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Aussi disponible en français

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2015 . 2016

In November 2015, Allergan secured its final three years of federal funding through the Networks of Centres of Excellence (NCE) program.



Corporate Profile

AllerGen NCE Inc. (AllerGen), the Allergy, Genes and Environment Network, is a national research network that aims to help Canadians address the challenges of living with asthma, allergies, anaphylaxis and related immune diseases.

AllerGen was established in 2004 by Innovation, Science and Economic Development Canada (formerly Industry Canada) through the Networks of Centres of Excellence (NCE) Program.

For more than a decade, AllerGen research teams have generated new knowledge, advanced drug development, laid the groundwork for significant future discoveries, forged a strong national research community in allergy, asthma, and anaphylaxis, and expanded related research and clinical training opportunities to nurture a new generation of leaders in the field.

In 2015-2016, 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 1:1.93.

2015-2016 At-a-Glance

318 trainees and young professionals, research associates and technicians	94 network investigators
184 network participants (full-time equivalent)	31 active research projects and strategic initiatives
125 partner organizations across academia, industry, not-for-profit and government sectors	18 international partners

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



In November 2015, AllerGen secured its final three years of federal funding through the Networks of Centres of Excellence (NCE) program. This ongoing support—confirmed following a rigorous assessment of AllerGen’s achievements and plans—will allow the Network to continue its work in allergic disease and asthma research, training and innovation to 2019.

AllerGen approaches its final NCE term with increasing momentum, focus and integration. Over the next three years, working closely with its legacy partners and other stakeholders, the Network will complete its research program and focus on translating and commercializing key findings for the benefit of Canadians with allergic diseases.

Among other enduring legacies, AllerGen will ensure that:

- the Canadian Healthy Infant Longitudinal Development (CHILD) Study continues to generate novel research opportunities and to facilitate ground-breaking discoveries about the early-life origins of allergies, asthma, and other chronic, non-communicable diseases;
- the Clinical Investigator Collaborative (CIC)—a world leader in conducting Phase II clinical trials of new drugs for managing asthma and allergies—emerges as a self-sustaining Academic Contract Research Organization (A-CRO);
- Canadian Food Allergy Strategic Team (CanFAST) research lays the foundation for the creation of an AllerGen-enabled National Food Allergy Strategy, which, in turn, will disseminate the best evidence on the diagnosis, treatment and management of food allergies and anaphylaxis to patients and policymakers;
- an initiative to integrate data and share biological samples across the Network, using a systems medicine approach informed by

the concept of “personalized health,”

amplifies the usefulness of the Network’s findings; and

- the enduring value of AllerGen’s investments in Highly Qualified Personnel (HQP) is made evident through the career trajectories of researchers trained over the lifespan of the Network.

Network participants registered numerous accomplishments in 2015-2016. AllerGen researchers and teams leveraged the Network structure and its array of disciplinary expertise to secure funding for new national networks and team grants.

The publication of Network research in high-impact journals further accelerated, with 399 new publications during the year, bringing the total number of AllerGen publications, presentations and abstracts to over 3,900 since 2005.

Breakthrough scientific findings arising from AllerGen research investments achieved national and international impact and exposure. Representing the largest survey to date on the prevalence of food allergies in Canada, CanFAST research published in October 2015 will be used as a baseline to gauge

if food allergy rates have since been rising or falling. The Cross-Canada Anaphylaxis REgistry (C-CARE) project compiled a fourth year of data and published important findings on the underuse of epinephrine, the likelihood of anaphylaxis recurrence, and increasing anaphylaxis rates among Canadian children.

Cross-Network collaborations between researchers from AllerGen's Gene-Environment Interactions and Biomarkers & Bioinformatics Enabling Platforms resulted in new insights into how diesel exhaust and inhaled allergens provoke molecular changes in the lung tissue of allergy-prone individuals—opening the door to improved prevention strategies and treatments for allergic diseases.

The CHILD Study enabled four scientific discoveries that are delivering seminal new knowledge on the early-life microbiome “window” and its role in the development of allergies and asthma; the impact of antibiotics during delivery on the infant gut microbiome; and the relationship between a mother's prenatal diet and her baby's early physical and cognitive development. These findings attracted worldwide media attention from outlets including *TIME*, *Maclean's*, *Fox News*, *Washington Post*,

BBC, *CTV News*, *Global News* and the *LA Times*, among many others.

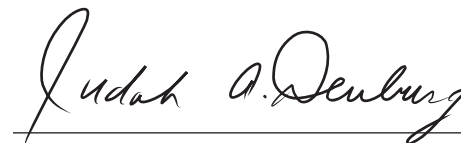
Innovations arising from Network research resulted in four intellectual property disclosures, three licences granted or under negotiation, and three patents filed during the year. The output of Network press releases and associated media coverage was likewise significant, resulting in national and international exposure for AllerGen researchers and teams. Network investigators also contributed to public discourse on topics ranging from the stigma of food allergies to pseudoscience and alternative medicine practitioners.




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


AllerGen's work is of tremendous importance to Canadians. The Network's achievements—an expression of our members' shared commitment to making social and economic impacts—are due to the efforts and dedication of our investigators and HQP, our partners, the Board of Directors, the administrative team, and Research Management Committee (RMC) and advisory committee members.

We appreciate and thank all those individuals and teams, as well as the NCE Secretariat and AllerGen's host institution, McMaster University, for their ongoing support of AllerGen's vision, mission and goals.




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

2015 . 2016



**Researchers using data from
AllerGen's CHILD Study have
traced a solid line between
specific bacteria in an infant's
gut and the risk of developing
asthma.**

2015-2016 Impacts



“Our findings emphasize the importance of the gut microbiome in asthma and point to a window in the first 100 days or so of life when disruptions in the gut’s normal bacterial composition can derail the immune system and lead to asthma down the road,” says Dr. Finlay.

Four gut bacteria may help protect kids from asthma

If you were holding a baby in your arms and wondered if an asthma diagnosis lay in its future, the baby’s diaper might be the last place you would think to look for an answer. But think again: researchers using data from AllerGen’s Canadian Healthy Infant Longitudinal Development (CHILD) Study have traced a solid line between specific bacteria in an infant’s gut and the risk of developing asthma.

The research, published in *Science Translational Medicine* in September 2015, found that infants with low levels of four gut bacteria, abbreviated as FLVR (*Faecalibacterium*, *Lachnospira*, *Veillonella*, and *Rothia*), at three months of age had a significantly higher risk of asthma.

AllerGen investigators Dr. Brett Finlay, a microbiologist and Peter Wall Distinguished Professor at The University of British Columbia (UBC), and Dr. Stuart Turvey, a pediatric immunologist at BC Children’s Hospital and Aubrey J. Tingle Professor in Pediatric Immunology at UBC, led the research. Most infants acquire the FLVR bacteria naturally from their environment. However, some babies are not exposed to them for various reasons, including cesarean-section delivery, or their FLVR levels are diminished due to antibiotic use.

“Our findings emphasize the importance of the gut microbiome in asthma and point to a window in the first 100 days or so of life when disruptions in the gut’s normal bacterial composition can derail the immune system and lead to asthma down the road,” says Dr. Finlay.

From the stool samples of 319 children enrolled in the CHILD Study, the researchers pieced together a picture of the babies’ gut environments and the bacteria living there. They assessed the children for early signs of allergies and asthma during clinical check-ups at one and three years of age. Children with low levels of FLVR at three months of age were more likely to wheeze and to have positive allergy skin tests (telltale signs of future asthma) at one year, even if their FLVR levels had normalized. The researchers then confirmed the protective effect of FLVR in mice.

The study grabbed worldwide attention, generating over 400 international headline stories within 24 hours.

The FLVR discovery could profoundly impact medical practice. “Although more research is needed, this



raises the possibility of flagging children most at risk for developing asthma by testing their microbiome in the first three months of life,” says Dr. Turvey, who is the Vancouver site leader for the CHILD Study. “It also opens the door to developing FLVR probiotic treatments to prevent asthma in the first place.” UBC has filed a patent for the FLVR discovery that could eventually lead to a new therapy.

“We received emails from families affected by asthma thanking us for this work,” adds Dr. Turvey. “We believe this outpouring of gratitude attests to the burden that asthma places on families. People are eager for anything that might help—even bacteria.”

Increasing cases of anaphylaxis among children

Are anaphylaxis rates rising in Canada? Unfortunately, it seems so.

Anaphylaxis—a sudden and potentially life-threatening allergic reaction—is increasing among children, according to a new study compiling four years of data from AllerGen’s Cross-Canada Anaphylaxis Registry (C-CARE).

The study’s findings reveal that the percentage of emergency department (ED) visits due to anaphylaxis doubled between 2011 and 2015, at the Montreal Children’s Hospital of the McGill University Health Centre (MCH-MUHC) in Montreal, QC.

“With the rising rates of allergies among Canadian children, we were interested in determining if anaphylaxis rates are also increasing,” says Dr. Moshe Ben-Shoshan, the AllerGen investigator who leads C-CARE. “Our findings suggest a worrisome increase in anaphylaxis rates that is consistent with

a reported worldwide increase.” Dr. Ben-Shoshan is a pediatric allergist and immunologist at the MCH-MUHC, and an assistant professor of Pediatrics at McGill University.

Published as a Letter to the Editor in the *Journal of Allergy and Clinical Immunology*, the study also identified a serious underuse of epinephrine auto-injectors: just over 50% of those who had an auto-injector used it before they got to the ED, and not using it increased the risk that multiple epinephrine doses would be administered in hospital.

Funded by AllerGen, C-CARE was launched in 2010 and has since collected data from thousands of adults and children treated for anaphylactic reactions. Hospitals, ambulance paramedics, and allergy clinics in Quebec, British Columbia and Ontario contribute data to the registry, and expansion to other parts of the country is underway. It is the first registry in the world to track episodes of anaphylaxis at the time they occur.

“Canadian data on anaphylaxis are sparse and imprecise,” says Dr. Moshe Ben-Shoshan. “The C-CARE database is critical to provide an improved understanding of anaphylaxis—what causes it, how often it occurs, whom it affects, and how it is being treated.”

Dr. Ben-Shoshan and his collaborators believe C-CARE, which has partnership and support from Health Canada and other organizations, is a powerful tool that will improve the management of severe allergic reactions from both a medical and a public health perspective.

“The registry has already helped us to identify which foods are the most common anaphylactic triggers for children and adults, the annual incidence of recurrent anaphylaxis in children, and the frequency of accidental exposure to known allergens,” he says. Health Canada will use C-CARE results to evaluate the role of health policies, particularly those related to food labelling, in the prevention of anaphylaxis in Canada.

As C-CARE expands across the country, it will support the development of a National Food Allergy Strategy for Canada—an AllerGen Legacy initiative that aims to maximize choice and minimize risk for individuals affected by food allergies, inform public policy and educational programming, and facilitate public engagement, debate and dialogue.

CIHR grants \$6M to CHILD Study research

In 2015-2016, three projects using data from AllerGen’s Canadian Healthy Infant Longitudinal

Development (CHILD) Study were awarded approximately \$2 million each, for a total of nearly \$6 million over five years, by the Canadian Institutes of Health Research (CIHR), the federal agency responsible for funding health research in Canada.

“These major funding awards attest to the value of the CHILD Study as a key tool for understanding the effects of genes and the environment on children’s health,” comments Dr. Malcolm Sears, CHILD Study Director at St. Joseph’s Healthcare Hamilton and a professor of medicine at McMaster University.

CHILD Study research teams led by Dr. Stuart Turvey (The University of British Columbia) and Dr. Padmaja Subbarao (University of Toronto) are behind two of the winning grants. Dr. Turvey’s team will investigate how a child’s environment interacts with his or her genome in the development of asthma, as a means to better predict who will get asthma and how it can be prevented. Dr. Subbarao’s team will study gene and environment effects on lung growth and the risk of developing chronic respiratory disease, asthma and chronic obstructive pulmonary disease (COPD).

A third project, led by Dr. Vern Dolinsky (University of Manitoba), will link to CHILD Study data to explore how environmental exposures during pregnancy are associated with childhood obesity,

as a step towards preventing obesity and cardiovascular metabolic disease.

Only eight Canadian research teams—of which three were CHILD Study-related—were awarded funding in the CIHR competition for Programmatic Grants in Environment, Genes and Chronic Disease.

“The broad scope of these projects illustrates how the wealth of data and biological samples in the CHILD Study can inform not only studies of asthma and allergy, as originally proposed, but also studies of the origins of many other chronic diseases of later childhood and adulthood,” observes Dr. Sears. “The CHILD Study has become an international resource for multiple research endeavours that will inform scientific, government and public stakeholders for decades to come.”

Funded by CIHR and AllerGen, the CHILD Study is collecting a vast range of health, lifestyle and environmental exposure information from more than 3,500 mothers and children from pregnancy to age five. The study involves four provinces (British Columbia, Alberta, Manitoba and Ontario), over 40 multidisciplinary researchers, and more than 100 students and research staff.

2015 . 2016

Innovations arising from Network research resulted in four intellectual property disclosures, three licenses granted or under negotiation, and three patents filed during the year.

AllerGen's Integrated Research Program

In 2005, despite an explosion in the prevalence of allergies and asthma, Canada had no coordinated research community in allergic disease and asthma; no national discussion about best practices in related clinical fields; and no focus on developing much needed expertise in clinical care, scientific research or academia. Since 2005, AllerGen has been successfully filling these gaps.

Led by internationally recognized Canadian researchers with expertise across a wide range of disciplines, the Network's 31 active research projects and strategic initiatives aim to promote earlier diagnosis, disease interception, better treatment, and optimal outcomes for Canadians with allergic diseases.



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AllerGen's Integrated Research Strategy

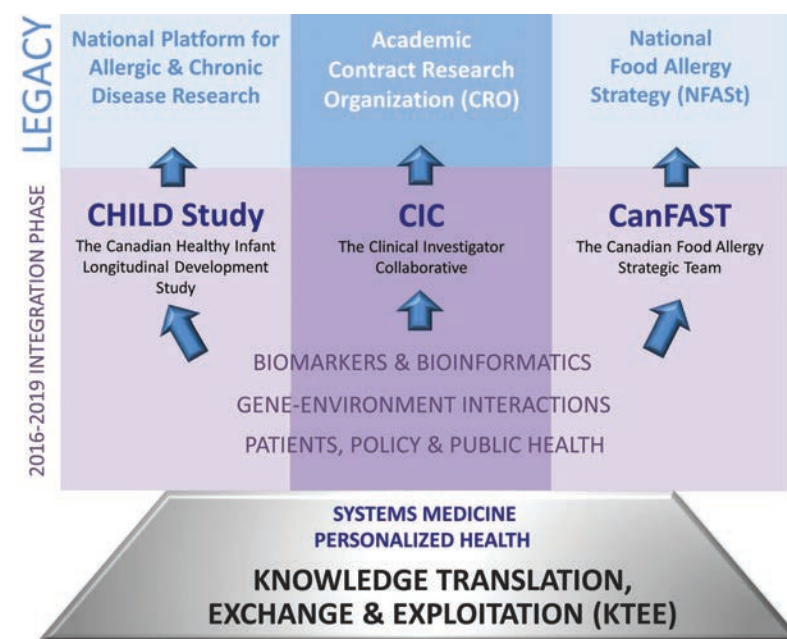
AllerGen Legacy Projects:

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

AllerGen Enabling Platforms:

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

Through strong partnerships, in 2015-2016 AllerGen leveraged its research investments to generate an additional \$8.1 million in cash and in-kind support from partner and stakeholder organizations over the year—a leveraging ratio of 1:1.93.





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 Respiriology, Department
of Medicine, McMaster University
Dr. Padmaja Subbarao, Director,
Pulmonary Function Laboratory,
The Hospital for Sick Children; Associate
Professor, Department of Paediatrics,
University of Toronto

Strategic Focus:

- the largest birth cohort study ever conducted in Canada, following over 3,500 Canadian children and their families
- enabling breakthrough discoveries about the early-life origins of asthma, allergy and other chronic diseases
- an unprecedented pool of early-life human genetics, epigenetics and microbiome data linked with birth cohorts across the world
- involves over 40 researchers/scientists from 30 disciplines and more than 100 research staff and trainees
- in the long term, the CHILD Study will lead to strategies for disease interception, prevention and cure

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; Adjunct
Professor of Medicine, McGill University;
Staff Respirologist, St Joseph's Healthcare
Hamilton
Dr. Anne Ellis, James H. Day Chair in Allergic
Disease and Allergy Research, 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 that evaluates potential drug candidates for the treatment of allergic asthma, severe asthma and allergic rhinitis
- delivers accurate, rapid and cost-effective early-stage results using a globally unique allergen challenge model and proprietary SOPs
- 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 Canadian Food Allergy Strategic Team (CanFAST)

Research Leaders:

Dr. Jean Marshall, Professor,
Departments of Microbiology & Immunology
and Pathology, 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 national, transdisciplinary research consortium that produces new knowledge of food allergy and translates it into clinical and public health practice
- measures the prevalence and socioeconomic impacts of food allergy and anaphylaxis among Canadians
- is co-developing with multiple stakeholders a National Food Allergy Strategy (NFAST) for Canada: a Knowledge Mobilization platform that will position Canada as a global leader in improving the management of food allergy across environments and settings



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, 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 well-established teams working nationally and globally on genetic, environmental and epigenetic research to facilitate the development of public health interventions and policies relevant to asthma and allergies
- generates critical exposure data on maternal/family stress, chemicals and traffic-related air pollution
- aims to discover novel therapies and diagnostics, and to promote advancements in personalized health to tackle the rising burden of chronic, non-communicable diseases

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 Respiriology, Critical Care & Sleep
Medicine, Department of Medicine,
University of Saskatchewan

Strategic Focus:

- unites leading scientists across the country to discover and develop diagnostic, prognostic, therapeutic and mechanistic biomarkers for asthma and allergies
- helps to develop emerging therapies, advance new diagnostic and healthcare options, and to integrate data from across the Network to accelerate advances in patient care and public health
- focuses on disease susceptibility, early diagnosis, discriminating disease sub-types, monitoring drug response, and identifying novel therapeutic targets

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 harnessing interdisciplinary expertise to translate AllerGen research into new evidence-based policies, practices, products and services for the benefit of patients and health professionals
- aims to develop educational and disease management tools, promote public awareness and deliver new knowledge to end-user groups that can apply it for maximum impact

2015 . 2016

Children whose mothers consumed fruit each day during pregnancy performed better on developmental testing at one year of age, according to the study published in the journal *EBioMedicine* in Spring 2016.

Research Highlights

Prenatal fruit consumption boosts babies' cognitive development

New research using data from the CHILD Study suggests that children may reap the health benefits of fruit even before birth.

Children whose mothers consumed fruit each day during pregnancy performed better on developmental testing at one year of age, according to the study published in the journal *EBioMedicine* in Spring 2016.

AllerGen investigator Dr. Piush Mandhane, an associate professor of Pediatrics in the University of Alberta's Faculty of Medicine & Dentistry, and Edmonton site leader of the CHILD Study, led the research.

"We wanted to know if we could identify prenatal and postnatal factors that affect cognitive development," says Dr. Mandhane. "We found that one of the biggest predictors of cognitive development was how much fruit a mother consumed during pregnancy. The more fruit a mom had, the higher her child's cognitive development."

The study examined data from 688 children participating in the CHILD Study and controlled for factors that would normally affect a child's

learning and development, such as family income, parental education and the child's gestational age.

Using a traditional IQ scale as a model, the study showed that if pregnant mothers consumed six or seven servings of fruit or fruit juice a day, on average their infants placed six or seven points higher on the scale at one year of age. "It's quite a substantial difference—that's half of a standard deviation," Dr. Mandhane explains.

To further build on their findings, the researchers showed similar results in a laboratory test on fruit flies—the more fruit the flies ate before laying eggs, the better the offspring performed in specially adapted tests.

While these findings suggest the more fruit the better, the researchers caution that their study has not considered the potential complications of increasing natural sugar intake, such as gestational diabetes and high birthweight.

"Our future research will investigate whether the benefits of prenatal fruit consumption persist in children over time," says Dr. Mandhane. "We also hope to determine if fruit can influence cognitive functions such as planning, organizing and working memory."

Early childhood eczema linked to food allergies

AllerGen researchers have published the first study to link eczema in the first two years of life to common food allergies.

The research, published in the *International Archives of Allergy and Immunology* (April 2015) and featured in an issue of *Pediatric Chronicle*, concluded that eczema in the first two years of life was a risk factor for egg, peanut, tree nut and fish allergy—but not for allergies to milk and shellfish.

"It is likely that the impaired skin barrier seen in early childhood eczema allowed certain allergens to penetrate the skin, promoting allergic sensitization," says AllerGen investigator Dr. Moshe Ben-Shoshan, a pediatric allergist at the Montreal Children's Hospital, who was lead author on the paper. "This research supports the hypothesis that there is a critical age interval in which eczema increases the risk for many food allergies."

The authors note that understanding the role of the skin barrier in relation to the development of food allergies is of particular interest, as it represents a potentially modifiable risk factor.



Understanding the relationship between air pollution and allergic respiratory disease

New research led by The University of British Columbia (UBC)-based lab of AllerGen investigator Dr. Christopher Carlsten has generated insight into how diesel exhaust (DE) and inhaled allergens can provoke molecular changes in the lung tissue of allergy-prone individuals.

In cross-Network collaborations with AllerGen investigators Dr. Scott Tebbutt (Associate Professor in the Department of Medicine at UBC) and Dr. Michael Kobor (Professor in the Department of Medical Genetics at UBC), Dr. Carlsten's research brings us closer to understanding the role of air pollution in the development and progression of allergic respiratory disease, including asthma.

In April 2016, the Carlsten-Tebbutt labs published findings on the effects of DE and allergen co-exposures on inflammatory lung markers in *The Journal of Allergy and Clinical Immunology* (JACI).

The study found that allergen exposure evoked significant changes in gene and miRNA profiles measurable at 48 hours, while the effects of DE were less pronounced. It also found that co-exposure appeared to induce unique effects,

AllerGen Research Leader Dr. Ann Clarke, a professor in the Department of Medicine at the University of Calgary, was senior author on the paper, titled "Eczema in Early Childhood, Socio-demographic Factors and Lifestyle Habits Are Associated with Food Allergy: A Nested Case-Control Study."

The research was conducted as a population-based nested case-control study within AllerGen's nationwide SPAACE survey (*Surveying Prevalence of food Allergy in All Canadian Environments*),

which surveyed 5,734 Canadian households about food allergies.

Dr. Clarke is co-leading the next phase of AllerGen's food allergy prevalence research via the project *Surveying the Prevalence of food Allergy in All Canadian Environments: Trends over Time (SPAACE 2 SPAACE)*. This study will determine whether or not food allergy prevalence is increasing in Canada by conducting interviews with 15,000 households about food allergies five years after the SPAACE survey.

though these were not seen when the data was subjected to a conservative statistical model. The researchers concluded that the changes they documented were “remarkable and novel,” given the stringent statistics applied and that previous studies tended to measure effects at 24 hours or earlier and focus on the upper (not lower) airway.

For a second *JACI* study published in May 2016, the Carlsten-Kobor labs explored the role of DNA methylation in the lung’s immune response to allergens and DE.

This study found that exposure to either allergen or DE alone, and co-exposure to both, resulted in modest DNA methylation within 48 hours. However, sequential exposures to first one and then, four weeks later, the other, produced a much greater effect. The researchers concluded that “specific exposures appear to prime the lung for changes in DNA methylation induced by a subsequent insult.”

These studies provide further evidence that air pollution and inhaled allergens have significant allergy-relevant effects on cell biology. These insights, in turn, may contribute to improved prevention strategies and treatments for allergic diseases, especially given that current therapies

do not control well for exacerbating factors like air pollution.

Artificially sweetened drinks during pregnancy increase infant BMI

A study of over 3,000 Canadian mothers and their infants has shown that consumption of artificially sweetened beverages during pregnancy may place infants at an increased risk of obesity.

This breakthrough finding from AllerGen’s CHILD Study provides the first human evidence that exposure to artificial sweeteners *in utero* is associated with body mass index (BMI) in the first year of life and may contribute to the development of early childhood overweight.

“Animal research has suggested that consuming artificial sweeteners during pregnancy can pre-



dispose offspring to develop obesity, but to our knowledge, this has never been studied in humans,” says lead author Dr. Meghan Azad, an assistant professor in pediatrics and child health, Rady College of Medicine, Rady Faculty of Health Sciences, University of Manitoba, and research scientist at the Children’s Hospital Research Institute of Manitoba.

“Given the current epidemic of childhood obesity and the widespread consumption of artificial sweeteners, we wanted to find out if a mother’s prenatal

intake may be associated with her baby’s BMI,” adds Dr. Azad, who is an associate investigator of the CHILD Study. “CHILD provided us with an incredibly rich source of data to examine this important health issue.”

As part of the study, women completed dietary assessments in their second or third trimester of pregnancy and infant BMI was recorded during clinical assessments. Daily maternal consumption of artificially sweetened beverages was associated with a twofold higher risk of infant overweight.

The research was published in *JAMA Pediatrics* and involved CHILD Study investigators across four provinces at the University of Manitoba, the University of Alberta, The University of British Columbia, the University of Toronto and McMaster University.

Childhood obesity is a major public health challenge in Canada and obesity rates have doubled since the 1970s, with nearly one in three children now classified as overweight or obese, the authors note.

“While more research is warranted to confirm our findings and investigate the underlying biological mechanisms, we hope that this research will help to inform evidence-based dietary recommendations for pregnant women,” notes Dr. Azad.

Understanding asthma control preferences of parents and teens

Understanding the views of parents and children is critical to designing effective asthma management programs, yet these preferences are often not incorporated into clinical practice guidelines.

“Practice guidelines place equal weight on achieving various parameters of asthma control, but fail to reflect the fact that parents and children have



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different preferences with regard to which parameters they feel are most important,” says Dr. Wendy Ungar, an AllerGen investigator and Senior Scientist in Child Health Evaluative Sciences at The Hospital for Sick Children.

To quantify these preferences, Dr. Ungar led an AllerGen-funded study that measured and compared the views of parents and teens on factors they perceived to be important in asthma control.

Fifty-two parents of children with asthma and 44 teens with asthma were surveyed regarding night-time symptoms; wheezing/chest tightening; changes in asthma medications; emergency room visits; and limitations in physical activity.

The study, published in *BMC Pulmonary Medicine* in November 2015, revealed that parents valued avoiding night-time asthma symptoms (most preferred) and disliked incurring 10 emergency room visits per year (least preferred).

Teens valued not having limitations on their physical activity (most preferred) and disliked having 10 physical activity limitations per month (least preferred).



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“Asthma education and asthma management plans tend to use ‘one size fits all’ approaches that assume parents and children want exactly the same things with respect to asthma control,” says Dr. Ungar. “Our research pinpoints their

different preferences, which we hope will help to inform the design of more effective, tailored clinical practice guidelines and asthma education programs.”

2015 . 2016

In 2015-2016, several Network trainees undertook research visits to international partners, fostering global research collaboration, knowledge exchange, and networking.



Network Partners, Collaborators and Knowledge Users

As Canada's allergic disease research network, AllerGen links researchers, students, industry and community partners, and other organizations across academia, industry, not-for-profit and government sectors.

Partners play a vital role in shaping and enhancing AllerGen's research outcomes, and in translating and commercializing key findings for the benefit of Canadians with allergic diseases.

In 2015-2016, AllerGen worked with 125 partners, engaging an average of four partners per research project.

2015-2016 Partners List (n=125)

Universities (n=26)

(17 Canadian, 9 International)

Changzhou University
 Charité Universitätsmedizin Berlin
 Dalhousie University
 Harvard University
 Karolinska Institute
 Lakehead University
 McGill University
 McMaster University
 Queen's University
 Simon Fraser University
 Stanford University
 The University of British Columbia
 The University of Newcastle
 The University of Western Australia
 Université de Montréal
 Université du Québec à Chicoutimi
 Université Laval
 University of Alberta

University of Calgary

University of Manitoba

University of Nebraska

University of Ottawa

University of Queensland

University of Saskatchewan

University of Toronto

University of Waterloo

Hospitals and Health Centres (n=9)

Centre for Heart and Lung Innovation
 Centre Hospitalier universitaire (CHU)
 Sainte-Justine
 Hôpital du Sacré-Cœur de Montréal
 Institut universitaire de cardiologie et
 de pneumologie de Québec (IUCPQ)
 Kingston General Hospital
 St. Joseph's Healthcare Hamilton
 St. Michael's Hospital
 The Hospital for Sick Children
 The McGill University Health Centre

Industry (n=34)

(28 Canadian, 6 International)

Adiga Life Sciences Inc.
 Allergic Living
 AstraZeneca Canada Inc.
 AUG Signals
 Carr-Gordon Limited
 Chenomx Inc.
 CTI Life Sciences Fund
 David Brener & Associates Inc.
 Deborah Danoff Consulting
 Fluidigm Corporation
 GlaxoSmithKline
 Greenfleet Ltd.
 Kanata Allergy Services Ltd.
 Kincora Innovation
 Knopp Biosciences
 Lincoln Diagnostics Inc./ALK
 Lumira Capital
 McDonald's Restaurants of Canada Limited
 NanoString Technologies

AllerGen NCE Inc.

Novartis Pharmaceuticals Canada Inc.
 PerkinElmer Inc.
 Pfizer Canada Inc.
 Pro-Bio Associates
 Roche Canada
 Sanofi Pasteur Limited
 Shoppers Drug Mart Corporation
 Sylviane Duval Consulting
 Takeda Canada Inc.
 TEC Edmonton
 Teva Pharmaceutical Industries Ltd.
 Trudell Medical International
 TVM Capital
 Vedanta BioSciences
 Westmed, Inc.

Federal Agencies (n=5)

Canadian Foundation for Innovation
 Canadian Institutes of Health Research
 Environment and Climate Change Canada
 Health Canada - Clean Air Regulatory Agenda
 Health Canada - Food Directorate

Provincial Agencies (n=8)

Fonds de recherche du Québec
 Healthy Child Manitoba
 Healthy Child Manitoba - Families First
 Michael Smith Foundation for Health Research
 Ontario-China Research and Innovation Fund
 Ontario Ministry of Health and Long-Term Care
 Ontario Ministry of Labour
 Public Health Ontario

Non-Profit, Networks and Professional Associations (n=34)

Allergies Québec (AQ)
 Allergy/Asthma Information Association (AAIA)
 American Academy of Allergy, Asthma
 & Immunology (AAAAI)
 Asthma Society of Canada
 British Columbia Lung Association
 Canadian Allergy, Asthma and Immunology
 Foundation (CAAIF)
 Canadian Anaphylaxis Initiative
 Canadian Lung Association/Canadian
 Thoracic Society (National Office)
 Canadian Respiratory Research Network
 Canadian Society of Allergy and Clinical
 Immunology (CSACI)
 Centre for Drug Research and Development
 (CDRD)
 Centre of Excellence for Prevention of
 Organ Failure (PROOF)
 Childhood Asthma Foundation
 City of Hamilton
 Compute Canada
 DeGroote Family - William J. Walsh
 Professorship in Medicine
 Dietitians of Canada
 Food Allergy Canada
 JP Bickell Foundation
 Fondation Fast/Fast Foundation
 M. Alex Harvey
 Manitoba Medical Services Foundation

Markin USRP Summer Studentship
 Mitacs
 NeuroDevNet
 Ontario Centres of Excellence
 Palix Foundation
 Réseau Québécois de l'asthme et de la MPOC
 Saskatchewan Health Research Foundation
 St. Joseph's Healthcare Foundation
 SickKids Foundation
 Stem Cell Network
 The Sandbox Project
 University Health Network (UHN)

Research Institutes (n=9)

Alberta Children's Hospital Research Institute
 Biomedical Research Centre
 Centre for Blood Research (UBC)
 Children's Hospital Research Institute of Manitoba
 Farncombe Family Digestive Health Research Institute
 Helmholtz Zentrum München
 Munich Allergy Research Center (MARC)
 Southern Ontario Centre for Atmospheric Aerosol
 Research
 Women and Children's Health Research Institute

International Partnerships

Through strategic international partnerships and collaborations, AllerGen provides innovative training and skill acquisition opportunities for the Network's students, new professionals and research staff.

The *International Trainee Research Visit Program* funds selected AllerGen trainees to spend up to six months outside of Canada working on research projects with international investigators and research teams.

In 2015-2016, several Network trainees undertook research visits to international partners, fostering global research collaboration, knowledge exchange, and networking.

Studying second-hand smoke and food allergy in Sweden

Laura Feldman spent four months with AllerGen partner organization the Karolinska Institute in Stockholm, Sweden, investigating the effects of early-life exposure to second-hand smoke on the development of food allergy symptoms among children in a population-based Swedish birth cohort. Ms. Feldman, a Masters of Public Health (Epidemiology) candidate at the University of Toronto's Dalla Lana School of Public Health,



"As a result of this once-in-a-lifetime opportunity, I have been able to meaningfully contribute to the scientific literature on the impact of environmental exposures on allergic disease outcomes. On a personal level, I have experienced immense growth as an epidemiologist-in-training, and have built valuable personal and professional relationships."

Laura Feldman, MPH(c), University of Toronto



"This exchange provided me with invaluable experience conducting research in a high-calibre international research institute. The studies I initiated have been continued by others, and additional collaborative experiments conceived of during my visit are now in progress—hopefully leading to a long-lasting and fruitful relationship between the VIB at the University of Ghent and AllerGen."

Matthew Gold, PhD(c), The University of British Columbia

was supervised by Dr. Anna Bergström and by Dr. Jennifer Protudjer, a postdoctoral fellow and former AllerGen trainee.

Building ties in Belgium

Matthew Gold, a PhD candidate in Experimental Medicine at The University of British Columbia, spent nine weeks in the laboratory of Dr. Bart Lambrecht at the Vlaams Instituut voor Bio-technologie (VIB) Inflammation Research Centre of the University of Ghent, in Ghent, Belgium. During his research visit, Mr. Gold honed his

expertise in the influence of dendritic cells on type 2 helper (Th2) cells—cells which appear to play a triggering role in certain allergy-related immune responses.

Working with a global pioneer at Harvard

Dr. Michelle North, a postdoctoral fellow in the department of Biomedical and Molecular Sciences at Queen's University, spent the summer of 2015 at the Harvard T.H. Chan School of Public Health in Cambridge, MA. Under the supervision of Dr. Andrea Baccarelli, she analyzed the mitochondrial DNA



**Dr. Michelle North with
Dr. Andrea Baccarelli at the
Harvard School of Public Health.**

"This research visit provided me with specialized skills that can be obtained in only a few laboratories in the world and I had the opportunity to work with a pioneer in mitochondrial epigenetics. This experience helped me secure a postdoctoral fellowship at the University of Toronto, will enhance my competitiveness for the next stage of my career, and will help me to achieve my goal of developing an independent research program."

Michelle North, Postdoctoral Fellow, Queen's University

of children participating in The Kingston Allergy Birth Cohort—part of her research on the early-life origins of allergic disease.

Legacy Partnerships

One in three Canadians is affected by allergic disease; nearly three million Canadians suffer from asthma; approximately 21,000 Canadians die each year due to air pollution; and 7.5% of the population self-report a food allergy.

In 2015-16, AllerGen strengthened its partnerships with organizations critical to AllerGen's research and HQP training mandate to 2019 and beyond.

Legacy funding for AllerGen's *Clinician-Scientist Fellowship* post-2019

A legacy partnership with the Canadian Allergy, Asthma and Immunology Foundation (CAAIF) will ensure that AllerGen's flagship *Emerging Clinician-*

Scientist Fellowship award continues to support Canadian innovation and capacity building for years to come.

AllerGen has awarded three *Emerging Clinician-Scientist Fellowships* since 2011. Valued at \$250,000 each, these awards have enabled newly trained Canadian allergists and immunologists to advance their research expertise and pursue a combined career as clinicians and academic researchers.

In March 2016, the AllerGen Board of Directors announced that CAAIF will provide legacy funding to support this award from 2019-2022, and potentially in perpetuity, after the completion of AllerGen's NCE mandate in 2019.

"AllerGen has recognized that the need for more clinician-scientists in the field of allergy and clinical

immunology is a persistent challenge that will extend beyond the life of AllerGen as an NCE," said Dr. Howard Bergman, AllerGen's Chairman of the Board. "We are thankful for CAAIF's partnership to extend the reach of this important award, which aims to address the shortage of clinician-scientists in allergy and clinical immunology."

"Clinician-scientists are uniquely positioned to make a major contribution to the translation of research knowledge into improved patient care and health," adds CAAIF President, Dr. Susan Waserman. "CAAIF is thrilled to partner with AllerGen on this award, and to carry on the legacy they have established into the years beyond NCE support."

Previous recipients of the *Emerging Clinician-Scientist Fellowship* have made significant contributions to the field of allergic disease. Dr. Moshe Ben-Shoshan (2011, McGill University) has established a Canadian database of anaphylaxis cases, tracking the rate, triggers and management of anaphylaxis across provinces and health-care settings.

Dr. Phillipe Bégin (2013, Centre hospitalier universitaire Sainte-Justine) trained at Stanford University

in the Stanford Alliance for Food Allergy Research (SAFAR) clinical research centre under Dr. Kari Nadeau, where he advanced the development of cost-effective approaches to oral immunotherapy for food allergies.

Dr. Marylin Desjardins (2014, Research Institute at McGill University Health Centre; Montreal Children's Hospital) is studying 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.

The joint award will be re-named the *AllerGen-CAAIF Emerging Clinician-Scientist Fellowship*.

Cross-network partnership with CRRN deepens

In 2015-16, AllerGen and the Canadian Respiratory Research Network (CRRN) further strengthened their strategic partnership in areas critical to their mandates, including supporting new investigators, training and integrating Highly Qualified Personnel, and fostering cross-network collaboration. The two organizations were actively engaged at all



CRRN AGM participants, January 12-15, 2016, Ottawa, ON

levels, from senior network management to the student grassroots.

AllerGen's Managing Director, Dr. Diana Royce, attended the CRRN's Annual General Meeting in January 2016, where she spoke about how to build and sustain a well-functioning network of expertise, and the importance of sharing expertise across Networks.

"Together, AllerGen and CRRN aim to improve patient care and outcomes for Canadians with chronic respiratory diseases, such as asthma and chronic obstructive pulmonary disease," said

Dr. Royce, following the two-day meeting. "Our joint vision for cross-Network collaboration through research conferences, meetings, workshops, symposia and capacity-building programs will ensure research momentum, and will extend and continue the skill development opportunities that AllerGen has provided its trainees since 2005."

In April 2016, AllerGen funded four of its trainees and its Manager of Highly Qualified Personnel Training Program and Events, Michelle Harkness, to attend the 2nd Annual CRRN/RENASCENT Training Workshop in Halifax, NS. The workshop



CRRN/RENASCENT workshop participants, April 16, 2016, Halifax, NS

focused on strategies for effective knowledge translation and offered opportunities for networking among trainees.

AllerGen HQP participants included Mena Soliman, Laura Feldman, Jasmine Yang and Vivek Gandhi.

From May 29-June 1, 2016, CRRN investigators and trainees participated in the 2016 AllerGen Research Conference. CRRN trainee representatives served on AllerGen's trainee committee — the ASNPN Executive—to collaborate on the planning and execution of the conference's HQP

activities. Post-conference, the CRRN representatives continued on the committee as guests, to encourage ongoing collaboration and exchange.

Also in 2016, the two organizations granted the second *CRRN/AllerGen Emerging Research Leaders Initiative (ERLI) Award*. This joint award will support the research of Dr. Azadeh Yadollahi, an assistant professor at the Institute of Biomaterials & Biomedical Engineering, University of Toronto, who is investigating the role of fluid shift on the pathophysiology of asthma. Specifically, Dr. Yadollahi

will study the hypothesis that lying down during sleep causes fluid to move out of the legs and into the chest, where it swells the airway wall, thus narrowing the airway and worsening asthma symptoms overnight.

CAAIF and AllerGen boost innovative research

Two Research Fellowships, co-funded in 2015-16 by the Canadian Allergy, Asthma and Immunology Foundation (CAAIF) and AllerGen, are supporting the innovative research of exceptional young scientists in the field of clinical immunology and allergy.

In 2016, *CAAIF-AllerGen Research Fellowships* were awarded to Dr. Catherine Biggs (The University of British Columbia) and Dr. Nicholas Jendzjowsky (University of Calgary), providing funds to support their salaries and a research allowance towards research-related expenses, including travel to national and international scientific meetings.

Dr. Biggs (MD) attended medical school at The University of British Columbia (UBC) and completed her sub-specialty training in allergy and clinical immunology at Harvard Medical School/ Boston Children's Hospital.

The Fellowship will allow Dr. Biggs to work with AllerGen investigator and pediatric immunologist Dr. Stuart Turvey (UBC) to study eosinophils, a type of white blood cell. Her research will examine a rare mutation in the Janus kinase 1 (JAK1) gene, which leads to high eosinophil levels and organ system inflammation. Working with a Canadian family comprising the only people known to have a heritable form of the JAK1 mutation, Dr. Biggs will characterize the functional impact that this genetic defect has on the immune system. Her research will generate new knowledge on the mechanisms behind eosinophil survival and will have therapeutic implications not only for rare disorders such as JAK1, but also for common allergic diseases.

With support from the *CAAIF-AllerGen Research Fellowship*, Dr. Jendzjowsky (PhD) will work with Dr. Richard Wilson at the University of Calgary to study the origins of asthma in the central nervous system and neural interactions with lung inflammation. His research will enhance our understanding of the origins of asthmatic disease and will potentially provide a platform to test new drug therapies, which may benefit patients with asthma and inflammatory lung disease.



2015 . 2016

**A “food free” pilot program informed by
AllerGen research helped an Ontario
library become a more welcoming
space for everyone.**



Knowledge and Technology Exchange and Exploitation (KTEE)

In 2015-16, AllerGen published high-impact research findings that captured the attention of the scientific and clinical communities, government, industry and the general public. AllerGen's knowledge mobilization and commercialization activities accelerated the uptake and application of these results both within and beyond the Network to partner organizations, stakeholders and receptor communities across the country.



Knowledge Mobilization

AllerGen Success Stories

AllerGen's *Success Stories* is written for Canadian families and healthcare providers, providing up-to-date information on cutting-edge research into asthma, allergies and anaphylaxis and exploring what causes these illnesses, how better to manage, treat and prevent them, and steps towards finding cures.

AllerGen has published and distributed nine issues of *Success Stories* to over 1,200 Network participants, partners and knowledge users since 2010.

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

AllerGen's food allergy research drives library's policy change

Keeping toddlers and preschoolers with food allergies safe in the busy children's spaces of a public library can be daunting. But the success of a 2016 "food free" pilot program—informed by AllerGen's Canadian Food Allergy Strategic Team's

(CanFAST) food allergy research—has helped a Markham, Ontario library become a more welcoming space for everyone.

Markham parents Dr. Jyoti Parmar and Mr. Peter Deboran used to make regular family outings to their local library branch. But when two of their three young children developed food allergies, they began restricting their visits.

"Parents and caregivers feed children while they are playing in the kids' book sections and story-time areas," says Parmar. "Food drops on the



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floor, is smeared onto the tot tables, and even gets onto the books themselves. As parents of allergic children, we are extremely vigilant, but it became an enormous challenge to make sure our kids didn't touch or eat the foods that other children were snacking on at the library."

Citing AllerGen CanFAST prevalence data that revealed 7.5% of the population, or one in 13 Canadians, has a food allergy (Soller *et al.*, 2015), the couple made a formal presentation to the

Library Board in November 2015, to share their experiences and to propose a food and beverage restriction in the children's spaces of the library.

Following a Board-approved four-month pilot project to evaluate the effectiveness and impact of a no-food zone in the children's area, the findings were presented in May 2016. In a customer satisfaction survey: 64% of patrons felt that the no-food zone was beneficial; 19% maintained that the library should allow food in the children's

area; and 17% had no preference. Further, 83% reported that their satisfaction with the library had increased; 82% felt that the children's area was cleaner; and 68% felt safer when bringing their children to the library.

As a result of the pilot's success, the *Food and Drink Policy for the Markham Public Library* was amended, and all city branches will adopt the no-food zone policy in children's areas.

"We are excited that we can enjoy the library again as a family," says Parmar. "AllerGen's research on the prevalence and impact of food allergies helped us to achieve this important change in our community, which will create a safer and more inclusive environment for Markham citizens."

Award-winning video features CHILD Study

AllerGen's CHILD Study video received first place and a \$5,000 prize in a 2015 competition run by the CIHR-Institute for Human Development, Child and Youth Health.

The "IHDCYH Talks" competition recognizes excellence in videos that present evidence-based research to a lay audience and incorporate a

message designed to have a positive impact on the health of children, youth and families.

The CHILD Study video scored an average of 4.45 out of 5.0 on criteria ranging from: impact and relevance; accessibility; innovation and creativity; video quality and reach. It received 2,900 views on the CIHR website and the highest number of online public votes among all 13 entrants.

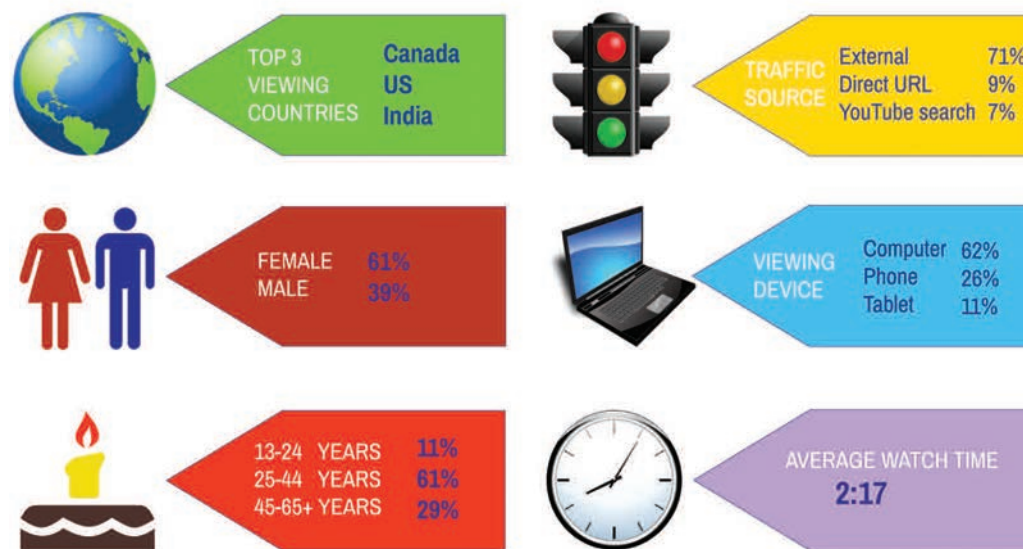
Since July 2015, the video has registered nearly 7,000 views in 88 countries.

AllerGen research on the move

Each year, AllerGen participates in high-impact workshops and events with partners across the country to mobilize the Network's allergic disease research and knowledge to those who can put it into practice.

In May 2015, AllerGen partnered with Food Allergy Canada at its 8th Annual Conference held in Toronto, Ontario, featuring the theme "Unlocking the mysteries of food allergy: what can we learn from research?" The event informed patients, caregivers, educators, and healthcare professionals about trends in food allergy research and food labelling

CHILD Study video: Who's watching? AllerGen YouTube Analytics (July 2015-June 2016)



initiatives, emphasizing their relevance to the allergy community.

Approximately 300 delegates, including members of the general public, and pharmaceutical and food industry representatives, attended the conference. The full-day program featured presentations and discussions with leading experts in food allergy research, food science, and food labelling and risk

assessment, as well as a dynamic youth panel where teens and young adults talked about their experiences living with food allergies.

As Food Allergy Canada's primary research partner, AllerGen provided expert speakers, sponsorship, a booth display and resource materials to share its body of food allergy and anaphylaxis research with the general public and policymakers. AllerGen's

Managing Director, Dr. Diana Royce, provided an overview of AllerGen's national food allergy prevalence data, and spoke about the development of an AllerGen-enabled National Food Allergy Strategy (NFASt), which aims to bundle and disseminate the best available evidence on the diagnosis, treatment, and management of food allergy and anaphylaxis.

In Fall 2015, AllerGen joined the Quebec Association for Food Protection (AQIA), an affiliate of the International Association for Food Protection, for its 6th Annual Meeting held September 30 to October 1 in Quebec City. The two-day event featured a line-up of international scientists and professionals who debated emerging issues in and perspectives on food allergen management.

Dr. Judah Denburg, AllerGen's Scientific Director and CEO, delivered a keynote presentation about the Network's contribution to knowledge generation, dissemination and policy development related to food allergy management. Dr. Susan Elliott, co-leader of AllerGen's Patients, Policy and Public Health Research Platform, spoke about AllerGen's national food allergy prevalence data and outlined the imperatives of the AllerGen-enabled NFASt for Canada.

Food-allergic students face stigma in Ontario schools

Has Sabrina's Law impacted the lives of food-allergic students?

A 2015 paper by AllerGen researchers examined this question. It is the first study of its kind to explore the social implications of Sabrina's Law—the legislation requiring Ontario schools to establish an anaphylaxis policy and individual action plans for each allergic student.

Sara Shannon—mother of Sabrina Shannon, who died at 13 years of age in 2003 from an anaphylactic reaction at school, and after whom the legislation is named—co-authored the paper with AllerGen investigators Drs Susan Elliott (University of Waterloo) and Ann Clarke (University of Calgary), and collaborators Drs Nancy Fenton and Jennifer Dean (University of Waterloo).

The researchers interviewed 20 children at risk for anaphylaxis and their parents two years after Sabrina's Law was enacted. While the legislation was intended to create a safe environment for allergic youth, the in-depth interviews revealed that 75% of students and their parents also reported negative implications resulting from the process of disclosing their health status.



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"Certain practices and policies implemented under Sabrina's Law to ensure safety, such as removing allergic students from the classroom and posting photos of allergic students, resulted in some children feeling stigmatized," explains Dr. Jennifer Dean, an assistant professor at the University of Waterloo and the paper's first author. "On a social

level, the disclosure process did subject some allergic youth to stigmatization and isolation, and this affected some students more than others."

Stigma was categorized as either "enacted," through overt discrimination and bullying by classmates, or "felt," where the student internalized feelings of shame, fear or worry about future discrimination.

On the other hand, the study credited Sabrina's Law with contributing to the cultural shift in awareness of food allergies, which has had beneficial effects for the allergic population.

"Questions were raised at the time that Sabrina's Law was introduced regarding the potential of it doing more harm than good," comments Dr. Susan Elliott, an AllerGen Research Leader and a professor of Geography and Environmental Management at the University of Waterloo. "Our findings have shown that Sabrina's Law is an important tool to promote education and awareness in schools, but we need to be mindful about how we operationalize the legislation so we can balance protecting the physical safety of food-allergic children with their social well-being."

The paper was published in *Health and Social Care in the Community* in May 2015.

AllerGen Media Activity 2015-2016

 **399**
Research Publications

 **36**
Newsletters

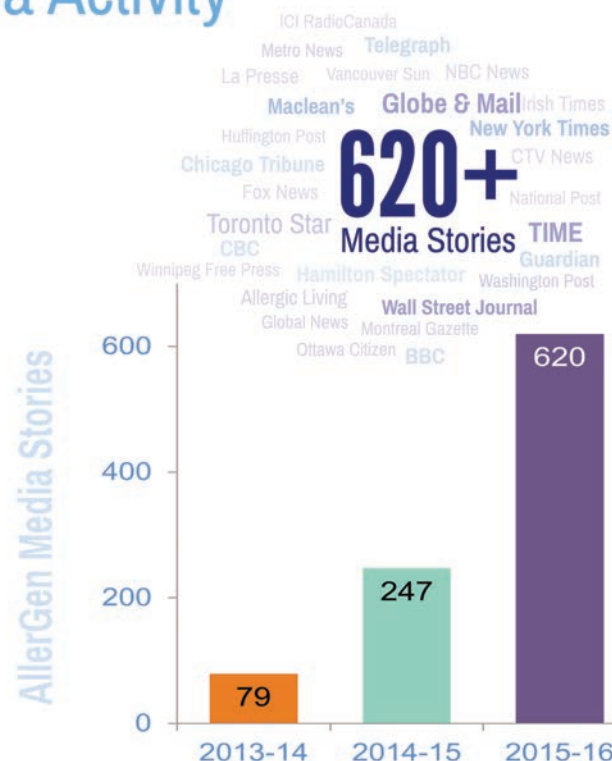
 **10**
Press Releases

As at March 31, 2016

155,550
Website views
since 2008

13,000
YouTube Views
since 2015

1,068
Twitter Followers
since 2012



Commercialization

Peer power: Helping kids with asthma to help each other

Children living with asthma and allergies need all the support they can get. For over 40 years, the Asthma Society of Canada (ASC), an AllerGen legacy partner, has provided expert advice and support to adults and children affected by asthma—and now the organization will do even more to let Canadian kids know they are not alone.

In February 2016, the ASC signed a non-exclusive, non-revenue generating licensing agreement with AllerGen and the University of Alberta (TEC Edmonton) to adapt and offer to the public a unique peer mentoring program developed by AllerGen investigator Dr. Miriam Stewart.

“Children face many challenges managing their asthma and the stigma associated with having a chronic condition,” says Vanessa Foran, President

& CEO of the ASC. “This agreement allows us to offer a free online program that will empower kids to develop greater confidence and better communication skills, and help them live an active, symptom-free life by connecting them with other children and peer mentors who have faced similar experiences.”

Program materials were designed by an interdisciplinary team led by Dr. Stewart, a professor of nursing at the University of Alberta, with research funding provided by AllerGen. From 2011 to 2013, these resources were refined and pilot-tested with community partner organizations through grants from AllerGen and Alberta Innovates-Health Solutions.

In 2014, Food Allergy Canada (FAC), another AllerGen legacy partner, first licensed and adapted these resources, launching *Allergy Pals* (for youth aged 7-11 years), followed in 2015 by *Allergy Allies* (12-15 years)—customized peer-support programs for children and teens affected by severe food allergies. Since 2014, over 300 Canadian children have been mentored online, sessions have reached maximum capacity, and 100% of parents report that they would recommend the program to others.



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2015-2016 “Planning for Research Success” Webinar Series



Jason Ding (TEC Edmonton) offered a wealth of helpful business planning tools and expert tips on IP valuation.



Jonathon Jafari (CDRD) provided insight into how to identify and reach potential end-users of research outputs.



Dr. Brian Underdown (Lumira Capital) discussed how to attract investment and partners to research and innovation endeavours.



Dr. Pieter Cullis (The University of British Columbia) shared “stories from the trenches” of research commercialization through his experiences as a businessman-scientist.



Dr. Antoine Hakim (University of Ottawa) revealed his lessons learned in the Stroke Network leveraging research evidence to change public policy and stroke care delivery on a national scale.

AllerGen facilitated the development of the agreements with both ASC and FAC through the Network’s commercialization program, which assists Network researchers to find and secure knowledge mobilization and commercialization opportunities for their research outcomes.

“Kids with asthma and allergies can face social isolation and miss out on activities with their peers,” says Dr. Stewart. “We are delighted that the ASC will offer this accessible, appealing program designed to connect these kids with their peers and with peer mentors, because living

with allergies and asthma is a lot easier when you know you’re not alone.”

Commercialization webinars draw viewers beyond Network

“Don’t let the fact that you know nothing about business inhibit you from starting a business,” advised scientist-entrepreneur Dr. Pieter Cullis on March 10, 2016, as he spoke about launching business ventures based on research results to members of the AllerGen Network and other interested stakeholders.

Dr. Cullis was one of a stellar slate of business and innovation specialists featured in AllerGen’s “Planning for Research Success” webinar series, delivered to researchers, students, community partners and other NCEs in Fall 2015 and Winter 2016. The speakers offered expert insights, from what to cover in a value proposition, to how to gain traction with an industry partner and who to include in a start-up team.

The five-part professional development series was designed to impart skills and know-how to help researchers maximize the sustainability and impact of their research.

2015 . 2016

**For members of the AllerGen
ASNPN Executive Committee,
honing their governance and
leadership skills is a built-in perk.**

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



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“Working with the CHILD Study and leading a research project from start to finish has been a transformative experience that has greatly accelerated my career development.”

Maxwell Tran, AllerGen HQP

3rd year Bachelor of Health Sciences, McMaster University

For more than a decade, AllerGen has been committed to attracting, developing, and retaining outstanding Highly Qualified Personnel (HQP) in Canada. Annually, AllerGen invests \$500,000 in capacity-building programs that enhance the training, education, and personal and professional development of students, research staff and new professionals.

These programs foster the development of talented and innovative people who are becoming leaders in allergic disease across Canadian campuses, companies and communities.

In 2015-2016, 318 HQP were involved in the AllerGen network: 263 actively working on AllerGen research projects, and 55 working on related research.

From classroom to boardroom: ASNPN Executive members gain governance experience

For many Canadian students and new professionals, finding opportunities to acquire governance experience and executive leadership skills can be a challenge.

But for the members of the AllerGen Students and New Professionals Network (ASNPN) Executive Committee, honing these skills is a built-in perk.

“Serving on the ASNPN Executive, I have developed a variety of practical and transferrable skills, such as how to chair a high-level meeting; critically review corporate documents like minutes, agendas and executive reports; and lead others in effective decision-making,” says **Amrit Singh** (PhD [c]), The University of British Columbia, the 2015-2016 ASNPN President.

Since 2005:

211 employed HQP graduates; 32% working in industry or private sector

54 graduates in faculty positions (42 Canadian; 12 International)

50% of AllerGen's peer-reviewed publications have a trainee as first author

443 trainee participants in Annual Trainee Symposium

40 recipients of *Summer Studentship* award

3 clinician-scientist careers launched

Launched in 2007, the ASNPN is a student-led organization open to trainees (undergraduate students to postdoctoral fellows), research staff and early career researchers working in the field of allergic disease in Canada. The 10-member Executive Committee—elected annually by the ASNPN membership—works to enhance research and professional networking opportunities for AllerGen research trainees, research staff and new professionals. The committee, which meets five-

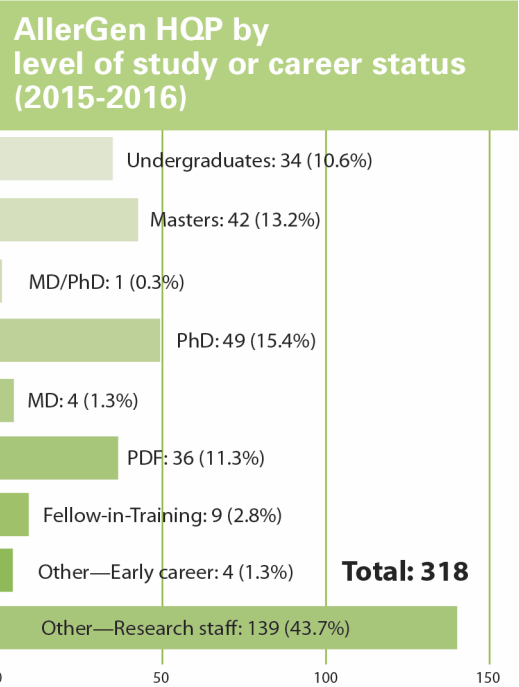
times per year by teleconference, acts in an advisory capacity to the AllerGen Advanced Education and Training Opportunities Advisory Committee (AETOAC), which, in turn, provides strategic advice on HQP programming and investments to the AllerGen Research Management Committee (RMC).

As ASNPN Vice-President, **Laura Feldman** (MPH [c]), University of Toronto) sits as an observer on AllerGen's RMC. "Representing AllerGen trainees on the RMC has been an unbelievable learning experience," says Feldman. "I have had the opportunity to review and comment on proposed new AllerGen research projects, and to participate in discussions with Canada's top scientists and clinicians about Network investments, which has given me valuable insight into the grant review process."

Singh plays a similar role on AllerGen's Board of Directors. "Working alongside senior Network executives, all with extensive industry, government or academic experience, has helped me understand the organizational dynamics, priorities and responsibilities of a board of directors," he says. "I don't know many other students who have had the same opportunities I have as part of the ASNPN Executive."



HQP Networking Dinner: Front row L to R: Dr. Richard Hegele, Hilary Caldwell, Kyla Jamieson. Back row L to R: Yolanda Yang, Nicole Garcia, Amrit Singh, Leah Graystone (Shaver), Young Woong Kim



10th Annual Trainee Symposium: Building career and life skills

"And what colour might you be?"

That was the question that 54 trainees, research staff and ASNPN members asked each other during a dynamic Personality Dimensions workshop at AllerGen's 10th Annual Trainee Symposium. Led by well-known personality expert Colleen Clarke, the session helped AllerGen HQP explore their personal temperament preferences and build skills to influence others positively, negotiate more effectively and optimize team performance.

"This interesting and entertaining professional development workshop provided me with an excellent opportunity to network with other



Career Panel experts—L to R: Elaina MacIntyre, Public Health Ontario; Farzian Aminuddin, Ontario Genomics Institute; Marie-Josée Martel, Xcenda, L.L.C.; Oxana Latycheva, Parkdale Community Health Care

AllerGen HQP. I learned that I am a ‘green’ temperament with strengths to think strategically, and to recognize and solve problems,” says **Dr. Chris Rider**, a postdoctoral fellow at The University of British Columbia.

The workshop was one of five unique skill-development sessions offered at the 2015 Trainee Symposium, held in Toronto, ON, from April 29 to May 1, with the theme of “careers outside academia.”

Other sessions included *The Business Side of Science*, *Success After Graduate School*, *Social Media & Communicating Your Science*, and a special presentation by Dr. Jane Aubin, Chief Scientific Officer and Vice-President, Research,

Knowledge Translation and Ethics Portfolio, at the Canadian Institutes of Health Research.

A career panel, moderated by former AllerGen trainee Dr. Marie-Josée Martel (Director of Scientific Client Strategies, Xcenda L.C.C.) and featuring representatives from the Ontario Genomics Institute, Public Health Ontario and the Parkdale Community Health Centre, was another event highlight.

Delegates also had the opportunity to pose for a professional corporate photo and to record a video testimonial about the impact of AllerGen’s HQP training program on their career development and research expertise. Following the conference, the video testimonials were incorporated into AllerGen’s NCE Mid-term Review application and are featured on AllerGen’s YouTube channel.

AllerGen’s Trainee Symposium provides Network trainees and ASNPN members with value-added professional development to complement their academic and scientific training.

“I look forward to the Trainee Symposium every year,” adds AllerGen HQP **Stephanie Nairn**, a PhD candidate in Sociology & Social Studies of Medicine at McGill University. “In addition to the exceptional workshops, I have found the

opportunity to network with researchers across disciplines, as well as the professional development advice provided by former AllerGen trainees, to be invaluable during my development as a doctoral candidate.”

Standing out from the crowd with Research Skills Awards

AllerGen HQP seeking to develop specialized technical and laboratory skills need look no further than AllerGen’s *Research Skills Awards* program.

Since 2011, the program has funded 24 individual HQP training experiences, including participation in scientific courses and workshops, specialized



“The Flow Cytometry Workshop was an excellent career development opportunity that has helped me become a more competent and efficient researcher. I received hands-on training in the latest technologies for flow cytometry and cell sorting, which has diversified my research skill set and improved my practical lab skills.”

Ali Hosseini, M.Sc.(c)
The University of British Columbia
 Supervisor: Dr. Chris Carlsten

AllerGen 2015-2016 *Research Skills Awards*

Institution/Recipient	Supervisor	Activity Supported
McMASTER UNIVERSITY		
John Paul Oliveria , PhD(c)	Gail Gauvreau	Laboratory visit: Dr. Kelly McNagny (The University of British Columbia) to study flow cytometry
Maxwell Tran , Undergrad	Malcolm Sears	Laboratory visit: Dr. Kelly McNagny (The University of British Columbia) to study flow cytometry
THE UNIVERSITY OF BRITISH COLUMBIA		
Loubna Akhabir , PDF	Denise Daly	Course: Complex Trait Analysis of Next Generation Sequence Data Laboratory visit: Dr. Judah Denburg, (McMaster University) to study TSLP gene and proteins in asthma pathogenesis, facilitating future collaborations
Rachel Edgar , Research staff	Michael Kobor	Workshop: Canadian Bioinformatics Workshop —Informatics for RNA-seq Analysis
Ali Hosseini , MSc(c)	Chris Carlsen	Workshop: Flow Cytometry
Sarah Koch , PhD(c)	Chris Carlsen	Course: Saltin International Graduate Course in Clinical & Exercise Physiology
UNIVERSITÉ LAVAL (IUCPO)		
Daniel Beaurivage , PhD(c)	Louis-Philippe Boulet	Research visit: Hunter Medical Research Institute in Australia to work on questionnaire validation (measures and evaluation) for Patient-completed Asthma Knowledge Questionnaire
Emilie Bernatchez , PhD(c)	Marie-Renée Blanchet	Research visit: Dr. Kelly McNagny (The University of British Columbia) to work with the CD34 family of proteins and transgenic mice available to study allergic disease



"My research visit to Dr. Kelly McNagny's laboratory at The University of British Columbia was a turning point in my training. I am more confident about how to lead a project and how to focus a study, which will significantly enhance my PhD and postdoctoral studies, and my career as an independent researcher."

Emilie Bernatchez, PhD(c)

Université Laval

Supervisor: Dr. Marie-Renée Blanchet

skills acquisition, and laboratory visits in Canada and abroad.

The goal, according to Michelle Harkness, AllerGen's HQP Training and Events Coordinator, is to help students develop competencies that support their training and enhance their future employability.

In 2015-2016, AllerGen disbursed eight *Research Skills Awards* to trainees based at Université Laval, The University of British Columbia and McMaster University to help them develop their capacities in questionnaire validation, data sequencing, bioinformatics and flow cytometry.

Travel awards promote personal and professional growth

AllerGen *Travel Awards* assist Network investigators and HQP to travel to prestigious national and international meetings and conferences to present their work, network and learn. AllerGen *Travel Awards* are highly sought after, and to date more than 263 awards have allowed HQP to share their

allergic disease research with audiences around the globe. Awards, valued up to \$1,200, are matched 1:1 with non-AllerGen partner funding.

“Travel awards support the acquisition of educational experiences that enrich not only our students, but the AllerGen network as a whole,” says AllerGen’s Managing Director, Dr. Diana Royce.



“I attended the European Respiratory Society (ERS) International Congress in Amsterdam to present my work characterizing the early-life microbiota in children diagnosed with asthma. This opportunity was extremely beneficial to my growth as a young scientist: I gained valuable experience interacting with other trainees and scientists, and I developed confidence in presenting my research to a large, international audience.”

Leah Stiemsma, PhD(c)
The University of British Columbia
 Supervisor: Dr. Stuart Turvey



“Through the AllerGen *Travel Awards* program, I presented my work on the nasal allergen challenge technique utilized by the Allergic Rhinitis–Clinical Investigator Collaborative at both the European Academy of Allergy and Clinical Immunology Congress in Barcelona, and the American Academy of Allergy, Asthma and Immunology Annual Meeting in Los Angeles. Discussing my research with clinician-scientists and medical affairs directors from pharmaceutical companies was a great way for me to acquire different perspectives, and, in turn, to pique the interest of potential industry partners in my research.”

Mena Soliman, M.Sc.(c)
Queen’s University
 Supervisor: Dr. Anne Ellis

“In 2015-16, AllerGen granted 44 awards, supporting attendance at three national and 12 international events—we are delighted with the impact our HQP are having on the global stage.”

Summer Studentships offer taste of clinician-scientist career

In 2015, **Jasmine Cheng** and nine other Canadian university undergraduates were awarded AllerGen *Summer Studentships*—facilitating unique opportunities to work with AllerGen research teams conducting innovative allergic disease research.

“My ultimate career goal is to become a clinician-scientist,” says Cheng, a third-year student at The University of British Columbia. “The AllerGen studentship allowed me to work in a lab that specializes in bench-to-bedside research and to observe what a clinician-scientist’s job entails.”

AllerGen *Summer Studentships* aim to foster an early interest in allergic and related immune disease research, potentially leading to a career in research or clinical practice—or both. Since 2012, 40 trainees have participated in the program, which allows students to work full-time on a summer research project under the supervision of an AllerGen investigator.

AllerGen 2015-16 Undergraduate Summer Studentship Recipients		
Institution/ Recipient		Partnered Award Value
McGill University , Supervisor: James Martin Michael Chen	"Oxidative stress mediates organic dust-induced airway hyper-responsiveness and airway remodeling."	\$6,000
McMaster University , Supervisor: Judah Denburg Raymond Chen	"The effects of a single nucleotide polymorphism rs18372353 on nasal epithelial-derived thymic stromal lymphopoietin and peripheral blood CD34+ cell eosinophil/basophil lineage commitment."	\$6,000
McMaster University , Supervisor: Malcolm Sears Maxwell Tran	"Child diet in relation to persistent food sensitization at 3 years in a Canadian Longitudinal Birth Cohort Study."	\$6,000
McMaster University , Supervisors: Susan Waserman & Mark Larché Mark Tenn	"Peptide immunotherapy for prevention of peanut sensitization in a murine model."	\$6,000
McMaster University , Supervisor: Sonia Anand Keith Tam	"Prenatal and early-life determinants for 1-year infant allergy and atopic diseases in a multi-ethnic prospective birth cohort."	\$6,000
The University of British Columbia , Supervisor: Stuart Turvey Jasmine Cheng	"The impact of the intestinal microbiota on human immune development and atopic disease."	\$6,000
The University of British Columbia , Supervisor: Peter Paré Eric Lu	"Elucidation of smoothelin function in airway smooth muscle."	\$6,000
Université du Québec à Chicoutimi , Supervisor: Catherine Laprise Anne-Marie Boucher-Lafleur	"Protein quantification of interleukin 1 family members in whole blood samples and bronchial epithelial cells in asthma."	\$6,000
Miriam Larouche	"Methylation study of selected genes involved in the inflammatory process in asthma."	\$6,000
University of Manitoba , Supervisor: Meghan Azad Deborah Chan	"Intrapartum antibiotic use and breastfeeding success in the Canadian Healthy Infant Longitudinal Development (CHILD) Study."	\$6,000
2015-2016 Award Value		\$60,000



2015 AllerGen Summer Studentship recipient Michael Chen (centre front), with Dr. James Martin (back row, 3rd from left) and his research staff at McGill University.

For Cheng, working alongside Dr. Stuart Turvey at The Child & Family Research Institute in Vancouver, BC, was a remarkable experience. As a member of his team analyzing data from the CHILD Study, Cheng contributed to the breakthrough finding in September 2015, that infants at high risk of developing asthma had low levels of four gut bacteria in the first three months of life.

“The AllerGen studentship has strengthened my desire to become a clinician-scientist, so that I can interact with patients and translate clinical observations to biomedical research solutions,” Cheng adds.

Fellow 2015 *Summer Studentships* recipients **Michael Chen (McGill University)** and **Mark Tenn (McMaster University)** echo Cheng on the benefits of being part of a cutting-edge AllerGen research team. Working with Dr. James Martin at McGill University “fueled my interest in pursuing a career as a clinician-scientist, and gave me the chance to participate in and learn more about translational science research,” says Chen.

“The AllerGen Summer Studentship experience working with McMaster professors Dr. Mark Larché and Dr. Susan Waserman has been a highlight of my development,” comments Tenn.

Since 2012, AllerGen has invested over \$120,000 in the program. For each student, AllerGen provides up to \$3,000 in support, matched 1:1 by Canadian partner organizations for an annual program value of \$60,000.

Trainees present their research to Canada’s top clinicians

For the third consecutive year, AllerGen partnered with the Canadian Society of Allergy and Clinical Immunology (CSACI) to host AllerGen’s Annual HQP Poster Competition. The event was held in conjunction with the CSACI’s 70th Annual Scientific Meeting in Vancouver, BC, from October 21-24, 2015.

Each year, the poster competition offers trainees a venue in which to showcase their research and receive formative feedback from prominent Canadian allergists, clinical immunologists, researchers and clinician-scientists.

“Attending the CSACI Scientific Meeting is highly beneficial for junior scientists,” says **Dr. Damian Tworek** (MD/PhD), a postdoctoral fellow at McMaster University. “The meeting provides an excellent opportunity for us to network with clinician-scientists and form multidisciplinary collaborations.

2015 AllerGen Poster Competition Winners					
Name	Place	Category	Institution	Supervisor	Abstract Title
Stephanie Legere	1 st	Undergrad	Dalhousie University	Jean Marshall	IL-33 induces cytokine and chemokine production in human mast cells
Anne-Marie Boucher-Lafleur	2 nd	Undergrad	L'université du Québec à Chicoutimi	Catherine Laprise	IL33 DNA methylation in bronchial epithelial cells is associated with asthma
Mena Soliman	1 st	Masters	Queen's University	Anne Ellis	Mapping local inflammatory cytokine secretion following a cumulative allergen dose using the Allergic Rhinitis Clinical Investigator Collaborative Nasal Allergen Challenge model
Laura Feldman	2 nd	Masters	The Hospital for Sick Children	Teresa To	Secondhand tobacco smoke exposure in infancy and the development of food hypersensitivity from childhood to adolescence
Young Woong Kim	1 st	PhD	The University of British Columbia	Scott Tebbutt	Systemic immune pathways associated with the mechanisms of Cat-Synthetic Peptide Immuno-Regulatory Epitopes, a novel immuno-therapy, in whole blood of cat-allergic people
Amrit Singh	2 nd	PhD	The University of British Columbia	Scott Tebbutt	Multi-omic blood biomarker signatures of the late phase asthmatic response
Elinor Simons	1 st	Open	University of Manitoba	N/A	Age of peanut introduction and development of reactions and sensitization to peanut
Meghan Azad	2 nd	Open	University of Manitoba	N/A	Breastfeeding and infant wheeze, atopy and atopic dermatitis: findings from the Canadian Healthy Infant Longitudinal Development Study
Saiful Huq	1 st	Research Staff	University of Manitoba	Allan Becker	Comparison of skin-prick test measurements by an automated system against the manual method
Linda Warner	2 nd	Research Staff	The University of British Columbia	Stuart Turvey	The CHILD Study: optimizing subject retention in pediatric longitudinal cohort research
2015 CSACI Poster Competition Award Winners					
Dominik Nowak	2 nd	Case Reports	McMaster University	Paul Keith	Sitagliptin associated angioedema not related to concurrent use of ARB or ACE inhibitor
John Paul Oliveria	1 st	Basic Science/ Immunology	McMaster University	Gail Gauvreau	Characterization of IgE-expressing B cells in the airways and peripheral blood of allergic asthmatics



2015 Poster Competition: Undergraduate Category
L to R: Michael Chen, Maxwell Tran, Stephanie Legere, Laura Walsh, Miriam Larouche, Anne-Marie Boucher-Lafleur and Nela Cosic



AllerGen trainees in Vancouver, BC, at CSACI's 70th Annual Scientific Meeting and AllerGen Poster Competition
L to R: Young Woong Kim, Amrit Singh, Yolanda Yang, Laura Feldman, Erika Ladouceur, Maxwell Tran, Ali Hosseini, Mena Soliman

The poster competition is also an excellent forum for showcasing our research."

In 2015, 27 AllerGen trainees from different disciplines presented their research in five adjudicated poster categories: Undergraduate; Masters; PhD; Research Staff; and Open, which included postdoctoral fellows, fellows-in-training and early

career researchers. Several ASNPN members also participated in the CSACI Poster Competition.

Twelve AllerGen trainees, including two competing in the CSACI competition, took top honours at the 2015 event.

In the undergraduate category, the lightning-round oral presentations delivered by seven outstanding young students were a competition highlight. Lively and informative, the two-minute talks promoted interaction among the trainee presenters and the audience of international experts.

Partnership promotes allergic disease research in BC

Since 2010, AllerGen has partnered with British Columbia's Michael Smith Foundation for Health Research (MSFHR) to co-fund postdoctoral Trainee Awards. This partnership leverages provincial funding to support up-and-coming BC-based scientists and help them launch independent research careers.

In 2015, Drs **Leila Mostaço-Guidolin** and **Lisa Reynolds**, both from The University of British Columbia, received prestigious *MSFHR/AllerGen Postdoctoral Fellowships*, which will allow them to advance their work in asthma and allergic disease.

Supervised by former AllerGen trainee Dr. Tillie-Louise Hackett, Dr. Mostaço-Guidolin's research focuses on using nonlinear optical microscopy to understand the changes that occur in the three-dimensional structure of the airways' elastic and collagen fibres in asthma. Her work aims to help researchers develop better asthma therapies and improve the quality of life for millions of asthma patients.

Dr. Reynolds is working in the laboratory of AllerGen investigator Dr. Brett Finlay to identify the key bacterial species within the microbiota that alter the severity of allergic disease, and to understand whether antibiotic use is linked to the development of allergic disease in both the human population and mouse models.

Recognized internationally for supporting research excellence, the MSFHR has granted more than 1,200 Trainee Awards worth over \$38 million.

AllerGen trainees embark on diverse career paths

Mentored by some of the best researchers in the world, and working in multisectoral, multidisciplinary teams, AllerGen HQP develop a broad range of highly marketable skills and are able to adapt to evolving academic and business environments.

Since 2005, 211 graduate students and post-doctoral fellows directly involved in AllerGen-funded research projects have found employment across sectors.

In 2015-2016 alone, 29 AllerGen HQP secured employment, making contributions within academia and across the public, private and not-for-profit sectors, including:

Tahira Batool (MD, FRCPC) is an allergist at **One Healthcare Centre** in Ajax, ON.

Roy Chen (M.Sc.) is a Medical Laboratory Technologist at **Provincial Health Services Authority** in Vancouver, BC.



Former trainee **Steve Smith** (Scientific Advisor, GlaxoSmithKline) re-connects with AllerGen HQP Coordinator **Michelle Harkness** at the Canadian Respiratory Conference, Halifax, NS.

Melanie Courtot (PhD) is Gene Ontology Annotation Project Leader at the **European Bioinformatics Institute** in Cambridge, UK.

Emma Goosey (PhD) is a Consultant and KTP Associate at **MTS Research Ltd** in Cornwall, UK.

Petya Koleva (PhD) is employed at **Labs Mart Inc.** in Edmonton, AB.

Mandy Pui (M.Sc.) is a Communications and Strategies Consultant in Vancouver, BC, for non-profit organizations and research institutes.

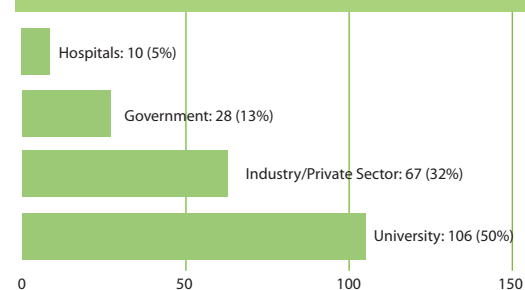
Jaclyn Quirt (MD, FRCPC) is Assistant Clinical Professor in the Division of Clinical Immunology and Allergy, Department of Medicine, and Director of the Clinical Immunology & Allergy Residency Training Program at McMaster University in Hamilton, ON.

Eli Rosenberg (MD, FRCPC) is Director, Adult Clinical Immunology and Allergy Service, at Soroka University Medical Center, and Lecturer in Immunology at Ben-Gurion University in Beersheba, Israel.

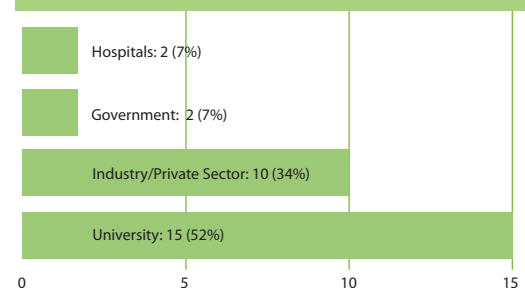
Steve Smith (PhD) is Scientific Advisor – Respiratory in the R&D Chief Medical Office at **Glaxo-SmithKline Canada** in Mississauga, ON.

Samuel Wadsworth (PhD) is Co-Founder and Chief Scientific Officer of **Aspect Biosystems** in Vancouver, BC.

AllerGen HQP employment by sector: 2005-2016 (n=211)



AllerGen HQP employment by sector: 2015-2016 (n=29)

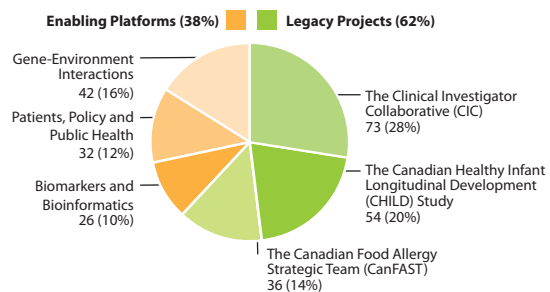


A Snapshot of AllerGen HQP 2015-2016

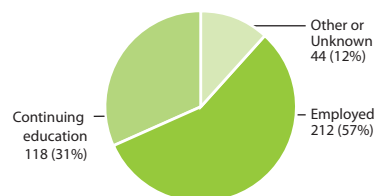
(n=318)



AllerGen HQP by Research Program (n=263)



AllerGen HQP Graduates 2005-2016 (n=374)



Trainees, New Professionals, Research Associates and Technicians (including ASNPN) by Province and University (n=318)

By Province

Ontario	104	33%
Alberta	76	24%
British Columbia	66	21%
Quebec	43	13%
Manitoba	16	5%
Saskatchewan	7	2%
Nova Scotia	4	1%
Other	2	1%

Total

318

100%

By University

The University of British Columbia	70	22.0%
McMaster University	43	13.5%
University of Alberta	38	11.9%
University of Calgary	29	9.1%
Université Laval	19	6.0%
University of Manitoba	16	5.0%
University of Toronto	15	4.7%
McGill University	8	2.5%
Queen's University	7	2.2%
University of Saskatchewan	7	2.2%
Simon Fraser University	5	1.6%
University of Waterloo	5	1.6%
Université du Québec à Chicoutimi	3	0.9%
Dalhousie University	2	0.6%
Université de Montréal	1	0.3%
Lakehead University	1	0.3%
International universities	4	1.3%
Affiliated institutions and organizations	45	14.2%

Total

318

100%

15.2016

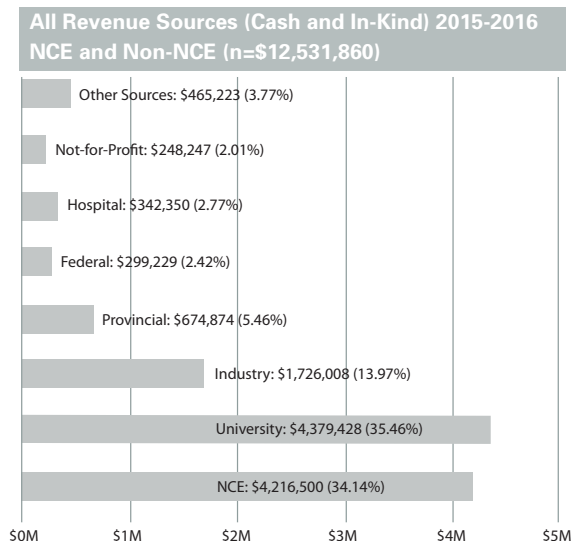
In 2015-2016, AllerGen leveraged its research investments to generate an additional \$8.1 million in cash and in-kind support from partner and stakeholder organizations.

Financial Overview

AllerGen NCE Inc. Financial Summary 2015-2016

	2015-2016 (Year 11)	Percentage	2014-2015 (Year 10)	Percentage
Revenues (Cash)				
NCE Award	4,216,500	94.19%	4,216,500	90.00%
Non-NCE Funds	259,859	5.81%	468,655	10.00%
	4,476,359	100.00%	4,685,155	100.00%
Expenditures (Cash)				
Research Programs	3,239,328	70.88%	3,491,984	65.91%
Networking	59,619	1.30%	144,399	2.73%
Training	296,350	6.48%	394,765	7.45%
Communications	60,531	1.32%	66,908	1.26%
Administration	914,436	20.01%	1,199,904	22.65%
	4,570,263	100.00%	5,297,959	100.00%
Committed Amounts for Future Research	1,230,919		1,072,726	

All Revenue Sources (Cash and In-Kind) 2015-2016 NCE and Non-NCE				
	Cash	In-Kind	Total	Percentage
NCE	4,216,500	—	4,216,500	34.14%
University	689,448	3,689,980	4,379,428	35.46%
Industry	1,362,152	363,856	1,726,008	13.97%
Provincial	154,874	520,000	674,874	5.46%
Federal	242,279	56,950	299,229	2.42%
Hospital	5,000	337,350	342,350	2.77%
Not-for-Profit	48,029	200,218	248,247	2.01%
Other Sources	288,220	177,003	465,223	3.77%
Total	\$ 7,006,503	\$ 5,345,357	\$ 12,351,860	100.00%



In 2015-16, AllerGen's income from all sources (cash and in-kind) was \$12,531,860. Of this amount, AllerGen received a base grant from the NCE in the amount of \$4,216,500. AllerGen secured an additional \$8,135,360 from other sources.

This represents a leveraging of NCE funding at a rate of 1:1.93

2015 . 2016

Over the next three years, working closely with its legacy partners and other stakeholders, the Network will complete its research program and focus on translating and commercializing key findings for the benefit of Canadians with allergic diseases.



Network Participants

Investigators (n=94)

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

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=22)

Centre Hospitalier Universitaire Sainte-Justine
 Dalhousie University
 Hôpital du Sacré-Cœur 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 de Montréal
 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=318)

Shelley Abercromby	Rozlyn Boutin	Melanie Cowley	Tresa George	Aruni Jha
Daniel Adams	Katie Bowden	Rowena Cua	Matt Gold	Yayuk Joffres
Omid Aghamirian	Miranda Bowen	David Dai	Sara Gordon	Andy Johnson
Loubna Akhabir	Ayanna Boyce	Nadia Daniel	Leah Graystone	Meaghan Jones
Mustafa Al-Saiedy	Julyanne Brassard	Beth Davis	Emma Griffiths	Cynthia Kanagaratham
Lubna Anis	Sarah Bridgman	Wojciech Dawicki	Christina Gu	Lianne Kang
Jason Arnason	Anne Burke	Bassel Dawod	Qingdong Guan	Michael Kariwo
Marie-Claire Arrieta	Helen Cai	Sarah De Schryver	Pampa Guha	Tosha Kells
Muhammad Asaduzzaman	Hilary Caldwell	Stephanie Delorenzo	Annahita Hadioonzadeh	Will Kennedy
Yuka Asai	Maureen Campbell	Phillip Deng	Mona Hamada	Amir Khakban
Susan Attridge	Francesca Cardwell	Alizeé Déry	Mariam Hanna	Young Woong Kim
Séverine Audusseau	Sylvie Carette	Francine Deschesnes	Raphael Hanna	Miranda Kirby
Ernie Avilla	Shannon Casey	Marylin Desjardins	Martha J. Hart	Melanie Kjarsgaard
Hana Awad	Deborah Chan	Alotaibi Dhaifallah	Mark Hayes	Linda Knox
Jane Awawias	Stephanie Chan	Jenna Dixon	Brenda Helpard	Sarah Koch
Meghan Azad	Yaminee Charavanapavan	Aimee Dubeau	Daniel Herod	Jordan Koe
Dunia Azzara	Michael Chen	Curtis Dumonceaux	Kris Herod	Petya Koleva
Salma Bahreinian	Raymond Chen	Judy Durocher	Delia Heroux	Tedd Konya
Tieghan Baird	Wenjai Chen	Rachel Edgar	Angela Hillaby	Krzystof Kowalik
Jyoti Balhara	Olivia Cheng	Tempest Emery	Jeremy Hirota	Joyce Kum
Susan Balkovec	Stephen Cheuk	Aida Eslami	Barnaby Hobsbawn	Manjeet Kumari
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Daniel Beaurivage	Rick Chin	Elena Fiadzinu	Doug Houlbrook	Josée Laflamme
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Mylène Bertrand	Derek K. Chu	Emily Fogarty	Henry Huang	Chynace Lambalgen
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Wendy Street
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Wendy Street, <i>observer</i>	Senior Program Manager, NCE Secretariat

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Jeff Brook, PhD	Senior Scientist, Air Quality Research Branch, Environment Canada; Assistant Professor, Division of Occupational & Environmental Health, Dalla Lana School of Public Health, University of Toronto
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Pia Reece, PhD, <i>observer</i>	Vice-President, ASNPN; McMaster University (<i>to June 2015</i>)
Diana Royce, EdD, <i>observer</i>	Managing Director and COO, AllerGen NCE Inc.
Wendy Street, <i>observer</i>	Senior Program Manager, NCE Secretariat

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Sylviane Duval	Knowledge Transfer Specialist
Neal Lemon, PhD, MBA	Technology Transfer Officer (Health Sciences), Industry Liaison Office, University of Saskatchewan
Luc Marengère, PhD	Managing Partner, TVM Capital Life Science
Kevin O'Brien Fehr, PhD	Consultant
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Oxana Latycheva, PhD	Director, Primary Health Care, Parkdale Community Health Centre
Danuta Radzioch, PhD	Professor, Department of Medicine, McGill University; Medical Scientist, Clinical Immunology, Montreal General Hospital
Diana Royce, EdD	Managing Director and COO, AllerGen NCE Inc.
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Lianne Soller, PhD (c)	President, ASNPN; McGill University <i>(to June 2015)</i>
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Cynthia Kanagaratham, PhD (c)	Regional Director: Quebec/Atlantic (McGill University) <i>(from July 2015)</i>
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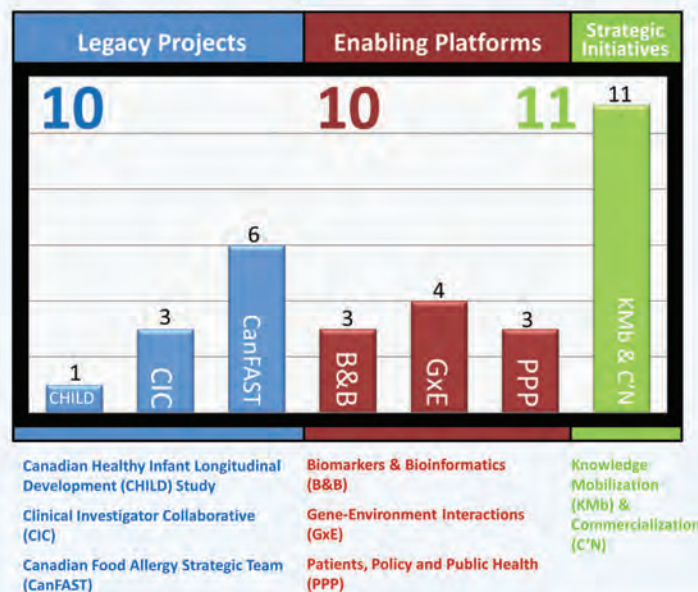
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Carol Ridsdale	Finance Officer
Graziella Infanti	Executive Assistant
Michelle Harkness	HQP and Events Coordinator
April O'Connell	Research Administrator
Marshall Beck	Administrative Coordinator, Communications and Knowledge Mobilization

AllerGen FAST FACTS

2015-2016

NCE : Non-NCE investment leverage ratio
1 : 1.93

Research Investments **31**



94 Investigators and Collaborators across 47 disciplines



Researchers

125
Partnerships



2005-2016

4060
Publications
(including refereed, specialized and other)

1427

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

AllerGen

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