



The Institute of Nutrition, Metabolism, and Diabetes (INMD)

**ADVANCING FOOD AND HEALTH
RESEARCH PRIORITIES**

WORKSHOP REPORT

November 3 - 5, 2010

Edmonton, Alberta

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EXECUTIVE SUMMARY

This document is a report from the Canadian Institutes of Health Research (CIHR) Institute of Nutrition, Metabolism, and Diabetes (INMD) Workshop: *Advancing Food and Health Research Priorities in Canada*.

The **objectives** of this meeting were to:

1. Identify strengths, gaps, and opportunities in research capacity in Canada for Food and Health.
2. Develop a Canadian research agenda for Food and Health that will address some of the gaps identified in the 2006 Institute of Medicine Report, Dietary Reference Intakes Research Synthesis: Workshop Summary. This research agenda will form the basis of future funding opportunities for the CIHR Institute of Nutrition, Metabolism and Diabetes.
3. Define opportunities for international and global collaborations for the Canadian Food and Health research community in the context of Chronic Disease Prevention and Control.
4. Engage partners as potential research funders to support the identified research agenda for Food and Health in Canada.

Approximately 80 participants attended the workshop, which brought together food science and nutrition researchers, representatives from voluntary health organizations, federal and provincial governments, and the food industry, as well as international speakers. Participants were invited to share knowledge and to work collaboratively to develop a research agenda that will advance knowledge in relation to Food and Health, so as to ultimately improve the health of Canadians.

Recommendations generated from the workshop will be used to inform future funding opportunities launched by INMD to support Food and Health research, a priority in INMD's Strategic Plan 2010-2014, which is based on the five foundational principles of research excellence through partnerships, ethics, capacity building, knowledge translation, and evaluation.

The workshop focused on the identification of research priorities in the six thematic areas:

1. Nutritional Vulnerability
2. Emerging Food Technologies
3. Food Policies and Programs
4. Food Security
5. Human Nutrition
6. "Omics"

Throughout all themes, the crucial components in moving this research agenda forward were identified as capacity building, training support, and research partnerships, with the latter to encompass other research funding organizations, the food industry, governments, and other collaborative groups.

Key research gaps and associated requirements identified in the six themes are summarized below:

- Research on nutrient requirements, particularly in special populations (e.g., pregnant women, children, and the elderly)
- Nutrition intervention studies in people with vulnerabilities (e.g., Aboriginal populations, and the institutionalized elderly)
- Community-based intervention research to determine what works at the policy and program level
- A balance between randomized controlled trials (RCT) and population studies to determine best practices to manage nutrition issues
- Interdisciplinary research to determine if food and nutrition policies are achieving what is intended
- A comprehensive, multi-centre human intervention trial platform in Canada to address challenges such as subject recruitment and lack of standardization for clinical trials, establishing hard end points and clinical tools that are non-invasive and repeatable
- Development of national collaborative programs to assess food security and diet quality
- Studies to better understand population variability and varying responses to specific nutrient interventions
- Identification of sub-populations with significant, characterizable genomic risk
- Increased focus on disease prevention research to inform policies and programs
- Identification of the social, legal, and ethical issues around genetic tests for personalized nutrition

There was also a need for research into methods and tools related to:

- Integrating different types of approaches and study methods, such as basic science, clinical research, and population-based studies
- Developing validated tools and methods for the assessment of dietary intakes, nutritional status, and nutrition surveillance
- Establishing tools and methods to evaluate nutrition policies and interventions
- Identifying validated biomarkers of exposure and effective use of emerging 'omics' technologies
- Developing methods and tools to implement the knowledge of nutrigenomics and metabolomics

Research and evaluation related to the public health impact of various food and nutrition interventions and policies were also identified as a need:

- Identification and assessment of the public health implications of biological and nutritional variability

- Evaluation of the impact of policies and programs on diet quality and food security (such as income support policies and programs at both the federal and provincial levels, and school food policies)

Knowledge translation was identified across many of the themes to support the translation of evidence to the public, health care providers, policy-makers and organizations that implement food and nutrition programs and services.

CONCLUSIONS AND RECOMMENDATIONS

Under the strategic priority of *Food and Health*, INMD aims to develop a stronger evidence base to inform best nutritional practice and food policy. The Institute is committed to fostering research on both total diet and on specific nutrients that will enhance health and reduce the risk of chronic disease.

With this focus, the CIHR-INMD is pleased to provide leadership to catalyze a broad range of research including: health, food science, knowledge-to-action (implementation science), and evaluation research supporting Food and Health. By bringing together multi-sectoral representation of national and global expertise in the area of Food and Health, key gaps, opportunities, and research priorities in each of the six thematic areas have been brought to light. This presents CIHR-INMD and relevant partners with the potential for creating specific funding opportunities that will build a strong portfolio of comprehensive research.

Next steps will include consultation with the INMD Institute Advisory Board and stakeholders to launch funding opportunities that will address the research gaps and opportunities identified in this Workshop.

SETTING THE CONTEXT FOR FOOD AND HEALTH

WELCOME AND OPENING REMARKS

Philip M. Sherman, Workshop Chair
Scientific Director, Institute of Nutrition, Metabolism and Diabetes, CIHR

Dr. Sherman welcomed participants to the meeting and noted the importance of bringing together a wide cross-section of diverse research leaders in Canada to provide input for the development of a research agenda that will advance knowledge in relation to Food and Health in Canada. It was highlighted that the proceedings of the workshop would be synthesized into a report identifying research gaps, research questions, and research priorities in six thematic areas relating to Food and Health.

Dr. Sherman thanked the workshop sponsors and CIHR partners and all of the individuals who contributed to the development of the workshop agenda, including representatives from the INMD Institute Advisory Board, with a special mention to Institute Advisory Board Chair, Dr. Stephanie Atkinson.

DIETARY REFERENCE INTAKES: WHERE DO WE GO FROM HERE?

Dennis Bier

Director, Children's Nutrition Research Center, Baylor College of Medicine, United States

Dr. Dennis Bier commended CIHR on its priority on 'Food and Health'. He urged the group to raise the crucial questions and shared his view that if the answers are critical then there should be a way to pay for such research. Despite all of the research work and volumes of information relating to Dietary Reference Intakes, data to establish requirements and UL's (upper tolerable levels) are still lacking. Dr. Bier identified a number research gaps and associated challenges:

- The need for systematic studies to provide baseline, depletion, and repletion data on which to base Estimated Average Requirements (EARs)
- Interest in basic studies to obtain requirements and toxicity levels is not well supported in current university settings (with a lack of incentives for investigators to undertake this type of work)
- A lack of sufficient intake data to determine EARs, and the need to establish hard endpoints
- Accurate measurement of food intake in humans presents a basic problem. New methods and independent biomarkers that reflect accurate dietary intake are needed, as current tools are not valid and food composition tables cannot keep up with rapid industry changes in prepared food products
- There is a need to answer the question: "Requirements for what?" Historically, requirements were used to prevent nutrient and micronutrient deficiencies. However, in the realm of *prevention* of chronic disease, other end-points also need to be considered
- Lack of intervention studies to confirm nutrient requirements for chronic disease risk reduction and prevention
- Since more than half of the current DRIS for children are derived using extrapolation and scaling, the validity of these values must be questioned. Appropriate nutrition intervention studies with biologically significant outcome measures are urgently needed in children
- The need for ethical guidelines to conduct clinical nutrition studies on children
- Since genetics account for a greater fraction of nutritional variance, there is a need to exploit 'omics' to provide proximate and specific biomarkers
- The validity of current figures and confidence ranges must be considered. In addition, there is a need for a paradigm for revision and update. No decision is not an option—there is a need for more data!

PLENARY 1: OVERVIEW OF FOOD AND HEALTH RESEARCH GAPS AND PRIORITIES

Discussant/Moderator: Stephanie Atkinson, Institute Advisory Board Chair, CIHR-Institute of Nutrition, Metabolism and Diabetes (INMD)

FOOD AND HEALTH RESEARCH: OVERVIEW OF GAPS AND OPPORTUNITIES IN CANADA

Susan Whiting

Professor of Nutrition, College of Pharmacy and Nutrition, University of Saskatchewan

In defining Food and Health, it is important to understand both the effects of food on the body and the process of procuring food i.e. agriculture (including issue of local foods), access to healthy foods, likes and dislikes, and cultural preferences. While we know health is not simply the absence of sickness, but the ability to engage in all human activities, historically, the focus for setting dietary recommendations was on avoiding classical nutrient deficiency disease.

Dietary Reference Intakes (DRIs) embrace a new paradigm that includes consideration of evidence concerning the prevention of disease, in addition to more traditional evidence related to the prevention of nutrient deficiencies. It is becoming apparent, however, that there are still large gaps in knowledge in the areas of prevention of diet-related chronic disease and in diet-enhanced performance. While lessons were learned in the development of the DRIs 1994-2004, challenges lie in understanding and managing the risks and benefits of higher Recommended Dietary Allowances (RDAs). One lesson still apparent is a lack of understanding of DRIs and their meaning.

Food and health research in Canada is represented by the geographical diversity of Canadian researchers. Currently, more than 36 Canada Research Chairs are held by scientists who conduct research in some aspect of Food and Health, which exemplifies national expertise in nutrition-based research. In pursuit of answering the ultimate question of whether food makes a difference to health, researchers are faced with numerous gaps, including:

- The role of nutrition in chronic disease with respect to aging, changing demographics, and information for prevention and treatment
- Food behaviours, including individual preferences and cultural determinants
- Food security, including availability of local foods, cost and needs of vulnerable populations, such as immigrants and refugees and those living in rural and remote communities
- Public health nutrition, including policy research and research for scientific principles
- Professional research issues, including dietitians' standards of practice and competencies, and quality assurance issues in the food service area
- Hospital malnutrition, including resolving the current lack of standardized measures

- Evaluations beyond essential nutrients, including micronutrients and the role of compounds and specific formulations
- Knowledge translation to effect changes in clinical care and in changing food and health policies and practices

There are also promising opportunities to be considered in seeking solutions:

- Working on projects of global importance may solve issues of food security and local foods
- Improving nutrient intakes, including supplements, fortification, functional foods, and biofortification options
- Study areas using cross-cutting methodologies through networks, teams, and partnerships across sectors.
- Use of existing and recently initiated national survey data to generate new and updated knowledge

WHAT CAN FUNCTIONAL COMPONENTS OF FOOD CONTRIBUTE?

Peter Jones

University of Manitoba, Canada Research Chair in Functional Foods & Nutrition, Director, Richardson Centre for Functional Foods and Nutraceuticals

Current recommended nutrient intakes fall far below the functional food effect. Therefore, it is possible that the optimal range of nutrient intakes have been underestimated. Functional foods could redefine daily nutritional requirements.

Functional foods may go beyond prevention and could be considered for therapeutic use. An example is metabolic syndrome where the current therapy of diet, exercise, and prescription drugs is not optimal resulting in more medications being prescribed. Studies have shown that intake of medium-chain triglycerides results in increased loss of adipose tissue and reduced abdominal girth, due to enhanced fat oxidation. Such an approach represents a dietary alternative to reduce abdominal fat. Positive results have also been shown using plant sterols in margarines to lower low density lipoproteins, yellow pea flour for insulin resistance modulation, and tomato extract and lycopene to reduce blood pressure. Taken together, there appears to be increasing evidence in support of a role for functional foods in going beyond disease prevention and into the realm of managing disease.

THE IMPORTANCE OF BIOMARKERS AS SURROGATES FOR CHRONIC DISEASE AND WELLNESS

Cindy Davis

Program Director, Nutritional Sciences Research Group, National Cancer Institute, USA

The burden of chronic disease is projected to continue to increase; thus, there is a need for developing effective preventive strategies. While optimizing the intake of specific foods or their bioactive components seems a prudent, non-invasive, and cost-effective strategy for reducing the burden of chronic disease, it is far from a simple process. The magnitude of the problem in identifying critical dietary components is evident by the literally thousands of compounds consumed by an individual each day. Furthermore, the dearth of quantitative information about some food constituents limits the ability to unravel which components are most important.

Predictive, validated, and sensitive biomarkers are required, including those that reliably evaluate intake and exposure to a specific food or bioactive component; that assess one or more specific biological effects; and that effectively predict individual susceptibility as a function of nutrient-nutrient interactions and genetics are fundamental to evaluating who will benefit most from a specific dietary intervention. Future biomarkers must be readily accessible, easily and reliably assayed, and highly predictive of a key biological process (or processes) involved in disease pathogenesis. It is very likely that a suite of biomarkers, rather than a single measure, will be needed to adequately evaluate the impact of altering dietary intakes on disease risk. Moreover, the response to a food is determined not only by the effective concentration of the bioactive food component reaching the target tissue, but also the amount of the target requiring modification. This threshold response to foods and their components is likely to vary from individual to individual.

Molecular biomarkers (the “omics” approach) is likely to offer the sensitivity and reliability for evaluating dietary exposures, and to provide valuable insights regarding behaviors of specific molecular targets and predictors of individual responsiveness to a dietary change. The study of nutrigenomics has the potential to identify which components in foods bring about either positive or negative consequences, to clarify their relevant mechanisms of action, and, importantly, ascertain when they can be manipulated to reduce cancer risk.

Knowledge about how diet-induced phenotypic responses depend on an individual’s genetic background (nutrigenetics), the expression of genes (epigenomics and transcriptomics), changes in the amounts and activities of proteins (proteomics), and shifts in small molecular weight compounds (metabolomics)—collectively referred to as “omics”—likely will assist in achieving greater precision in identifying responsive individuals.

PLENARY 2: A GLOBAL PERSPECTIVE ON FOOD AND HEALTH – EARLY NUTRITION AND COGNITIVE DEVELOPMENT IN RELATION TO HUMAN CAPITAL

Discussant/Moderator: Tony Philips, Scientific Director, CIHR-Institute of Neurosciences, Mental Health Addictions (INMHA)

THE IMPACT OF MATERNAL/CHILD NUTRITION ON COGNITIVE DEVELOPMENT

Michael Georgieff

Professor of Pediatrics and Child Psychology, Institute of Child Development; Director, Center for Neurobehavioral Development, University of Minnesota, USA

Studies show that nutrient effects on brain development are based on timing, dose, and duration of exposure. Regions of the brain have different developmental trajectories, and the vulnerability of the brain region to a nutrient deficiency is based on when the deficiency is likely to occur over a lifetime and the nutrient requirement for that region of the brain. In fetal and early postnatal life, there is active myelination occurring in the prefrontal cortex of the brain. Those nutrients that have particularly large effects on brain development and behaviour include macronutrients (protein, specific fats and glucose), micronutrients (zinc, copper, iodine and iron), and vitamins (B6, B12, vitamins A, K, folate and choline). Malnutrition can have either global or circuit-specific effects on the developing brain. It is estimated that elimination of micronutrient deficiencies (zinc, iodine, and iron) would increase the world's IQ by 10.

Effects are based on the timing and magnitude of nutrient deficit as well as the brain's need for a particular nutrient. Nutrient availability only represents the "supply side"; "demand" and "processing" must also be considered. It is not just nutrients, but growth factors as well that determine outcomes: the two together serve to stimulate normal neuronal growth and development. Both can be altered by non-nutritional factors, such as stressors. Infectious stress and psychological stress both alter nutritional status by creating a state of limited fuel availability for growth.

Multiple factors affect early brain development and function. Some are not mutable, but nutrition is. The need for policy is one key to preventing long-term nutritionally based brain deficits. Policies that favour early nutrition interventions are those most likely to be successful, since the brain is more plastic early in life. Accordingly, efforts should focus on pre-conceptual, maternal-fetal, and newborn nutrition to achieve the highest impact.

EARLY NUTRITION AND COGNITIVE DEVELOPMENT: THE NEED FOR RESEARCH IN SUPPORT OF 'THE SCIENCE OF IMPLEMENTATION'

Stanley Zlotkin

Professor of Pediatrics, Public Health Sciences and Nutritional Sciences, University of Toronto

After AIDS, micronutrient deficiencies are the biggest world health challenge. There is a need for a public health and population nutrition focus. As researchers with evidence and results, there is an obligation to translate this knowledge and implement effective solutions. It is time to go to the next step, which involves implementing knowledge translation.

The “Science of Implementation” involves the use of strategies and processes to integrate evidence-based health interventions in specific settings. Implementation research addresses any up-or down-stream components of implementation, including impact evaluation.

Implementing the results of science is difficult. As a result, there is a need for more rigour in order to accomplish this. The fortification of salt to address iodine deficiency is a good example of a successful implementation approach, because salt is used worldwide by all populations. However, in the case of vitamin A, despite three successful approaches that can be used, a large percentage of the world’s population continues to suffer from vitamin A deficiency. The problem of iron deficiency continues to exist even though there is sufficient research and information. Poverty is the main factor associated with micronutrient deficiencies.

The home fortification program sponsored by UNICEF using micronutrient powders (Sprinkles) is an example of implementation science. These single-serve packets contain a mixture of powdered vitamins and minerals that are easily sprinkled once daily onto many different types of foods without changing their sensory properties. The food technology is easy to use, the product is highly acceptable in varied populations, and it is low cost to produce. Nevertheless, the Sprinkles supply chain is complex and sustainable distribution is difficult. Sustainable distribution programs must be able to reach and provide micronutrient powders to the most vulnerable populations, and regulatory authorities must support its local use.

Important to note is that we have the knowledge to improve nutritional status and child survival, but do we know how to do it? An opportunity exists for CIHR to support the Science of Implementation.

ENABLING NEW SOLUTIONS FOR MATERNAL, NEONATAL AND CHILD HEALTH IN THE DEVELOPING WORLD

Rebecca Lackman
Grand Challenges Canada

In the 2008 Federal Budget, the Government of Canada announced the Development Innovation Fund, which is designed to: “support the best minds in the world as they search for breakthroughs in global health and other areas that have the potential to bring about enduring changes in the lives of millions of people in poor countries”. Grand Challenges Canada was created to achieve the goal of saving and improving lives, working in a consortium with the International Development Research Centre (IDRC) and the Canadian Institutes of Health Research (CHIR).

Grand Challenges Canada is funded by the Government of Canada’s foreign aid budget through the Development Innovation Fund. A grand challenge is a specific critical barrier that, if removed, would help solve an important health problem in the developing world with a high likelihood of global impact through widespread implementation. Core to Grand Challenges Canada’s strategy is Integrated Innovation™, which is the coordinated application of scientific/technological, social, and business innovation to develop solutions to complex health challenges.

The vision of Grand Challenges Canada is to develop a consortium of world-leading Canadian and International scientists, research organizations, and leaders from the business sector, including strong representation from the developing world, to discover and commercialize breakthrough solutions to global health challenges and to ensure that these solutions are available to those who need them the most. The mission of Grand Challenges Canada is to identify global grand challenges, fund a global community of researchers and related institutions on a competitive basis, and support the implementation and commercialization of the solutions that emerge. Grand Challenges Canada will identify, fund, and support a total of five grand challenge programs in global health. Each grand challenge is determined through a rigorous exploration process and through the advice and consultation with leading Canadian and international scientists.

GCC is currently exploring three grand challenges in the area of maternal, neonatal, and child health (MNCH):

1. Create methods to detect and prevent pre-eclampsia and preterm birth.
2. Scale up care around the time of birth.
3. ‘Saving Brains’: Identify early-life interventions that promote fulfillment of adult human capacity.

GCC also recently launched the Canadian Rising Stars in Global Health Program to strengthen and sustain Canada's global health community. The Rising Stars program will fund Canadian leaders coming forward with 'outside the box' ideas for solving global health challenges, in collaboration with career investigators from LMIC. Applications are due in March 2011 for initial seed grants (Phase 1); it is anticipated that Phase 1 competitions will be launched annually in 2012 and 2013. Phase 1 grantees that have demonstrated proof-of-concept for their idea will have the opportunity to apply for a Phase 2 grant.

FOOD AND HEALTH: BREAKOUT SESSIONS BY THEME

Workshop participants were divided into six groups based on the Workshop themes of:

1. Food Vulnerability
2. Emerging Food Technologies
3. Food Policies and Programs
4. Food Security
5. Human Nutrition
6. 'Omics'

In the format of six breakout sessions, each theme was introduced by three presenters who set the context for small roundtable discussions related to the key knowledge gaps, research opportunities and research questions related to the theme.

Following the presentations, two table groups of participants and a designated moderator deliberated on the workshop objectives using the three following questions:

1. What are the key **gaps in knowledge** in the field of this theme?
2. What are the **opportunities for research** in the field of this theme?
3. In light of the gaps and/or opportunities identified what are the **key research questions** that need to be answered?

After the discussion period, the breakout room moderator guided participants to prioritize the research questions according to the following criteria:

- **Alignment** – Does the research question align with the workshop objectives?
- **Feasibility** – To what extent is this research feasible?
- **Capacity** – Is there researcher capacity in Canada to address this research question?
- **Innovation** – Is the research innovative and will it advance the knowledge base?
- **Partnership** – Does the research question lend itself to partnerships within Canada, as well as at the international level?

For each theme, two report back summaries are summarized in this document.

THEME 1: NUTRITIONAL VULNERABILITY

Moderator: Tanya Verrall

Senior Researcher, Health Quality Council; Adjunct Faculty Member, College of Pharmacy and Nutrition, University of Saskatchewan

NUTRITIONAL VULNERABILITY IN CANADIAN ABORIGINAL CHILDREN AND ADOLESCENTS: GAPS AND OPPORTUNITIES

Rhona Hanning

Associate Professor of Health Sciences, University of Waterloo

The Canadian Community Health Survey (2004) identified higher levels of obesity, food insecurity, and poor quality diets in Aboriginal Canadians living off reserve, relative to the general population. However, there are gaps in knowledge, since ~ 46% of the Aboriginal population live on reserves. Data from research with seven Ontario First Nations (FN) since 2004, using an adaptation of the University of Waterloo Food Behaviour Questionnaire (www.uwfbq.ca), indicate a high prevalence of poor quality diets and obesity in children and adolescents. Emerging data indicate a high prevalence of household food insecurity, but point also to gaps in the ability to capture food security issues for these remote communities when using standard instruments. Intervention strategies tailored for Aboriginal communities, such as school nutrition programs, are valued by community members and have the potential to improve access to healthy foods for these vulnerable children. However, continued research is needed to identify effective intervention and knowledge translation strategies to reduce nutritional inequities and support sustained change.

KNOWLEDGE GAPS IN OBESITY PREVENTION FOR ABORIGINAL CHILDREN

Noreen Willows

AHFMR Health Scholar, Faculty of Agricultural, Life, and Environmental Sciences, University of Alberta

Why Aboriginal children are prone to obesity is a key question and knowledge gap in the area of obesity prevention for Aboriginal children. Knowledge gaps in this area of study require an understanding of prenatal and early childhood risk factors for obesity and for appropriate growth assessment specific to Aboriginal children.

Another key question is whether school-based interventions can improve children's diet and weight status. Examples of garden-based nutrition education programs have been implemented to increase vegetable and fruit intake in children, such as EarthBox Kids in a Cree community in Alberta and the Urban Aboriginal Kitchen Project in Vancouver. Garden-based nutrition education programs often include many of the conditions that are predictive of vegetable and fruit consumption by children. However, a number of knowledge gaps present themselves with

these programs, such as: are school interventions sustainable and effective? How long do interventions need to be to affect dietary and weight change? Are the costs prohibitive?

Another key research gap relates to the inter-relationships between food insecurity, food choices, and obesity. Studies show that Aboriginal households are more likely than non-Aboriginal households to have moderate and severe food insecurity, compared to the general Canadian population. Food insecurity is related to poor health and well-being. Studies also confirm that food insecurity and obesity co-exist in Inuit preschoolers. Further studies are needed to better understand these relationships in this Northern population.

Finally, how food security is measured in Aboriginal households remains an outstanding research question. Investigation of the 18-item Household Food Security Survey Module, developed by the United States Department of Agriculture, could be validated to determine the appropriateness of this tool in assessing food insecurity among Canadian Aboriginal households.

ASSESSING DIETARY INTAKE TO DEVELOP, IMPLEMENT AND EVALUATE NUTRITIONAL INTERVENTION PROGRAMS FOR IMPROVING DIET AND REDUCING CHRONIC DISEASE AMONG INUIT AND INUVIALUIT COMMUNITIES

Sangita Sharma

Endowed Chair in Aboriginal Health, Professor, Aboriginal and Global Health, University of Alberta

Research among Inuit and Inuvialuit in northern Canada has highlighted the nutrition transition occurring among these indigenous populations. This transition is characterized by increased consumption of non-nutrient dense store-bought foods, decreased consumption of nutrient rich traditional foods, and an increase in the prevalence of obesity and nutrition-related chronic disease risk factors. Such changes in diet and lifestyle may be attributed to a multitude of factors including: acculturation, overall food access and availability, food insecurity, and climate change all of which present unique challenges in assessing the nutritional vulnerabilities and needs of these communities.

The Healthy Foods North (HFN) program aims to improve diet quality and reduce the risk of chronic disease among Indigenous populations in northern Canada. As part of the program, up-to-date dietary, physical activity, behavioral, and anthropometric data were collected among Inuit, NU and Inuvialuit, NT. A culturally appropriate, validated Quantitative Food Frequency Questionnaire was developed for each population, which can be used to monitor the nutrition transition and track changes in diet over time. In partnership with the communities, government, and food retailers the HFN program developed a culturally appropriate, multilevel nutrition and lifestyle intervention to reduce the risk of chronic disease and improve dietary adequacy in these nutritional vulnerable populations.

IDENTIFICATION OF GAPS, OPPORTUNITIES, AND RESEARCH PRIORITIES IN NUTRITION VULNERABILITY

RESEARCH GAPS:

- Food and nutrition vulnerability throughout the lifecycle, especially for children, women, the elderly, and those in the health care system (from community to institution-based care)
- Food intake patterns and population health outcomes
- Impact of food systems on obesity
- Nutrition interventions and their impacts
- Defined biomarkers and reproducible outcome measures
- Cohort studies (especially in children)
- Global health and nutrition

RESEARCH OPPORTUNITIES:

Opportunities in Research and Interventions

- Develop validated dietary assessment tools adaptable to different groups
- Need for better data on young children
- Research related to policy decisions and evaluation of the impacts of policy changes
- Evaluate effective components of nutrition interventions
- Use existing successful research teams for cohort studies
- Employ current data sets from cohort studies for further analyses (e.g. Food and Nutrition Environment Study and the Canadian Longitudinal Survey on Aging)

KEY RESEARCH QUESTIONS AND PRIORITIES:

1. Nutrition intervention studies in women of reproductive years, with the intent to improve maternal health, child health, and behaviour outcomes.
2. Elderly population studies to determine how to prevent and manage malnutrition in the continuum of care.
3. Use a variety of research methods to determine best practices to manage obesity and other nutritional issues.
4. Assessment of the impact of food systems and environmental factors that play a key role in dietary intake, obesity, and other nutritional issues.

5. Develop innovative strategies to achieve optimal nutrition and food security in national and international Aboriginal populations.
6. Evaluation of sustainable nutrition interventions.
7. Development and validation of novel tools to assess nutritional status and dietary intakes.

THEME 2: EMERGING FOOD TECHNOLOGIES

Moderator: Rickey Yada

**Professor and Canada Research Chair in Food Protein Structure, University of Guelph;
Scientific Director of the Advanced Foods and Materials Network, Networks of Centres of
Excellence**

NOVEL STRATEGIES TO REDUCE SATURATED FAT IN FOODS BY NANOSTRUCTURING OILS

Alejandro G. Marangoni

Professor and Canada Research Chair in Food and Soft Materials, University of Guelph

Sedentary lifestyle and poor eating habits have led to a dramatic increase in the proportion of overweight and obese people in both affluent and not-so-affluent societies. This will lead to an increase in the incidence of cardiovascular diseases and type 2 diabetes, burdening society with the high costs of caring for an unhealthy population. To address this problem, there is a need to improve the nutritional quality of foods, reduce the total amount of fat, sugar, sodium and calories consumed, and increase physical activity.

Partnering with the food industry in an effort to motivate research and implementation of novel food technologies to meet targets in areas such as lowering saturated fats and removing trans fat is key. Without new technologies it is challenging for food manufacturers to produce healthier products, without changing sensory properties, food quality and, most importantly, without increasing costs to the consumer.

Current research in the area of edible oil organogels, which involves the conversion of structured oils to liquid gels, is useful in food products reliant on hard fats. This technology is applicable in the inhibition of oil migration, controlled release of bio-actives, healthy structuring of food lipids and in stabilization without emulsions. This example, and other technologies, requires further research and partnerships with the food industry to establish the functionality and success of these novel food technologies and to motivate industry towards the manufacture of healthier foods.

WHY AND HOW TO ORGANIZE CONCERTED CLINICAL NUTRITION RESEARCH IN CANADA

Benoît Lamarche

Professor, Department of Foods Sciences and Nutrition, Canada Research Chair in Nutrition and Cardiovascular Health, Laval University

Multi-centre studies are critical to the area of food and health. The medical community needs to be convinced that food and health interventions can work to improve the health of Canadians. However, evidence-based science is still lacking. Clinical nutrition researchers are currently facing challenges in areas such as the identification of biomarkers for disease, recruitment of research subjects, research funding, and delays in the approval of patient-based studies.

While there are challenges associated with multi-centre clinical research studies, the argument in favour of such trials is supported by the benefits in overcoming the barriers to small clinical trials, yielding more conclusive results, and increasing confidence in data that can reflect a causal association. Multi-centre trials would also allow for a synergy of expertise from multiple centres, opportunities for mentorship, unique training opportunities as well as an assessment of multiple outcomes. The Pan Canadian Portfolio study is an example of this type of research: it is the largest study of its kind, and involves four centres and 300 subjects.

Multi-center studies are critical to address key nutritional issues in Canada. Greater capacity and increased expertise will require more funding and partnerships with industry.

TO WHAT EXTENT HAVE DRUGS PROVIDED RISK REDUCTION FOR CARDIOVASCULAR DISEASE?

David Jenkins

Clinical Nutrition & Risk Factor Modification Center, St. Michael's Hospital; Department of Nutritional Sciences, Faculty of Medicine, University of Toronto

Research studies have shown that statin drugs are effective in providing risk reduction for cardiovascular disease. However, the risks remain high, which suggests that we are not winning with the use of current medications. Nutrition studies have shown that diet can be made effective in coronary heart disease (CHD) risk reduction, including the use of slow release carbohydrate (low glycemic index), diets for diabetics, and the use of plant sterols, viscous fibre, nuts, and soy for cholesterol reduction, thereby establishing that functional foods can make a positive impact on lipid profiles and diabetes risk factors for CHD.

In order for diet to be taken seriously in the prevention and treatment of CHD, randomized control trials (RCTs) with harder endpoints are needed, including direct visualization of the vasculature by ultrasound and magnetic resonance imaging (MRI). In light of numerous barriers

associated with large clinical studies, namely, the lack of recognition of the cost, the lack of appreciation of the importance of nutrition versus drugs, the lack of backing by the nutrition community for RCTs, and the competition for current funding, there is a strong need to facilitate large collaborative RCTs and promote funding for studies of secondary analyses by tender to research groups across Canada and internationally.

IDENTIFICATION OF GAPS, OPPORTUNITIES, AND RESEARCH PRIORITIES IN EMERGING FOOD TECHNOLOGIES

RESEARCH GAPS:

Gaps in Knowledge/Barriers in Developing New Food Technologies

- Regulatory issues related to the food industry
- Strategies to manage potential conflicts of interest in working with the industry
- Mechanisms to leverage research funding opportunities and partnerships
- Communication techniques for Canadians to better understand the benefits of healthy foods and food ingredients

Gaps in Research and Interventions

- Lack of support for clinical trials - limitations of subject recruitment representing a broad enough genetic background, lack of national standards
- Metabolic effects of improved foods emerging from new technologies
- Comprehensive multi-centre human intervention trial platform, including a Research and Development (R&D) model for chronic disease management that fits with nutrition

RESEARCH OPPORTUNITIES:

Opportunities in Partnerships and Research

- Develop partnerships between CIHR and the Natural Sciences and Engineering Research Council of Canada (NSERC) in order to build capacity
- Increase partnerships between CIHR and the food industry to broaden testing of new products in both multi-centre trials and human intervention trials, to develop industry-related chair positions, and to communicate to public at large
- Government to encourage a more facilitative approach to regulation
- Need for a multi-centre trial platform in Canada
- Need for knowledge translation to increase consumer understanding of health benefits of foods
- Creation of innovative ways to deliver healthy foods to vulnerable populations groups

KEY RESEARCH QUESTIONS AND PRIORITIES:

1. Establishment of a long-term funded clinical research network to develop multi-centre trials, in order to address long-term gaps and opportunities and allow for larger population measurements.
2. Establishment of hard end points and non-invasive, repeatable clinical tools as part of human trials related to functional foods and management of chronic disease.
3. Continued research to establish safe modern food technologies that confer health benefits.
4. Development of principles for industry to use in manufacturing a broad spectrum of new generation food products with better nutritional profiles. Assessment of the role for a new Health/Nutrition Charity to address the need for system alignment in order to narrow gaps between research and systems support.
5. Development and validation of a knowledge translation process, to bridge the gap between evidence and behaviour change, and between the supply system and consumers.
6. Assessment of the economic impact of new foods, in terms of their accessibility and cost to the whole Canadian population and to vulnerable populations.

THEME 3: FOOD POLICIES AND PROGRAMS

Moderator: Lori West

Director of Heart Transplantation Research, Professor of Pediatrics and Surgery, University of Alberta Stollery Children's Hospital, University of Alberta

KNOWLEDGE GAPS IN NUTRITION REGULATORY POLICY MAKING

William Yan

Director, Bureau of Nutritional Sciences, Health Canada's Food Directorate

Health Canada's Food Directorate (FD) has evolved and is now taking a modernized approach to managing claims for foods. In the past, claims dealing with either disease risk reduction or therapeutic effects would automatically bring a food product under the definition of drug. With the changes, where it is determined that a product is a food and is safe for consumption as a food, claims dealing with disease risk reduction or therapeutic effects would not automatically bring it under the definition of drug. The conditions of use for such claims and foods with these claims can be marketed following publication of the health claim summary of assessment.

As the food regulatory framework becomes more flexible, FD decision-making and changes to the regulatory framework will remain based on sound science. This strategy will promote and protect health, while avoiding unnecessary impediments and burdens to industry. Some areas, however, still present knowledge gaps (for instance, the health effects of probiotics) while

others have been successful. For instance, health claim assessment by the FD has concluded acceptable scientific evidence exists in support of the claim about the relationship between the consumption of plant sterol-enriched foods as foods and lowering of blood cholesterol. The FD is currently reviewing the use of claims about the nature of probiotics in foods, with the long term goal to move towards permitting only the use of scientifically substantiated probiotic claims about specific health effects and benefits based on strain-specific evidence.

A challenge to the FD is in the food to Natural Health Product (NHP) interface, involving products in a food format that meet the definition of a food or NHP (e.g. energy bars, waters, or juices with added vitamins and minerals). Suggested recommendations to deal with this challenge may include classification of products, with the intent of transitioning most to the food regulatory framework and continuing to modernize the Food Regulatory Framework.

UPDATE ON AGRICULTURE AND AGRI-FOOD CANADA'S GROWING FORWARD PROGRAMS RELATED TO FOOD AND HEALTH RESEARCH

Michèle Marcotte

Science Director, Food and Health, Agriculture and Agri-Food Canada

Agriculture Canada, once traditionally focused solely on agriculture, has evolved to focus on agri-food. Growing Forward (GF) is an integrated approach, encompassing innovative agriculture, agri-food, and agri-based products industry that seize opportunities in responding to market demands and contribute to the health and well-being of Canadians. This framework encompasses the Growing Canadian Agri-Innovation Program (GCAIP) consisting of Canadian Agri-Science Clusters, which is aimed at supporting the development of industry-led national agricultural collaborations of coordinated government, academic, and industry science to enhance capacity in agri-based applied science. The Developing Innovative Agri-Products (DIAP) is designed to encourage the agriculture sector to develop new or expand existing value-chains and provide access to scientific and technical support to resolve pre-commercialization issues relating to agri-products, practices, and processes development.

Also within the framework is the Animal and Plant Health Research and the Agricultural Regulatory Action Plan (ARAP). Health Canada has committed \$100.5M to the ARAP Program, of which \$35.4M has been assigned to the area of Health Claims, Novel Foods and Ingredients, a new category aimed at assisting industry in understanding the regulatory processes and requirements to accelerate the market entry of new food products. A new Food Fortification category has been added with the intention to contribute to the cost of developing and implementing a Temporary Marketing Authorization Letter process for industry submissions, monitoring the market presence and health impact of fortified foods, and developing policy and regulations.

The ARAP serves to increase capacity in Health Canada, particularly in the area of health claims, through its funding of both the research area and the area of communication. Canada needs to keep up with other countries in approving health claims, with challenges due to the newness of

the area of health claims, the complex and costly science needed for regulatory approval, the fact that Health Canada's priority is Consumer Health and Safety Protection, and the lack of policy objectives for health claims.

Future consideration should be given to address a national food policy in Canada, the few and minimally funded programs at AAFC aiming at food and health research priorities, and the question related to how to ensure that relevant issues are addressed using an integrated approach.

FOOD AND HEALTH - ADVANCING THE PUBLIC HEALTH POLICY AGENDA

Howard Morrison

Director of the Science Integration Division, Centre for Chronic Disease Prevention and Control, Public Health Agency of Canada

The majority of disability and premature death in Canada results from chronic diseases. Diet is a key determinant of many major chronic diseases, and also impacts obesity, which either contributes to or exacerbates these chronic diseases. Historically, public health nutrition has focused on single nutrient deficiencies. However, chronic diseases and the problems of obesity are complex and not likely to be mediated by a single nutrient, or factor. All plants and animal foods have biological activities and the sum may be greater than, or different from, the parts. As such, there is an increasing appreciation that people eat food, not individual food components, and there is a need to move away from the single nutrient focus, towards more evidence in the research area of dietary patterns.

The Public Health Agency of Canada (PHAC) considers nutrition to be a central issue. Three nutritional issues of specific interest include: over-nutrition, vitamin D, and dietary patterns. The PHAC's obesity research priorities include: supporting the analyses of existing data on obesity and determinants of obesity from the Canadian Health Measures Survey and the Canadian Community Health Survey (CCHS), and identifying the role of various determinants related to obesity development and prevention, in answer to what is making our current environment "obesogenic".

More evidence is required in research areas relating to these three key topics, recognizing that government will not make policies without the supporting evidence. Research areas of importance include the voluntary fortification of foods and its potential contribution to the over-consumption of foods perceived to be "healthier"; the need for evidence to better characterize dietary patterns and their connection to chronic disease risk and prevention, and the need for more etiologic research for vitamin D, particularly in light of the updated vitamin D and calcium DRI recommendations.

IDENTIFICATION OF GAPS, OPPORTUNITIES, AND RESEARCH PRIORITIES IN FOOD POLICIES AND PROGRAMS

RESEARCH GAPS:

Gaps in Knowledge

- Population variability and the effects of total exposure (e.g. Vitamin D from foods, functional foods, nutraceuticals, and supplements)
- Post market surveillance and policy questions addressing market surveillance
- Nutrigenomics - prior risk and nutritional benefit assessments
- Comprehensive understanding of the food supply system, including a local food sufficiency index
- Sufficient consumer research to understand dietary patterns of Canadians

Gaps in Research and Interventions

- Systems approach to product development and marketing involving a broad spectrum of expertise (e.g. taste, portion sizes)
- Public policy for the general population and impact of food interventions
- Defined biomarkers for dietary patterns and methods to promote dietary patterns
- Nutrition profiling criteria for healthier patterns of eating
- Biological and non-biological markers of intervention and the effectiveness of food interventions
- Synergistic effects of the entire diet

RESEARCH OPPORTUNITIES:

Opportunities in Research and Interventions

- Develop a holistic approach to food and food systems
- Make existing data sources available to researchers
- Conduct consumer research to advance knowledge in determining the behavioural effects of the changing food supply over time on nutrients, intakes and dietary patterns, and the understanding of consumers food habits and choices
- Conduct research at the whole food level
- Evaluate the effectiveness of existing government programs and policies

KEY RESEARCH QUESTIONS AND PRIORITIES:

1. Identification of areas where intervention can have the greatest benefit:
 - a. Evaluate existing interventions
 - b. Conduct research on tools/methods to evaluate policies and interventions.
2. Development of dietary assessment tools, biomarkers, and surveillance methodologies.
3. Assessment of population variability, including identification of the responder versus the non-responder to a specific dietary intervention.
4. Cohort studies to discover biomarkers of healthy nutrition measures.
5. Post-market surveillance research to address the need for a commitment to national ongoing nutrition surveys.

THEME 4: FOOD SECURITY

Moderator: Linda Piazza

Director of Research, Heart and Stroke Foundation of Canada

HOUSEHOLD FOOD INSECURITY: PUSHING THE BOUNDARIES OF NUTRITION RESEARCH

Valerie Tarasuk

Professor, Department of Nutritional Sciences and Dalla Lana School of Public Health, University of Toronto

In 2007-08, 8% of Canadian households experienced food insecurity, defined as inadequate or insecure access to adequate food due to financial constraints. Through numerous analyses of national population survey data, the descriptive epidemiology of household food insecurity is now well documented. There is a good understanding of the socio-demographic correlates of household food insecurity and its independent association with increased nutritional vulnerability; poorer physical, social, and mental health; and increased likelihood of heart disease, hypertension, type 2 diabetes mellitus, and major depression.

Yet, the conditions that give rise to household food insecurity and the interventions that could alleviate this problem remain poorly understood. Such inferences cannot be readily drawn from research in other jurisdictions, because the social, economic, and political context play such an important role in shaping both the problem and the potential responses. Canadian research is, thus, imperative to lay the empirical foundation for effective interventions in this country.

The recent institution of a national food security monitoring system presents an opportunity to address some knowledge gaps, but the inclusion of food security measures on other survey platforms is required to elucidate critical policy drivers at the federal and provincial levels. The research needs in this field highlight the importance of strategic funding initiatives that foster

interdisciplinary research, national and international collaborations, and research partnerships with policy makers and other end-stage knowledge users.

FOOD SECURITY RESEARCH NEEDS: A PERSPECTIVE FROM THE FEDERAL HEALTH PORTFOLIO

Michelle Hooper

Acting Manager, Food and Nutrition Surveillance, Office of Nutrition Policy and Promotion, Health Canada

Key findings of surveillance data and future opportunities to fill gaps were highlighted. These include understanding the experience of household food insecurity in the context of household expenditures through the 2010 Survey of Household Spending and assessing household food insecurity in First Nations communities through the First Nations Food Nutrition and Environment Study (FNFNES). The unique considerations for Canada's Aboriginal populations and relatively limited evidence to inform decision-making are acknowledged.

New opportunities to focus on food security, including a renewed Aboriginal Diabetes Initiative and Nutrition North Canada, present potential opportunities for research and evaluation. Potential areas for research include increasing knowledge about the specific policy shifts required to achieve food security, knowledge about what is required for these changes to happen, and the combination and order of interventions that will produce the greatest effect. In addition, there is a need to determine how to better capture Aboriginal food security issues (e.g., traditional foods, food sharing), taking into consideration the diversity of Aboriginal people, geographic location, gender, and age.

Evidence is key for government decision-making, although not the only consideration. Effective knowledge translation is also beneficial. Evidence arising from a single study is important, but knowledge synthesis (that is, the aggregation of existing knowledge) is particularly valuable to policy-makers.

LOCAL FOOD SECURITY & CLIMATE CHANGE: IMPLICATIONS FOR RESEARCH

Aleck Ostry

Canada Research Chair in the Social Determinants of Health and Senior Scholar with the Michael Smith Foundation for Health Research, Professor, University of Victoria

The current approach to nutrition policy in British Columbia is very strong; however, the weakness to this approach lies in gaps that exist relating to limited evaluation of innovative food security programs currently in place, limited data available on the food production, import, or export dimension of food security, and a complete lack of research relating to the potential impacts of climate change on normal patterns of food production, import, and export.

To ensure that food consumption advice is linked realistically with the underlying reality of food production, export, and import patterns, there is a strong need for an integrated food and

nutrition policy framework. Specifically, there is the need for a nutritional policy to rest more firmly on a foundation of research, based on data related to current and future local food production, import, and export patterns.

Health and nutrition planners require specific information at a basic level:

- What are the secular changes underway in local food production?
- What are the trends in food import/export?
- What is local consumption demand and how likely is it to change?
- To what extent can local production meet local needs for food consumption?
- What are the impacts of climate change?

Health and nutrition policy-makers need to take a more holistic approach to food security, by better understanding the dynamics of food production, import, export, and distribution. Such knowledge will serve as the foundation of a health-focused local food policy to promote healthy eating in the Canadian population in order to reduce the burden of chronic illnesses.

IDENTIFICATION OF GAPS, OPPORTUNITIES, AND RESEARCH PRIORITIES IN FOOD SECURITY

RESEARCH GAPS:

Gaps in Knowledge

- Analysis of effective programs at the macro level (e.g., Newfoundland poverty reduction) and micro levels (e.g., local community)
- Urban/rural agriculture effects across provinces on food security
- Understanding of the lack of effectiveness of some conventional programs
- Identification of vulnerable populations

Gaps in Research and Interventions

- Interdisciplinary research using existing data to understand solutions
- Evaluation of the impact of food policies and provincial funding on food security

RESEARCH OPPORTUNITIES:

Opportunities in Research and Policy

- Evaluate the impact of global climate change on availability and cost of foods
- Identify countries with lower rates of food insecurity and the factors and policies contributing to such success
- Implement effective programs and strategies at the community level

- Determine the scope and impact of food programs based on charitable models and identify barriers to participation
- Create strategies to address outstanding issues in:
 - methodologies
 - policy analysis
 - coordination of frameworks for decision making
 - intersectoral collaborations
- Assess the impacts of federal, provincial, and local policies and programs on food security at the local level
- Narrow gaps between nutrition, food, and agricultural policies
- Develop a federal food security policy

KEY RESEARCH QUESTIONS AND PRIORITIES:

1. Develop national collaborative programs to assess household food security and diet quality.
2. Conduct interdisciplinary research which encompasses the scale of the problem and identifies targeted populations.
3. Assess the chronicity, severity, and successful solutions to food security.
4. Define the impact of policies and programs on diet quality and food security.
5. Conduct community-based intervention research to assess the risks of the most vulnerable, followed by development of a detailed set of research questions to link the neighbourhood and community levels.
6. Develop a knowledge translation strategy to bridge the gap between science and public perception regarding charitable food assistance.

THEME 5: HUMAN NUTRITION

Moderator: Jeffrey Johnson

Canada Research Chair in Diabetes and Health Outcomes and Professor, Dept. of Public Health Sciences, University of Alberta

PEDIATRIC CLINICAL RESEARCH: OPPORTUNITIES TO MAKE A REAL DIFFERENCE AND HUMAN RESOURCE BARRIERS

Deborah O'Connor

Director of Clinical Dietetics, Hospital for Sick Children, Associate Professor, Dept. of Nutritional Sciences, University of Toronto

Traditionally, the focus in the field of human nutrition has been one of meeting nutrient needs and the prevention of nutrient deficiencies. More recently, there has been a fundamental shift in thinking towards nutrition and its impact on health. This shift is supported by the significant evidence that proactive nutritional care (i.e. meeting nutritional requirements, breastfeeding)

will improve the clinical course of disease, decrease the length of hospital stays, and reduce the need for more expensive treatments, in addition to improving long-term health and development.

Given this evidence, Canada must increase its investments and better co-ordinate efforts in patient-oriented research to improve the quality, accessibility, and cost-effectiveness to the health care system. There is a need for a secure funding model for those engaged in clinical nutrition research to have the capacity to carry out patient-based nutrition research. The solution needs to include going well beyond attracting more trainees to the field of nutrition.

NUTRITION ASSESSMENT IN HUMAN RESEARCH: OPPORTUNITIES AND CHALLENGES

Linda McCargar

Professor of Human Nutrition, Department of Agricultural Food and Nutritional Science, University of Alberta

There has been expanded capacity in the area of nutrition assessment in recent years to collect data, including tools such as web-based surveys and on-line 24 hour recalls. There is an opportunity to take advantage of medical scans for nutritional assessment. For example, sarcopenic obesity, a new emerging health problem, is characterized by low muscle mass and high body fat and a DXA (Dual Energy X-ray Absorptiometry) scan can accurately quantify lean mass (which is primarily muscle), bone mass, and fat mass in infants, children, and adults.

Numerous opportunities exist in this area of research, because the Canadian nutrition community is collegial and innovative with many world leaders. The group has strong affiliations in both agriculture and health sectors. The interest in nutrition is the highest it has ever been, and significant advances in genomics, metabolomics, plant biology, biochemistry, and physiology support developments in the field. There are strong human nutrition research groups in all regions of Canada, which are available for multi-centre trials, collaborations, and networks. Finally, technologies are available to bridge the knowledge dissemination and translation gap.

Despite opportunities, challenges exist to implement such research such as: the lack of a working definition of Food and Health; the complexity of health issues in Canada; the need for increased capacity in the Canadian nutrition community; limited opportunities for competitive funding support targeted to human nutrition research; and the need for a Canadian Nutrition Foundation. In addition, nutrition is pulled in many directions, because it is part of all health fields. There is a need for leaders to coordinate activities and regional leaders to engage researchers in their area to move a national agenda forward. Recruitment and retention of participants for human studies remains a challenge and multi-site, multi-sectoral research with different administrative processes, documentation, ethics reviews, approvals, and policies is challenging. The co-ordination and scheduling of shared research space, equipment, staff and resources and short-term training, employment issues, and turnover in the grant funding system are also challenges.

NUTRITION RESEARCH IN DIVERSE POPULATIONS: OPPORTUNITIES AND CHALLENGES

Tim Green

Associate Professor, Foods and Nutrition, Faculty of Land and Food Systems, University of British Columbia

International research is often easier to execute in other countries, compared to Canada. Numerous opportunities exist overseas whereby small changes can have a big impact, particularly in malnutrition hotspots. However, despite the opportunities, challenges present themselves relating to resources, relationships, partnerships, and regulations.

There are various international studies in diverse populations currently ongoing. One example is aimed at improving the livelihood among communities in Kampong Chhnang Province, Cambodia by implementing homestead food production (HFP) and nutrition education programs to increase the availability and consumption of micronutrient-rich foods.

Within Canada, the city of Vancouver represents a diverse population, ideal for nutrition research. However, because of its diversity in culture, this city also presents a challenging environment. Recruitment is likely one of biggest challenges with conducting research in this city.

IDENTIFICATION OF GAPS, OPPORTUNITIES, AND RESEARCH PRIORITIES IN HUMAN NUTRITION

RESEARCH GAPS:

Gaps in Knowledge

- How to build connections to other institutes, e.g., the microbiome
- Ability to bridge biomedical to patient-based research to clinical practice
- Ability to connect health care communities to public health communities with food and nutrition
- Capacity- building strategy

Gaps in Research


- Prevention studies versus treatment studies
- Patient-focused research and clinical trial capacity
- Research relating to:
 - diverse ethnic populations to encompass the Canadian reality
 - cancer-nutrition connections
 - microbiome

RESEARCH OPPORTUNITIES:

Opportunities in Research and Interventions

- Establish multisectoral research to link agriculture to the food system, and to the health care system
- Establish an information broker to translate and coordinate food messages from producers to consumers
- Expand known nutrient-food mechanisms to agri-food industries
- Support large randomized control trials and multi-centre trials to provide a global perspective
- Develop and utilize novel, methodological tools,(e.g., CT scans, MRIs) and strategies to gather data and create linkages with healthcare practitioners
- Address subject recruitment issues
- Enhance training of nutrition-based researchers

KEY RESEARCH QUESTIONS AND PRIORITIES:

1. Establish additional direct data on nutrient requirements for specific populations, including pregnant women, children and preteens, and the elderly.
 2. Develop methods to extrapolate nutrient requirement data.
 3. Develop communication strategies to implement and translate knowledge to all populations.
 4. Conduct prevention type studies to understand upper levels of nutrients, in light of fortification of foods and use of supplements.
 5. Conduct research to establish connections between eating behaviours and health outcomes, and between diet and physical activity.
 6. Develop and validate novel tools and strategies for dietary assessment.
 7. Develop reliable biomarkers.
 8. Establish linkages to cohort studies currently underway in order to align nutrition and dietary assessments, food behaviours, and nutrition risk.
 9. Develop innovative strategies to recruit and train nutrition researchers, as well as enhance culture of appreciation and teamwork of current researchers.
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THEME 6: 'OMICS'

Moderator: Mohamed Karmali

Director-General of the Laboratory for Foodborne Zoonoses and Office of Biotechnology, Genomics, and Population Health, Public Health Agency of Canada; Adjunct Professor, Dept. of Nutritional Sciences and the Dalla Lana School of Public Health, University of Toronto

GENOMICS: HOPE OR HYPE?

Sonia Anand

Director of McMaster Population Genomics Program, Professor of Medicine and Epidemiology, McMaster University

At its most basic, personalized medicine refers to using information about a person's genetic make-up to tailor strategies for detection, treatment, and prevention of disease. For instance, genomics serves to better understand individual variability in drug effectiveness and side effects, and individual variability in cancer risk. The goal of genomics is to obtain an understanding of causative genotypes, increase individual risk prediction, create new therapeutic targets, develop safer and more cost-effective therapies, and, ultimately, decrease pharmaceutical utilization. However, gene scores do not currently add substantially to clinical tools. Genomic studies are expensive and there is a lack of availability and adoption of new technologies in this research area.

Genomics can be used to assess the prevalence of gene variants in different populations, the magnitude of disease risk associated with gene variants, and in the evaluation of gene-environment interactions, pharmacogenomics and genetics, and to determine the validity and effectiveness of genetic tests for screening and prevention of disease in human populations.

SLC23A1: AN EXAMPLE IN NUTRIGENOMICS

Peter Eck

Canada Research Chair in Nutrigenomics, Department of Human Nutritional Sciences, University of Manitoba

Over the last ten years, after completion of the first drafts of the human genome project, genomic technology has rapidly advanced. This advance enables us to identify genomic and genetic variations using high throughput technologies. Currently, we are still in a discovery phase where genetic variations are related to human diseases. This approach can be employed to increase basic knowledge of diet-gene interactions, but cannot directly lead to nutrient recommendations and novel interventions.

My research provides an example of the steps following a disease association, the verification that a gene polymorphism indeed does cause a health problem, based on recent data on the biology of variations in the SLC23A1 gene. About ten years ago, the gene structure of the two human sodium dependent ascorbic acid transporters, SLC23A1 and SLC23A2, were described. Subsequently, genetic variations in these two genes were discovered, and polymorphisms

associated with birth complications and an increased risk for developing colorectal adenoma. However, a genetic association does not imply causation, and in order to develop a nutritional intervention there is the need to determine underlying biological mechanisms causing disease.

The ascorbic acid transporter SLC23A1 contains four non-synonymous single nucleotide polymorphisms which change the amino acid sequence of the protein. When expressing different isoforms in *Xenopus laevis* oocytes, one isoform, an A→G substitution of nucleobase 772, strongly diminishes ascorbic acid transport. Subsequently, this variation was linked to lower ascorbic acid plasma levels in an epidemiological study undertaken in Europeans. At the moment, clinical studies to determine the variations effect on human ascorbate pharmacokinetics are being developed.

To investigate possible adverse health outcomes, a Slc23a1 gene knockout mouse was created. Slc23a1^{-/-} mice lose substantial amounts of ascorbate in the urine. These losses lead to low plasma ascorbic acid levels, but not to the deficiency known as scurvy. Compared to wild type animals, perinatal mortality in Slc23a1^{-/-} mice is elevated by a factor of five. The perinatal mortality is eliminated by ascorbic acid supplementation. The Slc23a1^{-/-} knockout mouse has diminished ascorbate availability and utilization. This might represent the situation in humans carrying the SLC23A1 772G genotype.

Epidemiologic studies consistently associate low ascorbate supply and status with diseases such as metabolic syndrome, type 2 diabetes, cancers, and birth complications. However, at the present time, it has not been possible to define a precise level of suboptimal ascorbate concentrations that predisposes individuals to these clinical syndromes. A genomic biomarker predicting an increased risk of adverse health outcomes could be used to target micronutrient supplementation to those at highest risk.

PREDICTING DIET RESPONSE WITH TRANSCRIPTOMICS

David M. Mutch

Assistant Professor of Nutrigenomics, Human Health & Nutritional Sciences, University of Guelph

Obesity is a complex physiopathological state and, as such, it is important to understand the genetics of this chronic disease. The genetics of obesity involve monogenic (high penetrance) genes, syndromic (low penetrance, variable phenotype) genes, and polygenic (variable phenotype) genes. Promising research in the area of diet and polygenic obesity can serve to identify ways to predict changes in body weight and implement successful weight maintenance, by using targeted weight loss programs, genetic polymorphisms, and gene expression profiles.

What has been learned to date with respect to predicting successful weight maintenance is that varying macronutrient content has a minimal impact, at least in the short term, on successful weight maintenance. Changes in body weight affect adipose tissue gene expression more

significantly than changes in macronutrient content. Moreover, weight maintainers and weight regainers do not respond to a low calorie diet in the same manner.

'Omics' based research faces a number of challenges, including the low number of study subjects, inter-individual differences (genetics, lifestyle, exercise), the relevance of the information provided by gene expression, funding support for hypothesis generating versus hypothesis-driven research, and establishing consortia in which researchers (both academic and industrial), clinicians, and policy-makers are involved in the challenge of bringing like-minded individuals together.

IDENTIFICATION OF GAPS, OPPORTUNITIES, AND RESEARCH PRIORITIES IN 'OMICS'

RESEARCH GAPS:

Gaps in Knowledge

- Next generation sequencing and genome wide association studies (GWAS) with a focus on sub-populations.
- Meaningful nutrient recommendations based on human variability.
- Emerging information relating to epigenetics and epigenomics.
- Lack of quality control in certain data banks.
- Identification of the social, legal, and ethical issues around genetic tests for personalized nutrition.

Gaps in Research

- Microbiome research and its effect on overall health outcomes.
- Integration of "omics" and "omic" technologies with biological systems; other "omics"; nutrition and dietary intake; and environment, e.g. microbiome.
- Basic science, clinical, and population studies.
- Bioinformatics capabilities, research tools, and the capacity to process existing data.
- Analysis of biospecimens from existing cohorts (e.g. Canadian Health Measures Survey).

RESEARCH OPPORTUNITIES:

Opportunities in Research and Funding

- Identification of nutritional states that act as triggers in some individuals, but not others.
- Use of "omics" technologies to develop biomarkers of dietary interventions.
- Creation of international consortia on nutrigenomics, with Canadian leadership.
- Standards for nutrigenomics data storage and data compilation.

- Partnership between CIHR and Genome Canada to research gene-environment interactions and to leverage funding.
- Use of existing cohorts to acquire biological samples (i.e. pooling projects) and access data for Canadian researchers.
- Investment in training opportunities in this emerging, multi-disciplinary research field.

KEY RESEARCH QUESTIONS AND PRIORITIES:

1. Identify the public health implications of biological and nutritional variability in human health.
2. Identify sub-populations with significant genomic risk, and apply information to studies on nutrition and health.
3. Develop tools and methods to implement the knowledge base.
4. Build on next generation sequencing in ‘omics’.
5. Develop novel biomarkers of dietary exposure and biomarkers to monitor effect and compliance to dietary interventions, using “omics” technologies.
6. Establish the clinical utility for ‘omics’.
7. Shift the research focus to prevention, rather than treatment research in the area of nutrigenomics.
8. Improve measurement exposure in population-based studies.

CLOSING PANEL: REFLECTIONS ON NEXT STEPS

PIERRE BILODEAU

Director, Bio Industries Division, Research Partnerships Programs, Natural Sciences and Engineering Research Council of Canada (NSERC)

Dr. Bilodeau began by noting that this Workshop strongly reiterated opportunities to link food and health. The research areas identified in Food and Health strengthen the S&T (Science and Technology) Strategy, which encourages partnerships between different agencies and levels of government. He highlighted partnerships in the nutrition area that already exist, namely with the food, agricultural sector, and industry. He praised Canada’s research excellence and the fact that food and health research brings health to the forefront, making it a research priority in Canada.

Dr. Bilodeau noted the strong relationship between CIHR and NSERC, using the Collaborative Health Research Projects Program (CHRP) as a good example. As of 2011, the funding in the CHRP program will be increased and will be accessible to the nutrition and food science communities. Dr. Bilodeau shared some next steps, commenting that the CHRP program increases the opportunities for funding at the food to health interface and that NSERC will

continue to work with INMD to make this happen, similar to existing collaborations in the area of sodium reduction.

MICHÈLE MARCOTTE

Science Director, Food and Health, Agriculture and Agri-Food Canada (AAFC)

Dr. Marcotte began by commending CIHR on hosting a great Workshop. The Food and Health agenda has two components and there is a need to bring these two communities together. She spoke of the language and system differences that exist in these two areas and encouraged CIHR to use this meeting as a first step in bridging the Food and Health agendas. Dr. Marcotte shared that AAFC recently launched the Science and Innovation Strategy of which Food and Health was identified as one of seven priorities. As such, there is capacity in this area and the possibility to create stronger links with the health sector and food research. She concluded by stressing that Agriculture and Agri-Food Canada is extremely willing and aware of the need to work closely with the health and food research communities.

HASAN HUTCHINSON

Director General, Office of Nutrition Policy and Promotion, Health Canada

Dr. Hutchinson thanked the INMD for organizing this Workshop and stressed the importance of the research strategy. The Public Health Agency of Canada, Health Canada's Food Directorate, and the Office of Nutrition Policy and Promotion are highly supportive of developing a stronger evidence base to inform government policy and programs. All of the workshop topics and themes are central to the type of work in place across Health Canada's portfolio.

Dr. Hutchinson expressed the strong need to move research and evidence into policy. The Sodium Reduction Strategy for Canada is a good example. This Strategy has involved a variety of different stakeholders including health professionals, non-governmental organizations (NGOs) and industry, to identify key research priorities in this area. CIHR played a key role in hosting a research workshop in January, 2010 that provided the basis for the research recommendations contained in the Strategy. INMD has been moving quickly to turn research priorities into funding opportunities. The result has been a full collaborative approach with the establishment of key partnerships, particularly with NSERC, industry, and across sectors in nutrition.

Dr. Hutchinson concluded by stating that Health Canada is committed to continuing to work closely with CIHR, agriculture, the food industry, and NSERC to collaborate and identify key research priority areas, such as curbing childhood obesity, and providing access to healthy foods. He also said that HC is committed to ensuring that knowledge translates to policy. In closing, he emphasized the need to look at new and creative ways to encourage stronger links between researchers and policy-makers.

CLOSING REMARKS:

Philip M. Sherman, Workshop Chair
Scientific Director, Institute of Nutrition, Metabolism and Diabetes, CIHR

Dr. Sherman thanked all of the speakers, and highlighted the rich input of participants and presenters. He commented on the diversity of the group, and reflected that it represented a 'who's who' of the food and nutrition research community in Canada. Dr. Sherman stressed INMD's desire to partner with other research funders to advance the research agenda identified at this Workshop, and emphasized the benefits achieved by partnering. There is a need to reach out to provinces and increase opportunities for research interactions with both Ministries of Health and Agriculture. As well, there is potential for global Food and Health research collaborations, as highlighted by the presentation from Grand Challenges Canada.

A variety of research approaches are required to address the many dimensions of Food and Health that integrate basic science, clinical research, and population-based studies. Dr. Sherman highlighted the new CIHR initiative, SPOR (Strategy on Patient-Oriented Research) and the potential opportunities it may present for the food and nutrition research community in Canada. He also emphasized the need for training to support the next generation of investigators in Food and Health, and reiterated the importance of knowledge translation and implementation to effect changes in health policies and practice. The workshop report will be made available in 2011.



Advancing Food and Health Research Priorities Workshop Agenda



WEDNESDAY NOVEMBER 3, 2010

6:00

Registration

6:30 - 9:00pm

Opening Dinner and Welcome

Setting the context for Food and Health

Philip Sherman

Workshop Chair

Scientific Director, Canadian Institutes of Health Research, Institute of
Nutrition Metabolism and Diabetes

Dietary Reference Intakes: Where Do We Go from Here?

Dennis Bier

Director, Children's Nutrition Research Center
Baylor College of Medicine

THURSDAY, NOVEMBER 4, 2010

7:30 - 8:30

Breakfast and Registration

8:30 - 8:40am

Opening Remarks

Philip Sherman

Scientific Director, Canadian Institutes of Health Research, Institute of Nutrition Metabolism and Diabetes

8:40 - 10:10am

PLENARY PANEL: Overview of Food and Health Research Gaps and Opportunities

Moderator: Stephanie Atkinson, Chair, INMD Institute Advisory Board

Overview of Gaps and Opportunities for Food and Health Research in Canada

Susan Whiting – University of Saskatchewan

Population Health and Beyond – What can Functional Components of Food Contribute?

Peter Jones- University of Manitoba

The Importance of Biomarkers as Surrogates for Chronic Disease and Wellness

Cindy Davis - National Cancer Institute, U.S. National Institutes of Health

10:10 - 10:20

Introduction to Breakout Sessions by Theme

Laura Pasut , Facilitator

Nutridata Consulting Services

10:20-10:40

Health Break

10:40-12:30pm

Breakout Sessions by Theme

<p>Theme 1:</p> <p>Nutritional Vulnerability</p>	<p>Theme 2:</p> <p>Emerging Food Technologies</p>	<p>Theme 3:</p> <p>Food Policies and Programs</p>
<p>Moderator:</p> <p>Tanya Verrall</p> <p><i>Nutrition Vulnerability in Canadian Children and Adolescents: Opportunities and Gaps</i></p> <p>Rhona Hanning University of Waterloo</p> <p><i>An ecological framework to understanding obesity in Aboriginal children</i></p> <p>Noreen Willows University of Alberta</p> <p><i>Assessing Dietary Intake to Develop, Implement and Evaluate Nutritional Intervention Programs for Improving Diet and Reducing Risk of Chronic Disease Among Inuit and Inuvialuit Communities</i></p> <p>Sangita Sharma University of Alberta</p>	<p>Moderator:</p> <p>Rickey Yada</p> <p><i>Novel Strategies to Reduce Saturated Fat Levels in Foods by Nanostructuring Oils</i></p> <p>Alejandro Marangoni University of Guelph</p> <p><i>Why and How to Organize Concerted Clinical Nutrition Research in Canada?</i></p> <p>Benoît Lamarche Laval Université</p> <p><i>To What Extent Have Drugs Provided Risk Reduction for Cardiovascular Disease</i></p> <p>David Jenkins University of Toronto</p>	<p>Moderator:</p> <p>Lori West</p> <p><i>Knowledge Gaps in Nutrition Regulatory Policy Making</i></p> <p>William Yan Health Canada</p> <p><i>Agricultural Regulatory Action Plan: Health Claims, Novel Foods and Ingredients</i></p> <p>Michèle Marcotte Agriculture and Agri-Food Canada</p> <p><i>A Chronic Disease Perspective on Food and Nutrition Research</i></p> <p>Howard Morrison Public Health Agency of Canada</p>

What are the strengths, gaps, opportunities in research capacity in Canada for Food and Health by each theme?

12:30-1:30 pm

Lunch

1:30-2:30pm

Report-back from small groups & prioritizing

2:30-2:50pm

Break

2:50-5:00pm

PLENARY PANEL: A Global Perspective on Food and Health

Early nutrition and cognitive development in relation to human capital

Moderator: Dr. Tony Philips, Scientific Director

CIHR-Institute of Neurosciences, Mental Health and Addictions (INMHA)

Nutrients that Influence Early Brain Development: Principles and Proofs

Michael Georgieff - University of Minnesota

Early Nutrition and its Application: the Need for Implementation Sciences

Stanley Zlotkin - Sick Kids Hospital, University of Toronto

Grand Challenges Canada: Enabling New Solutions for Maternal, Neonatal and Child Health in the Developing World

Rebecca Lackman – Grand Challenges Canada

5:30-6:30pm

Guided trail hike/run (Linda McCargar)

Dinner and Free Time

FRIDAY NOVEMBER 5, 2010

7:00- 8:00 **Breakfast**

8:00-10:00 **Breakout Sessions by Theme**

Theme 4: Food Security	Theme 5: Human Nutrition	Theme 6: “omics”
<p>Moderator: Linda Piazza</p> <p><i>Household Food Insecurity: Pushing the Boundaries of Nutrition Research</i></p> <p>Valerie Tarasuk University of Toronto</p> <p><i>Food Security Research Needs: A Perspective from the Federal Health Portfolio</i></p> <p>Michelle Hooper Health Canada</p> <p><i>How about Local Food Security and Climate Change: Research and Policy Implications</i></p> <p>Aleck Ostry University of Victoria</p>	<p>Moderator: Jeff Johnson</p> <p><i>Pediatric Clinical Research: Opportunities to Make a Real Difference and Human Resource Barriers</i></p> <p>Deborah O’Connor Hospital For Sick Children, Toronto</p> <p><i>Nutrition Assessment in Human Research: Opportunities and Challenges</i></p> <p>Linda McCargar University of Alberta</p> <p><i>Nutrition Research in Diverse Populations: Opportunities and Challenges</i></p> <p>Tim Green University of British Columbia</p>	<p>Moderator: Mohamed Karmali</p> <p><i>Population Genomics- Hope or Hype?</i></p> <p>Sonia Anand McMaster University</p> <p><i>SLC23A1 gene as a Nutrigenomics Example</i></p> <p>Peter Eck University of Manitoba</p> <p><i>Predicting Diet Response with Transcriptomics</i></p> <p>David Mutch University of Guelph</p>

What are the strengths, gaps, opportunities in research capacity in Canada for Food and Health by each theme?

10:00-10:30

Health Break

10:30-11:30

Report-back from small groups and prioritizing

11:30-12:15

Closing Panel Discussion: Reflections on Next steps

Pierre Bilodeau

Director, Bio Industries Division, Research Partnerships Programs
NSERC

Michèle Marcotte

Science Director, Food and Health
Agriculture and Agri-Food Canada

Hasan Hutchinson

Director General, Office of Nutrition Policy and Promotion
Health Canada

Philip Sherman

Scientific Director, Institute of Nutrition Metabolism and Diabetes,
Canadian Institutes of Health Research

12:15

Departure

APPENDIX B: PARTICIPANT LIST

Name	Affiliation
Luis Agellon	Professor and Canada Research Chair in Biochemistry and Molecular Biology of Nutrition School of Dietetics and Human Nutrition McGill University
Joanne Allard	University of Toronto
Sonia Anand	Professor of Medicine and Epidemiology, McMaster University
Harvey Anderson	Professor, Nutritional Sciences and Physiology Director, Program in Food Safety, Nutrition and Regulatory Affairs, Department of Nutritional Sciences, U of Toronto
Stephanie Atkinson	Professor and Associate Chair (Research), Department of Pediatrics, and Associate Member, Department of Biochemistry and Biomedical Sciences, Faculty of Health Sciences, McMaster University
Robert Bertolo	Canada Research Chair in Human Nutrition Associate Professor, Department of Biochemistry, Memorial U of Newfoundland
Dennis Bier	Professor of Pediatrics, Director of the USDA Children's Nutrition Research Center, Program Director of the NIH General Clinical Research Center, Baylor College of Medicine
Pierre Bilodeau	Director, Bio Industries, Research Partnership Programs, NSERC
Guylaine Charbonneau	Program Lead and Educator , Nutritional Wellness Strengthening the Forces Directorate of Force Health Protection Canadian Forces Health Services Group National Defence
Cindy Davis	Program Director in the Nutritional Sciences Research Group at the National Cancer Institute
Barbara Dillingham	Ontario Ministry of Agriculture, Food and Rural Affairs Research and Innovation Branch, Ministry of Agriculture, Food and Rural Affairs
Ross Duncan	Public Health Agency of Canada, A/Director, Division of Science and Technology Laboratory for Foodborne Zoonoses

Name	Affiliation
Peter Eck	Assistant Professor in the Department of Human Nutritional Sciences at the U of Manitoba
Ahmed El-Soheemy	Associate professor, Canada Research Chair in Nutrigenomics Department of Nutritional Sciences, University of Toronto
Karen Erin	Food Processing Development Centre, Government of Alberta
Guylaine Ferland	Faculté de médecine, Université de Montréal Chercheure, Institut Universitaire de Gériatrie de Montréal (IUGM),et Hôpital du Sacré-cœur de Montréal
Catherine Field	Alberta Institute for Human Nutrition, Uof Alberta
Karine Gale	Manager, Nutrition Program, Beef Information Centre
Theresa Glanville	Department of Applied Human Nutrition, Mount Saint Vincent University, Halifax
Ken Gossen	Executive Director, Food Processing Development Centre Government of Alberta
Leah Gramlich	Director, Nutrition Support, Associate Professor of Gastroenterology, Department of Medicine, University of Alberta, Royal Alexandra Hospital
Katherine Gray-Donald	Associate Professor, School of Dietetics and Human Nutrition, Macdonald Campus of McGill University
Michael Georgieff	Director at the Center for Neurobehavioral Development and Head of the Section of Neonatology Department of Pediatrics, University of Minnesota School of Medicine
Tim Green	Associate Professor, Foods and Nutrition, Faculty of Land and Food Systems, University of British Columbia
Rhona Hanning	Associate Professor, Health Studies, University of Waterloo
Michelle Hooper	Office of Nutrition Policy and Promotion, Health Canada
Isla Horvath	Executive Director, Canadian Foundation for Dietetic Research

Name	Affiliation
Jim House	Professor and Department Head, Human Nutritional Sciences, University of Manitoba
Van Hubbard	Rear Admiral, U.S. Public Health Service Assistant Surgeon General, Director, NIH Division of Nutrition Research Coordination, National Institutes of Health Department of Health and Human Services
Hasan Hutchison	Director General, Office of Nutrition Policy and Promotion, Health Products and Food Branch, Health Canada
David Jenkins	Professor in the Departments of Medicine and Nutritional Sciences, Faculty of Medicine, University of Toronto, Division of Endocrinology and Metabolism and Director of the Clinical Nutrition and Risk Factor Modification Center, St. Michael's Hospital
Jeffrey Johnson	Professor, Department of Public Health Sciences, Faculty of Medicine and Dentistry, University of Alberta
Peter Jones	Director of the Richardson Centre for Functional Foods and Nutraceuticals, Professor, Department of Food Science and Human Nutritional Services, University of Manitoba
Maria Kalergis	Program Manager, Health Professional Communications Nutrition, National Programs Dairy Farmers of Canada
Mohamed Karmali	Director-General of the Laboratory for Foodborne Zoonoses and Office of Biotechnology, Genomics, and Population Health, Public Health Agency of Canada
Mary L'Abbé	Earle W. McHenry Professor and Chair, Dept of Nutritional Sciences, Faculty of Medicine, University of Toronto
Rebecca Lackman	Grand Challenges Canada
Benoît Lamarche	Professor at the Department of Foods Sciences and Nutrition at Laval U, Canada Research Chair in Nutrition and Cardiovascular Health
David Ma	Associate Professor, Dept. of Human Health and Nutritional Sciences, College of Biological Science, University of Guelph
Janice MacDonald	Director, Communications (Public Affairs), Dietitians of Canada

Name	Affiliation
Diana Mager	Dept of Agricultural, Food and Nutritional Science, Alberta Institute for Human Nutrition, University of Alberta
Alejandro Marangoni	Professor and Canada Research Chair in Food and Soft Materials Science, University of Guelph
Michèle Marcotte	Science Director, Agriculture and Agri-Food Canada (AAFC)
Howard Morrison	Director of the Science Integration Division in the Centre for Chronic Disease Prevention and Control, Public Health Agency of Canada
David Mutch	Department of Human Health and Nutritional Sciences at the University of Guelph
Linda McCargar	Professor of Human Nutrition in the Department of Agricultural Food and Nutritional Science at the University of Alberta
Mary McKenna	Professor, Faculty of Kinesiology, University of New Brunswick
Deborah O'Connor	Director of Clinical Dietetics, Senior Associate Scientist in the Physiology and Experimental Medicine Program SickKids, Research Institute Associate Professor in the Department of Nutritional Sciences, Faculty of Medicine, University of Toronto
Erasmus Okine	Chair, PhD, PAS, FICN, Professor, Ruminant Nutrition & Metabolism, Associate Chair (Academic & Student Affairs) University of Alberta
Aleck Ostry	Associate Professor, Faculty of Social Sciences, University of Victoria
Tony Philips	Scientific Director of the CIHR Institute of Neurosciences, Mental Health and Addiction and Professor of Psychiatry and Senior Scientist in the University of British Columbia / Vancouver Coastal Health Brain Research Centre
Linda Piazza	Director of Research, Heart and Stroke Foundation of Canada
Francy Pillo-Blocka	President and CEO, Canadian Council of Food and Nutrition (CCFN)
Spencer Proctor	Associate Professor / Director Metabolic and Cardiovascular Diseases Laboratory Agricultural, Food and Nutritional Science, University of Alberta

Name	Affiliation
Kim Raines	CIHR/HSFC Applied Public Health Chair, Professor, Centre for Health Promotion Studies, School of Public Health, University of Alberta
Fereidoon Shahidi	University Research Professor, Dept of Biochemistry, Memorial University of Newfoundland
Sangita Sharma	Chair of Aboriginal Health, University of Alberta
Philip Sherman	Scientific Director, of CIHR Institute of Nutrition, Metabolism, and Diabetes
Valerie Tarasuk	Professor in the Department of Nutritional Sciences and the Dalla Lana School of Public Health, University of Toronto
Jennifer Taylor	Professor, Department of Family and Nutritional Sciences, University of Prince Edward Island
Tanya Verrall	Senior Researcher with Health Quality Council Saskatchewan and adjunct faculty member with the College of Pharmacy and Nutrition, University of Saskatchewan
Paul Veugelers	Professor, School of Public Health Director, Population Health Intervention Research Unit Canada Research Chair in Population Health, University of Alberta
Hope Weiler	Associate Professor, Nutrition, Development and Aging, School of Dietetics and Human Nutrition, McGill University
Lori West	Director of Heart Transplantation Research and a Professor of Pediatrics and Surgery at the University of Alberta Stollery Children's Hospital
Susan Whiting	Professor, Nutrition and Dietetics, University of Saskatchewan
Noreen Willows	Associate Professor, Community Nutrition, University of Alberta
William Yan	Director of the Bureau of Nutritional Sciences, Food Directorate, Health Canada
Stanley Zlotkin	Professor of Paediatrics, Public Health Sciences and Nutritional Sciences, University of Toronto, and Senior Scientist, Hospital for Sick Children