

AllerGen NCE Inc.

Programme B: Diagnostics and Therapeutics
Research Workshop on
Mind-Body Interactions

Post-Workshop Report

Re: Workshop held
Wednesday February 14, 2007
Hamilton Sheraton Hotel
Hamilton, Ontario

February 2007

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Executive Summary

AllerGen is one of 18 Networks of Centres of Excellence supported by the federal government to foster partnerships between university, government, industry and not-for-profit organizations that help turn Canadian research and entrepreneurial talent into economic and social benefits for Canadians.

On February 14, 2007, AllerGen Programme B: Diagnostics and Therapeutics Research Leader, Dr. Dean Befus, University of Alberta, hosted a strategic planning workshop in Hamilton, Ontario focusing on the identification of research opportunities in the field of mind-body interactions aligned with AllerGen NCE Inc.'s aim to improve the quality of life for people suffering from allergic and related immune diseases. The workshop was attended by 26 researchers, three of which were research trainees.

Numerous strategic opportunities were identified by workshop participants in the area of mind-body research related to health and allergic diseases. These opportunities fell into three overarching categories of research that AllerGen could support in the context of programmatically linked projects:

1. Epigenetics
2. Cellular and Molecular Mechanisms in Neuro-immunology
3. Stress and Depression

Next steps for AllerGen researchers interested in pursuing Network-supported research in this developing field are to:

- Form a writing team
- Prioritize the research initiatives identified at the workshop
- Select a limited number of foci around which to develop a mind-body grant application aligned with AllerGen's mission and goals that can be integrated into a five page programmatic research project submission
- Submit a draft proposal and budget to AllerGen Research Leaders by April 6, 2007
- Finalize the five page proposal and budget by April 25, 2007.

This five-page proposal will include a description of the research to be undertaken, the research outcomes transferable to specific users and decision-makers or sectors, academic and non-academic research partners, research platforms to be leveraged from academic partner organizations, strategies for project management including a user advisory committee, and an overview of the unique training opportunities for students, post-doctoral fellows, researchers, clinicians, and private, public and health sector learners that the programme project will offer in accordance with the recently issued AllerGen RFA.

Programmatic projects deemed eligible for funding by an international peer review process and approved by AllerGen's Board of Directors will be eligible to receive research support from June 1, 2007 to March 31, 2009. Additional funding to 2012 may become available subject to NCE renewal of the AllerGen grant, alignment with the AllerGen strategic plan, and the results of a peer review of a follow-on grant application.

1. Introduction

On February 14, 2007 AllerGen's Programme B: Diagnostics and Therapeutics Research Leader, Dr. Dean Befus, hosted a strategic planning workshop in Hamilton, Ontario, focusing on the identification of mind-body research thrusts that could be integrated into the overall AllerGen research programme. The workshop was attended by 26 researchers, of which three were research trainees, plus three support staff. A copy of the agenda is provided in Appendix A. A complete participant's list is provided in Appendix B.

The workshop provided AllerGen investigators interested in mind-body research with an opportunity to:

- Share their interests and expertise in mind-body research with other AllerGen investigators and trainees.
- Learn about leading edge mind-body research from pioneering researchers in the field.
- Identify mind-body research themes and research thrusts that align with the AllerGen mandate.
- Begin to identify a writing team that will develop a grant proposal for inclusion in the AllerGen programmatic research call for proposals, due May 1, 2007.

The balance of this report summarizes the discussion and recommendations arising from the workshop.

2. AllerGen Investigator Interests in Mind–Body Research

AllerGen investigators expressed a wide range of interests in mind-body research. These include:

Genetics and Epigenetics:

Understanding:

- Gene-environment interactions - the interface of nature, nurture and environment
- How social and economic status (SES) affects health outcomes in children
- Pollution exposure and relationship to allergy, asthma and cardiovascular disease and the role of inhaled irritants in disease
- The natural history of asthma

Developing:

- Methods to allow researchers to mesh understandings of population health and epigenetics

Mechanisms and Neuro-immunology:*Understanding:*

- Mind-body mechanisms; mechanisms of inflammatory responses and innate immunity
- Neuro-endocrine regulation of salivary glands and anti-inflammatory peptide secretion; role of the thalamus in modulating allergic reactions; role of mast cells in the regulation of allergic airway inflammation
- Interactions of the brain, nervous system and immune system; neuro-immunology
- Neuro-psychiatric pathways of immune disease e.g. lupus
- Effect of the vagus and other nerves on allergic responses

Stress and Depression:*Understanding:*

- Links between depression, stress and anxiety, brain function and the immune system
- The impact of stress on the inflammatory response and immune functions
- Health-promoting aspects of small amounts of stress
- Identifying markers for stress and allergic disease
- Maternal distress and links to development of asthma, post-partum mothers, influence of cortisone levels
- Environmental causes of childhood asthma, risk factors, why the rise in prevalence and why disparities

Developing:

- Animal studies of stress
- Intervention programs and the role of “belief” in triggering differences in clinical phenotypes

3. Mind-Body Research Presentations

A number of eminent mind-body researchers attended the workshop. Four individuals were invited to present their current research programs and discuss findings to date. A summary of the key points made by each presenter are provided below:

EPIDEMIOLOGY***Psychological Stress and the Development and Expression of Asthma: Epidemiologic Evidence***

Dr. Rosalind Wright, Assistant Professor, Department of Society, Human Development & Health, Harvard School of Public Health, Brigham & Women's Hospital, Harvard Medical School, Boston, Massachusetts

Dr. Wright's presentation covered the following points:

- Asthma was originally considered to be a psychosomatic disease (*asthma nervosa*)
- Stress is now viewed in a similar way to pollution – an environmental exposure that can be taken into the body and disrupt relevant physiological systems that may predispose to atopy

- It is important to understand the natural history of asthma by studying pregnancy cohorts because asthma is entrenched early in life; critical periods of development include the prenatal and early childhood (prior to age 3) period
- Early experiences affect an individual's vulnerability to stress throughout later life
- There have been few prospective studies to test the role of parental depression and anxiety in the development (i.e., onset) of asthma in children and results are mixed. One problem with the existing literature is the mix of measuring psychological stressors vs. the affective response (e.g., depression, anxiety) to ongoing stress.
- A. Steptoes and colleagues in the UK are preparing a manuscript that systematically examines the existing literature linking psychological factors and risk for atopy (including asthma) in a meta-analysis (not yet published)
- Recent studies are examining the effects of psychological stress on the onset and exacerbation of asthma
- It has been determined that people with chronic stress, who then experience superimposed acute stress, are more greatly impacted (i.e., experience more significant exacerbations of their asthma) underscoring the need to assess acute and chronic stress (and sometimes one or the other depending on the question one is asking)
- Dr. Wright's research currently focuses on genetic predisposition and the impact of multi-level environmental factors (e.g., in the home, family, community) and how environmental factors (including psychological stress) primes the child's immune system. These studies consider independent and interactive effects of these exposures.
- Children were followed every two months, and their blood was studied for intermediate phenotypes, including IgE levels, lymphocyte proliferation and cytokine expression as published in Wright *et al* AJRCCM 2002 and Wright *et al* JACI 2004.
- Using repeated measures on the 4-item Cohen Perceived Stress Scale (PSS), parental stress curves were also tracked over time as a method to ascertain chronic stress experiences within these households
- Stress seemed to be the predictive factor for asthma exacerbation when you control for SES and in part explains the link between SES and asthma morbidity
- It is important to measure the perception of stress and the individual response to that perception
- Higher levels of income are linked to lower levels of stress
- Cortisol balance is also very important to study – at this time it is not clear if the problem is too much or too little cortisol
- Wright's preliminary research suggests that a blunted cortisol response in mothers prenatally predicts higher maternal total IgE levels. This is of interest as other research has revealed that if the mother has high IgE levels in utero, this is a marker for the development of asthma in the offspring.
- Early trauma, as defined by the Childhood Trauma Questionnaire has also revealed that cortisol dysregulation with low basal rates in the morning and elevated levels throughout the day are characteristic of trauma victims in a number of studies albeit results are mixed
- Wright has demonstrated a similar pattern in the asthma pregnancy cohort using this measure

CELLULAR AND MOLECULAR FACTORS***Stress & Immune Function: The Good, The Bad, & The Beautiful***

Dr. Firdaus Dhabhar, Director of Research, Stanford Center on Stress & Health
Associate Professor, Department of Psychiatry & Behavioral Sciences
Stanford University School of Medicine, Palo Alto, California

Dr. Dhabhar's presentation covered the following points:

- Fatigue, depression, stress, anxiety, hostility, and personality can affect (and be affected by) changes in nervous, endocrine and immune function
- Acute stress is defined as lasting from minutes to hours
- Chronic stress is defined as lasting from weeks to months to years and can lead to the dysregulation of diurnal rhythm
- The body is bathed by different hormones during stress
- Examination of immune cell numbers in the blood of individuals under stress reveals a time-dependent significant increase in leukocytes, then a decrease in leukocytes and then a return to normal levels
- During acute stress, there is a large-scale mobilization of leukocytes from the spleen and possibly the bone marrow
- Animals that were acutely stressed had significantly higher leukocyte infiltration to a surgical site than non-stressed animals
- Stress amplifies the response of chemokines
- Found that immune function was enhanced where there was acute stress just prior to the receipt of immunization
- Adrenal gland activity is necessary for secretion of epinephrine and cortisol during an acute stress immune response
- Physiological levels of epinephrine and corticosteroid are needed to have a stress-induced enhancement of immune function
- The amount of glucocorticoid can increase or suppress (at high levels) the immune response at different concentrations and durations
- Acute stress can enhance immune function in certain circumstances
- Chronic stress suppresses the immune response
- Research revealed that high stress women had shorter telomeres typical of women 10 years older
- Chronically stressed animals have more tumours
- Chronic stress shifts the balance to the TH2 response and may set up susceptibility for asthma and other allergic diseases

EPIGENETICS***Epigenetic mechanisms: An Interface Between the Dynamic Environment and the Static Genome***

Dr. Moshe Szyf, Professor, Department of Pharmacology and Therapeutics
McGill University, Montreal, Quebec

Dr. Szyf's presentation covered the following points:

- Epigenetics is a dynamic interface between a dynamic environment and the static genome
- Programming of the genome is controlled by the epigenome which is composed of chromatin (associated with DNA) and various modifications to it and DNA

- DNA methylation, part of the covalent structure of the genome, can be a stable, long-term genomic structure
- S-Adenosylmethionine (SAMe) is important molecule to look at in asthma and allergic diseases
- An imprinted gene is differentially methylated depending on which parent it is inherited from - mother or father
- While there is mention in the literature of “maintenance DNA” methyltransferases, he does not believe that their role is just to automatically copy the DNA methylation pattern during cell division
- Methylation changes are not limited to dividing cells and DNA methylation and demethylation activities exist in non-dividing cells
- DNA methylation silences gene expression with at least two mechanisms:
 1. Inhibition of transcription factor binding to its recognition element
 2. Precipitating a locked chromatin structure through recruitment of methylated DNA binding proteins
- Demethylase could reverse the methylation reaction; several candidate demethylase activities were proposed
- Closed chromatin configuration prevents the demethylase from accessing the methylated genes
- The fact that DNA methylation is potentially reversible and that it could respond to intracellular signalling pathways implies that DNA methylation could serve in physiological control
- Suggests that behavioural and environmental factors can programme and reprogramme genes, leading to their activation or inactivation through changes in chromatin state DNA methylation or both
- An important transcription factor, NGFI-A – is involved in maternal grooming effects on the the epigenetic regulation of selected genes such as the glucocorticoid receptor in the brain of the infant rat.
- Dr. Szyf hypothesizes that histone modification states can influence methylation/demethylation
- MBD2 (Methylated DNA binding domain protein):
 - co-localizes with sites of histone acetylation
 - causes rapid tumour growth and induces cell migration
 - induces cytokines and causes demethylation in the glucocorticoid receptor and other genes
 - acts on a “template” that has genetic and epigenetic aspects
 - serves also as a methylated DNA binding protein causing silencing of genes through recruitment of histone deacetylases.

INTERVENTIONS

Targeting the Brain to Improve Symptoms of Somatic Disease

Dr. Glenda M. MacQueen, Associate Professor, Head, Dept. Mood Disorders Research Program
 Director, Dept. Clinical Investigator Training Program
 Head, Mood, Anxiety and Women's Health, St. Joseph's Healthcare, Hamilton, Ontario

Dr. MacQueen's presentation covered the following points:

- Studies have used behavioural interventions to target asthma symptoms but the aggregate interpretation of these is limited despite multiple Cochrane reviews
- The benefit of treating co-occurring psychiatric illness is under-studied
- It is feasible to target the brain to modify signalling and therefore physiology in the periphery.
- There are a number of ways to examine the factors that mediate relations between asthma and stress (depression)
- How people exist in relation to others affects their health
- Large inequalities decrease the availability of protective lifestyle factors for the poor in a community
- The disease consequences of feeling poor may be rooted in the psychosocial consequences of being made to feel poor by one's surroundings
- Increased income inequality decreases a community's "social capital"
- Such decreased capital mediates the relations between income inequality and health.
- Challenges of intervention research include deciding who to be targeted for interventions, determining if interventions improve symptoms in a sustained fashion and understanding the mechanisms driving the improvement
- Cognitive behaviour therapy is helpful but few people have access to service
- Patient education is essential
- A behavioural approach to symptomatic modification results in greater adherence to medication, better control of triggers, and fewer ignored warning symptoms
- Depression is common among youth with asthma
- By treating asthma co-morbidities of depression, anxiety and attempted suicide, asthma symptoms can be reduced
- Changing people's perceptions can change their brain function and neural pathways
- Modifying the brain to change signaling to periphery can change physiology
- Anterior cingulate cortex activity predicts peripheral measures of inflammatory potential
- Insula activity predicts peripheral measures of inflammatory potential and lung function
- There is increasing evidence that neuronal dysfunction and dysregulation contribute to the pathogenesis of allergic asthma.
- NGF, BDNF, NT-3 and other neurotrophins have "profound" effects on immune cells involved in the pathogenesis of allergic disease.
- Immune cells can produce neurotrophins, and the levels of neurotrophins, as well as neurotrophic activities, are up-regulated in allergic conditions.
- A number of pathomechanisms controlling allergic diseases are directly related to neurotrophin function, including the development of airway hyper-responsiveness.
- Decreased BDNF contributes to depression, and up-regulation of BDNF plays a role in treatment.
- Acute and chronic stress decreases the expression of BDNF in the hippocampus.
- Administration of corticosterone decreases BDNF expression and removal of the adrenal glands increases the expression of BDNF, but adrenalectomy does not completely block the effects of stress on BDNF.
- NGF and NT-3 are decreased in the hippocampus by chronic stress.

4. Mind-body research thrusts that could be incorporated into the AllerGen research program 2007-2009

Workshop participants identified the following thrusts as opportunities for AllerGen investment in mind-body research:

1. Epigenetics

- 1.1. Pilot well designed proof-of-principle studies demonstrating that there are epigenetic differences between individuals with and without allergic disease
 - Need to decide if the focus is on a few genes or a genome-wide scan or both
 - Such new knowledge will enable AllerGen to appropriately capture epigenetic phenomena in the CHILD Study
 - Develop epigenetic models for birth cohort – human or animal models
 - Could take high and low risk cord blood and look for other epigenetic differences in stem cells and/or other cells such as lymphocytes, etc.
- 1.2. Once proof-of-principle is established, AllerGen could support epigenetic research questions in the context of the “mini CHILD” study, linked to stress
- 1.3. Study the impact of SES and epigenetics focusing on glucocorticoid receptors
- 1.4. Case control study of 5 year old non-treated recently Dx asthmatics vs. controls – examine genome-wide scan (pooled DNA) (\$20-30k)
- 1.5. Select genes from genome scan for digging deeper - 10⁶ PhD students or bigger machines
- 1.6. Genetic studies and epigenetics may inform AllerGen about pathways that mediate cellular pathways to disease and help to identify psychosocial environmental targets
- 1.7. Epigenetics of immune cells, lymphocytes, mast cells and basophils
- 1.8. The social environment, especially in early life, can influence development and expression of allergy and asthma. What role do epigenetic modifications of stress and respiratory genes play in this?
- 1.9. Modifications in the epigenome associated with different genotypes

2. Cellular & Molecular Mechanisms and Neuro-immunology

- 2.1. Where is the molecular memory stored? In stem cells? Immune cells? T-Cells of peanut allergic? What is stored?
- 2.2. Devise a hypothesis about how molecular memory is regulated, make sense of connections – look at the end of processes and test whether the environment can explain differences
- 2.3. Concordance of methylation pattern in CD-34 stem cells v.s. CD-4 + CD-8 cells in cord blood in high risk vs. low risk kids and follow over time
- 2.4. Development of biomarkers for stress-associated inflammation and inflammatory responses e.g. neuro-endocrine pathways that regulate anti-allergic pathways in the salivary glands

3. Stress and Depression

- 3.1. A study of “short-term induced depression” by a tryptophan deficient diet in previously depressed asthmatics, to compare the effects of current depression vs not depressed asthmatics on response of individual to allergen challenge, combined with imaging of the regions of the brain that would be activated/recruited in the response
- 3.2. An intervention study in a targeted folate deficient population – genotyping etc. (see Denise Daley and Anita Kozyrskyj – Programme A)

- 3.3. Conduct small, well-designed study of Cognitive Behavioural Therapy in targeted population and assess impact on asthma and behavioural outcomes
- 3.4. Pilot study to look at asthma cohort babies for trauma, ADHD, obesity and identify modifiable stressors in the early care-giving environment
- 3.5. Case-control of defined pre-term stressed vs. un-stressed mothers' cord-blood
- 3.6. Develop animal models of stress and asthma susceptibility to test the effects of timing of stress on long-term outcomes, of air pollution exposure as a stressor, and assess levels of balance between good and bad stress; in humans to compare SES with perceived exposure to indoor pollutants, outdoor pollutants
- 3.7. What are the modifiable stressors and can we test several interventions using the AllerGen CIC models?

5. Next Steps and Milestones for Implementation

Table 1: Key Action Items	Milestone
1. Workshop report issued	February 28, 2007
2. Workshop participants confirm their willingness to participate in a writing team to develop a five page multidisciplinary programmatic project proposal	March 1- 7, 2007
3. Significant discussion to be undertaken among AllerGen Programme Leaders re: appropriate representation and leadership	March 1- 7, 2007
4. In a series of teleconference meetings, the writing team identifies priority research questions within the strategic areas identified by workshop participants	Ongoing March-April 2007
5. The writing team interacts on-line and via teleconference to: <ul style="list-style-type: none"> a. Develop an integrated set of primarily applied, programmatically linked and interdisciplinary mind-body research questions that leverage the Network structure, technology platforms and research infrastructure of AllerGen b. Identify applied outcomes for each research question that could be transferred to industry, the health system, policy makers and/or the public. c. Identify industry, government or not-for-profit sector partners (potential research users) and identify potential members of a user-committee to advise on the development of the research. d. Identify unique and needed training opportunities related to the research (consider students, post-doctoral fellows, researchers, clinicians and government, private sector and not-for-profit professionals as learners) e. The writing team prepares a five page research proposal and associated budget consistent with AllerGen’s RFA (see AllerGen members-only web-site) for review and comment by AllerGen Research Programme Leaders 	March 1 – April 6, 2007
6. Feedback from AllerGen Research Programme Leaders provided to writing team	April 16, 2007
7. Writing team finalizes five-page proposal and budget and submits to Programme Leaders	April 25, 2007
8. Programme Leaders review and submit to AllerGen for international peer review	May 1, 2007
9. AllerGen Board reviews and approves international peer review and AllerGen Research Management Committee recommendations	June 25, 2007
10. AllerGen funding issued	June 29, 2007

6. Concluding Remarks

NCE research programs distinguish themselves from those supported by the Canadian Institutes of Health Research (CIHR) by virtue of their interdependent, networked research teams working collaboratively across disciplines and institutions, and in partnership with potential end users of the research results. Ideally, NCE researchers work in virtual teams on complex problems that would not and could not be addressed by individual researchers working alone. These research teams are funded to be transformational agents of innovation that develop, protect, translate and apply knowledge for economic and / or social benefit to Canada.

NCE research is typically undertaken in a goal-oriented context that assumes the translation of such research findings are essential to the realization of the broader social and economic impact of a Network in relation to its specific mission. Thus, the “framing” of the basic research undertaken within an NCE is different from CIHR research in that it may be curiosity driven but also has a compelling justification in terms of its contribution to the Network’s social and/or economic impact and development objectives.

The mind-body research agenda is an important aspect of AllerGen’s overall research agenda. This workshop represents a major initiative to enhance AllerGen’s research efforts in this developing research field.

We are most grateful to the four guest presenters – Drs. Rosalind Wright, Firdaus Dhabhar, Moshe Szyf and Glenda MacQueen - for enriching our understanding of the mind-body research field, and sharing their expertise so generously with us as AllerGen makes a concerted effort to enrich its research programme in this field and moves to develop meaningful social and economic impact for Canadians.

We encourage all those workshop attendees interested in breaking new ground in this area in relation to allergic disease to seize the opportunity to lead AllerGen into novel and high impact mind-body research endeavours that will leverage the multidisciplinary, multi-sectoral composition of the Network and catalyze new discovery and development opportunities with potential to improve the quality of life for people suffering from allergic and related immune disease.

Dean Befus

Research Leader

AllerGen Programme B: Diagnostics and Therapeutics

University of Alberta

28 February 2007

Appendix A: Workshop Agenda

AllerGen NCE Inc.
 Theme III: Mechanisms and Biomarkers Research Workshop on
Mind-Body Interactions

Wednesday February 14, 2007
 8:30 a.m. – 4:00 p.m.

Beckett Room, Concourse Level (First Floor)
 Sheraton Hamilton, ON
 On-site Telephone: (905) 529-5515

Contact: Lynelle Watt, Theme III Coordinator, University of Alberta

Wednesday February 14, 2007 – Beckett Room, Concourse Level (First Floor)		
7:00 – 8:30 a.m.	Buffet Breakfast – External Foyer of Beckett Room, Concourse Level (First Floor)	
8:30 - 8:40 a.m.	Welcome and overview of agenda	Dean Befus
8:40 – 9:30 a.m.	Roundtable introductions and sharing responses to the following questions: <ul style="list-style-type: none"> • Name • Affiliation • Your interest in mind-body research 	Diana Royce, Facilitator
9:30 – 10:15 a.m.	EPIDEMIOLOGY “Psychological Stress and the Development and Expression of Asthma: Epidemiologic Evidence” Dr. Rosalind Wright Assistant Professor, Department of Society, Human Development & Health, Harvard School of Public Health, Brigham & Women's Hospital, Harvard Medical School, Boston, Massachusetts	
10:15 – 10:30 a.m.	Refreshment Break	
10:30 – 11:15 a.m.	CELLULAR AND MOLECULAR FACTORS “Stress & Immune Function: The Good, The Bad, & The Beautiful” Dr. Firdaus Dhabhar Director of Research, Stanford Center on Stress & Health Associate Professor, Department of Psychiatry & Behavioral Sciences Stanford University School Of Medicine, Palo Alto, California	
11:15 - 12:00 p.m.	EPIGENETICS “Epigenetic Mechanisms: An Interface Between the Dynamic Environment and the Static Genome”	

	<p>Dr. Moshe Szyf Professor, Department of Pharmacology and Therapeutics McGill University, Montreal, Quebec</p>	
12:00 – 1:00 p.m.	<p>Lunch – External Foyer, Beckett Room, Concourse Level (First Floor)</p>	
1:00 – 1:45 p.m.	<p>INTERVENTIONS</p> <p>“Targeting the Brain to Improve Symptoms of Somatic Disease”</p> <p>Dr. Glenda M. MacQueen Associate Professor, Head, Dept. Mood Disorders Research Program Director, Dept. Clinical Investigator Training Program Head, Mood, Anxiety and Women’s Health, St. Joseph’s Healthcare, Hamilton, Ontario</p>	
1:45 – 2:45 p.m.	<p>Prioritization of mind-body research opportunities: Towards a programmatically integrated research plan</p> <ol style="list-style-type: none"> 1. What are the major research themes arising from today’s presentations? 2. Which research questions are aligned with AllerGen’s mission and goals for social and economic impact? 3. Which research thrusts should be given priority in an integrated programmatic project proposed for AllerGen funding? 4. What might an integrated programme of research focusing on mind-body look like? 5. What organizations are potential research partners? 	<p>All participants</p>
2:45 - 3:00 p.m.	<p>Refreshment Break</p>	
3:00 – 3:45 p.m.	<p>Next steps</p> <ul style="list-style-type: none"> • Process • Milestones • Timeframes • Research team composition • Research team coordination 	<p>Diana Royce</p>
3:45 – 4:00 p.m.	<p>Concluding remarks and adjournment</p>	<p>Dean Befus</p>

Appendix B: Workshop Participants

	Name	Affiliation
1.	Becker, Allan	University of Manitoba
2.	Befus, Dean	University of Alberta
3.	Bienenstock, John	McMaster University
4.	Chen, Edith	University of British Columbia
5.	Collins, Stephen	McMaster University
6.	Daley, Denise	University of British Columbia
7.	Denburg, Judah	McMaster University
8.	Dhabhar, Firdaus (Invited Speaker)	Stanford University
9.	Elliott, Susan	McMaster University
10.	Forsythe, Paul (Trainee – John Bienenstock)	McMaster University
11.	Kobor, Michael	University of British Columbia
12.	Kozyrskyj, Anita	University of Manitoba
13.	Letourneau, Nicole	University of New Brunswick
14.	MacNeil, Brian	University of Manitoba
15.	MacQueen, Glenda (Invited Speaker)	McMaster University
16.	Mai, XiaoMei (Trainee - Anita Kozyrskyj)	Manitoba Institute of Child Health
17.	Mathison, Ron	University of Calgary
18.	Meaney, Michael	McGill University
19.	Miller, Greg	University of British Columbia
20.	Morris, Katherine (Trainee – Dean Befus)	University of Alberta
21.	Pare, Peter	University of British Columbia
22.	Sears, Malcolm	McMaster University
23.	Silverman, Frances	University of Toronto
24.	Szyf, Moshe (Invited Speaker)	McGill University
25.	Vliagoftis, Harissios	University of Alberta
26.	Wright, Rosalind (Invited Speaker)	Harvard Medical School
Staff:		
1.	Royce, Diana	Facilitator
2.	Simpkin, Samantha	AllerGen Office Manager
3.	Watt, Lynelle	AllerGen Research Coordinator