COO
Kim Wright	Manager, Communications and Knowledge Mobilization
Carol Ridsdale	Finance Officer
Graziella Infanti	Executive Assistant *(from January 2015)*
Michelle Harkness	HQP and Events Coordinator
April O'Connell	Research Administrator
Marshall Beck	Administrative Coordinator, Communications and Knowledge Mobilization

AllerGen FAST FACTS

2014-2015

NCE : Non-NCE investment leverage ratio
1 : 2.17

Research Investments **38**



Canadian Healthy Infant Longitudinal Development (CHILD) Study

Clinical Investigator Collaborative (CIC)

Canadian Food Allergy Strategic Team (CanFAST)

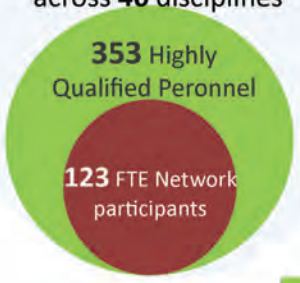
Biomarkers & Bioinformatics (B&B)

Gene-Environment Interactions (GxE)

Patients, Policy and Public Health (PPP)

Knowledge Mobilization (KMb) & Commercialization (C'N)

95 Principal Investigators and Co-Investigators across **46** disciplines



Researchers

133
Partnerships

2005-2015

3272
Publications
(including refereed, specialized and other)

1315
Total Highly Qualified Personnel (HQP)
participants in the Network since 2005

AllerGen

AllerGen NCE Inc.
McMaster University
Michael G. DeGroote Centre for Learning & Discovery
1280 Main Street West, Room 3120
Hamilton, ON L8S 4K1

Telephone: (905) 525-9140 ext. 26502
Fax: (905) 524-0611
E-mail: info@allergen-nce.ca

allergen-nce.ca

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