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Message from the Team Leaders

This was an exciting year as we celebrated the 10th anniversary of CCARM. In April, the Therapeutic Applications of Functional Foods and Bioactives Conference was held at the St Boniface Hospital Albrechtsen Research Centre. The conference provided CCARM PIs, affiliates and invited speakers with an excellent opportunity to share their research on functional foods and bioactives in relation to their potential health benefits. Trainees participated in both poster and oral presentations. Congratulations to Cara Isaak (advisor: Dr. Chris Siow) for the best oral presentation. We thank the co-chairs, Dr. Dan Brown and Dr. Thomas Netticadan, for organizing a terrific conference, and everyone who made the conference a success.

In May, we held a celebration to recognize Dr. Dan Brown’s three year term as Centre Leader (2013-2016) and his retirement from Agriculture and Agri-food Canada after 35 years of service. We thank Dan for all his efforts to continue the development of our facilities and for promoting collaborations within CCARM and with our partners. We wish Dan all the best with his retirement and enjoying more time with family, his cottage in southern Ontario and racing cars (a favourite hobby).

In November, Manitoba Agriculture Minister Ralph Eichler and MP Dan Vandal, on behalf of Federal Agriculture Minister Lawrence MacAulay, announced funding for a $1 Million nuclear magnetic resonance (NMR) spectrometer which has been installed and is now operational in the Agri-Health Metabolomics Laboratory. Dr. Michel Aliani and his many collaborators will now be able to confirm the identity of compounds present in food and biological fluids using the NMR. This will enhance our overall ability to make new discoveries about the compounds present in various plants that are able to improve health and fight disease, and how they relate to consumption of specific foods. Minister Eichler and MP Vandal also announced funding for a health economist position at University of Winnipeg who will work in close partnership with CCARM. This individual will conduct research that will examine the relationship regarding the economic benefits of functional foods and natural health products. This work will be of great value to CCARM investigators since it will assist in determining the economic impact of food-based interventions as it relates to the health care system and the commercial agri-food sector.

In the fall, we welcomed Dr. Harold Aukema and his lab group back to CCARM (they were temporarily located here after the Duff Roblin fire from 2009 to 2012). Harold’s group has expertise in the analysis of fat metabolites known as oxylipins and his LC/MS/MS spectrometer adds to the strong analytical capabilities of our research team.

CCARM participates annually in Agriculture in the City, which is held at the Forks Market in March, as one of our main outreach events. It provides us with an excellent opportunity to engage with the public. This year’s theme was pulses (dried beans, peas, lentils and chickpeas) given that the United Nations declared 2016 as the Year of the Pulse. The SBRC Communications and Media Services Team (Bill Peters, Robert Blaihc and Joseph Pilapil) supported our promotion of pulses by creating a “pulse” portrait of local media celebrity Ace Burpee for Ag in the City. They also received
funding from the Manitoba Pulse and Soybean Growers for the “Why Pulses? Challenge.” For this competition, a 4 foot x 24 foot art installation made of six individual panels was prepared. Their “Breaking New Ground” was a mosaic created with various beans and lentils, which was unveiled at the 10th Canadian Pulse Research Workshop held in Winnipeg in October.

2016 was a very productive year for research. CCARM Principal Investigator (PIs) received funding from 76 different competitive operating, equipment and salary grants totalling $3,189,540. This funding was from a wide range of sources including national and provincial granting agencies, commodity and international groups, Agriculture and Agri-Food Canada, University of Manitoba and the St. Boniface Hospital Foundation. It supported 77 students, postdoctoral fellows, and staff in addition to the 14 Principal Investigators at the Centre in 2016. We also acknowledge the support from St Boniface Hospital, Agriculture and Agri-Food Canada and the University of Manitoba that makes this unique partnership among a hospital, a federal agriculture department and a university possible. CCARM researchers published 43 peer-reviewed publications and presented 63 abstracts at local, national and international conferences. The high level of collaborative activity among CCARM PIs is demonstrated by the number of peer-reviewed papers with CCARM co-authors (63 papers reported by individual labs, with 43 of these being unique papers, and 111 abstracts reported by individual labs, with 63 of these being unique abstracts & 1 commentary). The reports from each of the individual laboratories highlight the accomplishments, publications, presentations, funding, awards, trainees, technical staff, professional service and outreach of our members. We congratulate everyone on a very successful year.

Training is a very important aspect of research. Congratulations to the 8 MSc students and 6 PhD students who successfully defended their thesis in 2016. We would like to acknowledge and congratulate the trainees who have been successful in receiving various types of awards:

**Scholarships:**
- **Canadian Institutes for Health Research (CIHR):** Jaime Clark (advisors: Carla Taylor & Peter Zahradka); Melissa Gabbs (supervisor: Harold Aukema)
- **James Gordon Fletcher PhD Fellowship in Functional Foods and Nutraceuticals, University of Manitoba (declined):** Md Monirujjamin (advisor: Harold Aukema); Pema Raj (advisor: Thomas Netticadan)
- **Libyan Program for International Education Scholarship:** Basma Aloud (advisors: Thomas Netticadan & Heather Blewett)
- **Manitoba Graduate Fellowship:** Md Ariful Islam (advisor: Harold Aukema)
- **Minden and Tom Olenick Research Studentship in Medicine, Undergraduate Medical Education Award of the Rady Faculty of Health Sciences, University of Manitoba:** Cara Isaak (advisor: Chris Siow)
- **Mitacs:** Youjia Du (advisors: Peter Zahradka & Carla Taylor); Erin Goldberg (advisor: Michel Aliani)
- **Research Manitoba:** Crystal Acosta (advisor: Hope Anderson); Tara Loader (advisors: Carla Taylor & Peter Zahradka); Pema Raj (advisor: Thomas Netticadan)
MESSAGE FROM THE TEAM LEADERS

University of Manitoba Graduate Fellowship: Ala’a Eideh (advisor: Michel Aliani); Md Monirujjaman (advisor: Harold Aukema)

Research Award:
Diagnostic Services Manitoba (Translation) Research Award for Outstanding Doctoral Research at the University of Manitoba: Stephanie Caligiuri (advisor: Grant Pierce)
Janice Dodd Award for Excellence in Endocrine Physiology, Department of Physiology and Pathophysiology, University of Manitoba: Youjia Du (advisors: Peter Zahradka & Carla Taylor)

Awards for an oral presentation at a conference:
Cara Isaak (advisor: Chris Siow): Agriculture and Agri-Food Canada Award for Best Oral Presentation, Therapeutic Applications of Functional Foods and Bioactives Conference, Winnipeg
Tara Loader (advisors: Carla Taylor & Peter Zahradka): 2nd Place, Graduate Student Oral Presentations, Canadian Pulse Research Workshop
Kabo Masisi (advisors: Trust Beta & Mohammed Moghadasian): Finalist, Nestle Nutrition Student and Trainee Oral Competition, Canadian Nutrition Society Annual Meeting

Awards for best poster presentation at a conference:
Stephanie Caligiuri (advisor: Grant Pierce): Manitoba Medical Service Foundation Poster Award, Canadian Health Student Research Forum (Winnipeg)
Cristiana da Costa (advisor: Michelle Alfa), Best Poster Award, Pan American Sterilization Conference (Montevideo, Uruguay)
Jessay Devassy (advisor: Harold Aukema): American Society of Nutrition Bronze Medal in Emerging Leaders in Nutrition Sciences Poster Award, Experimental Biology (San Diego)
Danielle Lee (advisor: Hope Anderson): Antoine A. Noujaim Award of Excellence, Canadian Society for Pharmaceutical Sciences (Vancouver)
Shan Leng (advisor: Harold Aukema): American Society of Nutrition Emerging Leaders in Nutrition Sciences Travel Award, Experimental Biology (San Diego)
Md Monirujjaman (advisor: Harold Aukema): 2nd Prize for Oral Poster Presentation, 5th Functional Foods and Natural Health Products Graduate Symposium (Winnipeg)

We are very grateful for all the support and resources that CCARM receives from the “St. B Team” that enables our success. Thank you to Grant Pierce for your enthusiastic support of agri-food research for health and medicine, and Susie & Shawna, for administrative and accounting assistance. Thank you to the Information Technology (IT) group (Shawn, Chris, Eric) for keeping all our office and equipment-related computers and networks running smoothly. Thanks to Communications and Media Services (Bill, Rob, Joseph) for promoting our work and providing audio-visual supports for our seminar series and the TAFFB conference. Thank you to Bram Ramjiawan and staff (Karen, Lorie, Angela) for supporting our research activities, and especially, clinical studies via the Office of Clinical Research. Thank you to Randy Aitken and all the staff in the RO Burrell Laboratory for wonderful support with our animal studies. Finally, all of...
MESSAGE FROM THE TEAM LEADERS

this would not be possible without the facilities in which we work and the tremendous support of the St Boniface Hospital Foundation. Thank you to all the Foundation staff. We would like to give a special thank you to our admin staff, Sue and Tracy, for the tremendous support you have provided to everyone at CCARM, as well for your valuable assistance with the TAFFB conference.

Congratulations to all the CCARM PIs, staff and trainees for a very productive and successful 2016!

Carla Taylor and Peter Zahradka
Principal Investigators and CCARM Team Leaders
Therapeutic Applications of Functional Foods and Bioactives Conference
&
Functional Foods and Natural Health Products Graduate Research Symposium

April 20th – April 22nd, 2016
St-Boniface Hospital Albrechtsen Research Centre
Winnipeg, Manitoba, Canada

HOSTED BY
The Canadian Centre for Agri-Food Research in Health and Medicine
Drs. Dan Brown, Carla Taylor, Peter Zahradka

Dan Brown - Thank you for being Centre Leader (2013-2016) and Happy Retirement!

Ag in the City – Ace Burpee Portrait for 2016 Year of the Pulses
“Breaking new ground” From the ox and plow to the researcher’s lab bench, Manitobans have been continually breaking new ground. This artwork, made entirely out of pulse crops (and a few sunflower seeds), celebrates Manitoba’s leaders in agri-food and human health research – at the University of Manitoba and the Canadian Centre for Agri-Food Research in Health and Medicine, in 2016 – International Year of the Pulses.

Project Producer: Bill Peters, Artists: Rob Blaich, Joseph Pilapil & Bill Peters
Sponsored by: Manitoba Pulse and Soybean Growers, St. Boniface Hospital Research & CCARM
## List of Members

### 1. Principal Investigators

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Affiliation</th>
<th>Funding Received</th>
</tr>
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<tr>
<td>1</td>
<td>Michelle Alfa, PhD</td>
<td>Professor, Department of Medical Microbiology, University of Manitoba</td>
<td>$161,871</td>
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<tr>
<td>2</td>
<td>Michel Aliani, PhD</td>
<td>Associate Professor, Department of Human Nutritional Sciences, University of Manitoba</td>
<td>$479,855</td>
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<td>3</td>
<td>Hope Anderson, PhD</td>
<td>Associate Professor &amp; Graduate Chair, College of Pharmacy, University of Manitoba; Adjunct Professor, Department of Pharmacology and Therapeutics, University of Manitoba</td>
<td>$150,646</td>
</tr>
<tr>
<td>4</td>
<td>Harold Aukema, PhD</td>
<td>Professor, Department of Human Nutritional Sciences, University of Manitoba</td>
<td>$343,434</td>
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<tr>
<td>5</td>
<td>Heather Blewett, PhD</td>
<td>Research Scientist, Agriculture and Agri-Food Canada; Adjunct Professor, Departments of Human Nutritional Sciences &amp; Physiology and Pathophysiology, University of Manitoba</td>
<td>$439,179</td>
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<td>6</td>
<td>Dan Brown, PhD</td>
<td>Centre Leader, Canadian Centre for Agri-Food Research in Health and Medicine (to April 2016); Research Scientist, Agriculture and Agri-Food Canada; Adjunct Professor, Department of Biology, University of Western Ontario; Adjunct Professor, Department of Human Nutritional Sciences, University of Manitoba</td>
<td>$148,427</td>
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<tr>
<td>7</td>
<td>Randolph Guzman, MD</td>
<td>Professor of Surgery and Head, Section of Vascular Surgery, University of Manitoba; Regional Lead, Section of Vascular Surgery, WRHA; Site Medical Manager, Department of Surgery, St. Boniface Hospital</td>
<td>$0</td>
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<tr>
<td>8</td>
<td>Mohammed Moghadasian, PhD</td>
<td>Professor, Department of Human Nutritional Sciences, University of Manitoba</td>
<td>$49,500</td>
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<tr>
<td>9</td>
<td>Thomas Netticadan, PhD</td>
<td>Research Scientist, Agriculture &amp; Agri-Food Canada; Adjunct Professor, Department of Physiology and Pathophysiology, University of Manitoba</td>
<td>$278,778</td>
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<tr>
<td>10</td>
<td>Karmin O, PhD</td>
<td>Professor, Department of Animal Science, University of Manitoba; Adjunct Professor, Department of Physiology and Pathophysiology, University of Manitoba</td>
<td>$46,500</td>
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<tr>
<td>11</td>
<td>Grant Pierce, PhD</td>
<td>Executive Director of Research, St. Boniface Hospital; Professor, Department of Physiology and Pathophysiology, University of Manitoba</td>
<td>$588,078</td>
</tr>
</tbody>
</table>
12. **Chris Siow, PhD:** Research Scientist, Agriculture and Agri-Food Canada; Adjunct Professor, Department of Physiology and Pathophysiology, University of Manitoba  
   $159,009

13. **Carla Taylor, PhD:** Team Leader, Canadian Centre for Agri-Food Research in Health and Medicine (from April 2016); Professor, Department of Human Nutritional Sciences, University of Manitoba; Adjunct Professor, Department of Physiology and Pathophysiology, University of Manitoba  
   $131,666

14. **Peter Zahradka, PhD:** Deputy Team Leader, Canadian Centre for Agri-Food Research in Health and Medicine (from April 2016); Professor, Department of Physiology and Pathophysiology, University of Manitoba; Adjunct Professor, Department of Human Nutritional Sciences, University of Manitoba  
   $212,597

**TOTAL FUNDING RECEIVED IN 2016:** $3,189,540

2. Affiliates

1. **Rotimi Aluko, PhD:** Professor, Department of Human Nutritional Sciences, University of Manitoba
2. **Nancy Ames, PhD:** Research Scientist, Agriculture & Agri-Food Canada, Richardson Centre for Functional Foods and Nutraceuticals & Adjunct Professor, Department of Human Nutritional Sciences, University of Manitoba
3. **Morag Graham, PhD:** Adjunct Professor, Department of Medical Microbiology, University of Manitoba
4. **Jim House, PhD:** Professor and Head, Department of Human Nutritional Sciences, Faculty of Agricultural and Food Sciences, University of Manitoba
5. **Edmund Lui, PhD:** Associate Professor & Scientific Director, Ontario Ginseng Innovation and Research Consortium, Ontario Research Excellence Program, Ministry of Research and Innovation & Adjunct Professor, University of Western Ontario
6. **Casey Sayre, PhD:** Assistant Professor, College of Pharmacy, University of Manitoba
7. **Garry Shen, PhD:** Professor, Section of Endocrinology and Metabolism, Department of Internal Medicine, University of Manitoba
8. **Miyoung Suh, RD, PhD:** Associate Professor, Department of Human Nutritional Sciences, University of Manitoba
9. **Alphonsus Utioh, MSc:** Research and Development Manager, Food Development Centre (Portage la Prairie)
10. **Gary Van Domselaar, PhD:** Chief, National Microbiology Laboratory, Public Health Agency of Canada
11. **Jeffrey Wigle, PhD:** Associate Professor, Department of Biochemistry and Medical Genetics, University of Manitoba
**LIST OF MEMBERS**

### Visiting Scientists

1. Dr. Lindsay Brown, University of Southern Queensland, Australia
2. Prof. Ali Movahed, Persian Gulf Tropic Medicine Center, Iran

### 3. Research Associates

1. Elena Dibrov
2. Omkar Ijare
3. Kimberley O’Hara

### 4. Postdoctoral Fellows

1. Erin Goldberg
2. Samantha Pauls

### 5. Graduate Students (* - defended thesis in 2016)

1. Crystal Acosta
2. Bolanle Akinwumi
3. Basma Aloud
4. Sirini Amarakoon
5. Aakangchhya Bhusal*
6. Stephanie Caligiuri*
7. Jaime Clark
8. Jessay Devassy*
9. Youjia Du
10. Andrea Edel*
11. Al’a Eideh
12. Adewale Esan (visiting PhD student)
13. Ronak Fahmi
14. Afroza Ferdouse
15. Melissa Gabbs
16. Nora Ghazzawi
17. Jennifer Grant
18. Thomas Hedley
19. Md Ariful Islam
20. Cara Isaak
21. Hibah Khawar
22. Rokiatou Kone Berethe
23. Danielle Lee
24. Shan Leng*
25. Tara Loader
26. Yan Lu*
27. Kabo Masisi*
28. Md Moniruijaman
29. Adriana Mudryj
30. Pema Raj
31. Mihir Parikh
32. Amalia Santiago*
33. Yvette Shang
34. Victoria Sid
35. Linda Siemens*
36. Aleksandra Stamenkovic
37. Le Wang*
38. Pengqi (Peggy) Wang*
39. Ruiyin Zhou*

### 6. Technical Staff

1. Alex Austria
2. Debbie Brisson
3. Patricia DeGagne
4. Jo-Anne Gilchrist
5. Shiva Ievari-Shariati
6. Khuong Le
7. Thane Maddaford
8. Sasanda Nimalgoda
9. Nancy Olson
10. Danielle (Hanke) Perera
11. Jay Petkau
12. Suvira Prashar
13. Heidi Pylypjuk
14. Li Ren
15. Jo-Ann Stebbing
16. Leslee Tworek
17. Tanja Winter
18. Brenda Wright
19. Liping Yu
LIST OF MEMBERS

7. Research Nurses
   1. Wendy Weighell  2. Angela Wilson

8. Undergraduate Students

9. Volunteer Research Assistants
   1. Prasanga Ketawalamulla  2. Matthew Wiecek

10. Administrative Staff
    1. Tracy Ewonchuk  2. Susan Zettler

Back row: Sirini Amarakoon, Melissa Gabbs, Yvette Shang, Danielle Lee, Tara Loader, Samantha Pauls, Bolanle Akinwumi; Front row: Youjia Du, Cara Isaak, Victoria Sid, Crystal Acosta, Jaime Clark
The Therapeutic Applications of Functional Foods and Bioactives (TAFFB) Conference was held April 21-22 at the St Boniface Hospital Albrechtsen Research Centre to celebrate the 10th anniversary of CCARM. The program and speakers are highlighted on the following pages.

The Functional Foods and Natural Health Products Graduate Research Symposium (FFNHP) organized by the University of Manitoba Human Nutritional Sciences Graduate Student Association was held in conjunction with TAFFB as a pre-conference event on April 20.

A sincere thanks to everyone who made the TAFFB conference a huge success:

**Co-Chairs:** Daniel Brown & Thomas Netticadan

**Conference Secretariats:** Tracy Ewonchuk & Susan Zettler

**Organizing Committee:** Michel Aliani, Daniel Brown, Tracy Ewonchuk, Thomas Netticadan, Karmin O, Peter Zahradka & Susan Zettler

**A-V/Media Team:** Bill Peters, Robert Blaich & Joseph Pilapil

**Judges for the TAFFB Oral Presentation Awards:** Thomas Netticadan, Mohammed Moghadasian, Chris Siow, Jaime Clark & Ifeanyi Nwachukwu

We would like to acknowledge and thank our sponsors for their financial support and for making TAFFB possible:

- Agriculture and Agri-food Canada
- Canadian Centre for Agri-Food Research in Health and Medicine
- Manitoba Agri-Health Research Network (MAHRN)
- Research Manitoba
- St. Boniface Hospital Albrechtsen Research Centre

A special thanks to Dr. Ed Kroeger, Faculty of Health Sciences, University of Manitoba for donating the use of the poster boards.
THERAPEUTIC APPLICATIONS OF FUNCTIONAL FOODS AND BIOACTIVES CONFERENCE

FUNCTIONAL/MEDICAL FOODS AND HEALTH I (Chair: Peter Zahradka)

Marketing of an orange-peel based natural health product, Andrew R. Tait, Tait Laboratories, Vancouver

The beans and peas study: Issues to consider when adding to the evidence regarding cholesterol-lowering by regular consumption of dried beans and peas, Rhonda C. Bell, University of Alberta, Edmonton

Running effective clinical trials for vascular function, Carla G. Taylor, University of Manitoba, Winnipeg

Effects of dietary α-linolenic acid on bioactive lipid formation in rat tissues, Harold Aukema, University of Manitoba, Winnipeg

FUNCTIONAL/MEDICAL FOODS AND HEALTH II (Chair: Karmin O)

What we know and what we need to know about dietary flaxseed and cardiovascular disease, Grant N. Pierce, University of Manitoba, Winnipeg

The effect of sources of natural health products on their health claims, Dan Brown, Agriculture and Agri-Food Canada, Winnipeg

The role of berberine in lowering hepatic lipids and type 2 diabetes, Xin Gao, Zhongshan Hospital, Fudan University, Shanghai, China

Health benefits of emerging crops in Canada, Y.L. (Chris) Siow, Agriculture and Agri-Food Canada, Winnipeg

Capturing the potential of functional eggs and egg-derived bioactives, James House, University of Manitoba, Winnipeg

FOOD BIOACTIVES AND HEALTH I (Chair: Dr. Dan Brown)

Can we save men’s fertility with DHA? Miyoung Suh, University of Manitoba, Winnipeg

Bioactives for the treatment of kidney disease: acute kidney injury (AKI) and chronic kidney disease (CKD), Karmin O, University of Manitoba, Winnipeg

What is the bioactive in lentils effective in treating PAD? Peter Zahradka, University of Manitoba, Winnipeg

Bioactives in ginseng and their respective health target, Ed Lui, University of Western Ontario, London
FOOD BIOACTIVES AND HEALTH II (Chair: Thomas Netticadan)

Anti-cancer effects of beta-glucan, Neelam Khaper, Lakehead University, Thunder Bay

Resveratrol and cardioprotection – where are we now, and where do we go from here? Thomas Netticadan, Agriculture and Agri-Food Canada, Winnipeg & Shelley Zierothe, St. Boniface General Hospital, Winnipeg

Beta-glucan and metabolic health, Nancy Ames, Agriculture and Agri-Food Canada, Winnipeg

Cardiovascular benefits of plant sterols, Mohammed Moghadasian, University of Manitoba, Winnipeg

PUBLIC FORUM & “Meet the Speaker/Author” Reception
Bryce B. Wylde – Let Functional Food Be Thy Medicine, Toronto

TECHNOLOGICAL ADVANCES IN ANALYSIS OF FOODS AND BIOACTIVES (Chair: Dr. Michel Aliani)

Role of oxidized phospholipids in myocardial reperfusion injury, Amir Ravandi, University of Manitoba, Winnipeg

The role of mitochondrial dysfunction and microRNA_133 in the development of muscle insulin resistance in offspring exposed to type 2 diabetes, Joseph Gordon, University of Manitoba, Winnipeg

Urinary metabolomics profile of genetically obese rats using liquid chromatography quadrupole time-of-flight mass spectrometry, Michel Aliani, University of Manitoba, Winnipeg

TAFFB Graduate Student Oral Competition

HOT TOPIC DISCUSSION: Taking it with a pinch of SALT
Michel Aliani, University of Manitoba, Winnipeg
Allison Dart, University of Manitoba, Winnipeg
Michael Eskin, University of Manitoba, Winnipeg
Lee Anne Murphy, Manitoba Agri-Food Health Research Network, Winnipeg
Thank you to Dr. Thomas Netticadan and his Seminar Assistants Pema Raj, Kabo Masisi & Cara Isaak for organizing the 2016 CCARM Food for Thought Seminar series. This year’s invited speakers are listed below. Trainees had an opportunity to meet with the external speakers and learn more about their research and career path during lunchtime meetings.

1. Ms. Stephanie Caligiuri, PhD Student, Physiology and Pathophysiology, University of Manitoba  
*Breaking News – Silent Killer Found Dead in Field of Blue Flowers. Research findings on flaxseed, hypertension and cardiovascular events in humans.*

2. Dr. Jason Dyck, University of Alberta  
*Can Resveratrol Improve the Symptoms of Heart Failure?*

3. Dr. Adewale Esan, University of Ibadan, Nigeria  
*Plant Growth Regulators: The Role in Plant Defence Mechanism and Secondary Metabolites for the Improvement of Metabolic Syndrome*

4. Dr. Ehsan Khafipour, Animal Science and Medical Microbiology, University of Manitoba  
*Microbiome Madness: A Tale of Three Stories*

5. Mr. Kabo Masisi, PhD Student, Food Science, University of Manitoba  
*Antioxidant Potential of Specific Cereal Grain Fractions: In Vitro and In Vivo Studies*

6. Dr. Shizuko Nagao, Fujita Health University, Japan  
*Usefulness of Animal Models of Cystic Kidney Disease for Drug and Nutritional Intervention*

7. Dr. Jayadev Raju, Health Canada, Ottawa  
*Characterizing the Health Effects and Hazards of Food-Borne Constituents and Chemicals: Key Components of Food Regulatory Process*

8. Dr. Paul Spagnuolo, University of Guelph  
*Anti-Cancer Treatment Applications of Nutraceuticals*
Our activities this year focused on completing three research projects; 1) the gut microbiome clinical study, 2) the American Society of Gastrointestinal Endoscopy (ASGE) research grant and 3) the STERIS Innovation grant (the latter two projects relate to reducing the risk of hospital acquired infections).

A key highlight of our studies in 2016 was the data for the MSPrebiotic clinical study because the microbiome analysis showed a significant increase in Bifidobacteria species in mid-age and elderly adults taking MSPrebiotic compared to placebo. In addition there was a significant decrease in glucose levels and insulin resistance in the elderly participants. All these findings support the role of this prebiotic in reducing the risk of Type 2 diabetes and maintaining a healthy gut microbiome in the elderly.

The ASGE project consisted of many different components including the development of a novel model of buildup biofilm (BBF) in PTFE channels used in endoscopes. This unique model was used to determine the optimal sample collection method for endoscope cultures. The final portion of this research project was an in vitro “mock clinical” study of 120 duodenoscopes. Each duodenoscope was inoculated with ATS2015 (organic test fluid) containing $10^8$ to $10^9$ CFU/mL of *Enterococcus faecalis* and *Escherichia coli*. After 2 hours of contact the inoculated duodenoscopes were fully cleaned, disinfected and stored dry. The endoscopes were then sampled after storage to determine if total eradication of *E. faecalis* and *E. coli* was possible following the manufacturer’s instructions for reprocessing. Our data used the most sensitive harvesting and culture methods and demonstrated that despite receiving proper cleaning, proper disinfection and dry storage that almost all the duodenoscopes tested had low levels of residual bacteria. Some of the surviving bacteria were *E. faecalis* (no survival of *E.coli*) but most were environmental bacteria likely arising from the tap water. This data suggests that even when an overall 6 Log$_{10}$ reduction of bacterial levels is achieved that there may still be low levels of residual bacteria within reprocessed duodenoscopes.

We were happy that the two Brazil PhD students (Maira Ribiero and Cristiana da Costa) that we hosted in 2015 successfully defended their thesis and graduated in 2016. Dr. Alfa was able to attend Maira’s PhD defense in Sao Paulo, Brazil. Cristiana has successfully published two research articles related to her research at SBRC.
## Research Funding

<table>
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<tr>
<th>Name of Granting Agency</th>
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<td><strong>OPERATING:</strong></td>
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<tr>
<td>Health Canada: Build in Canada Innovation Program (BCIP)</td>
<td>M. Alfa</td>
<td>SICODS evaluation</td>
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<td>American Society of Gastroenterologists and Endoscopy assistants (ASGE)</td>
<td>M. Alfa &amp; H. Singh</td>
<td>Prevention of biofilm formation in duodenoscopes</td>
<td>$81,871</td>
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<td><strong>TOTAL FUNDING:</strong></td>
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Pat DeGagne, Nancy Olson & Dr. Michelle Alfa
Collaborative Activity

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<tr>
<td>Dr. Morag Graham</td>
<td>National Microbiology Laboratory</td>
<td>Effects of MSPrebiotic on Gut Health in the Elderly.</td>
</tr>
<tr>
<td>Dr. Gary Van Domselaar</td>
<td>National Microbiology Laboratory</td>
<td>Effects of MSPrebiotic on Gut Health in the Elderly.</td>
</tr>
<tr>
<td>Dr. Rodrigo France</td>
<td>Dept of Dentistry, U of Manitoba</td>
<td>Prevention of biofilm formation in duodenoscopes</td>
</tr>
<tr>
<td>Dr. Kazuko Graziano</td>
<td>University of Sao Paulo Sao Paulo, Brazil</td>
<td>Development of Buildup Biofilm models</td>
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Publications & Presentations

Peer-Reviewed Articles


Abstracts

Invited Presentations
“Endoscopes and biofilm”, Canadian Association of Medical Device Reprocessing Conference, Toronto. (Featured Speaker)

“Endocavity probes”, Canadian Association of Medical Device Reprocessing Conference, Toronto.


“Dissecting recent outbreaks of CRE associated with contaminated duodenoscopes”, Pan American Sterilization Conference, Montevideo (Uruguay).

“Bacteria of concern in endoscope outbreaks: how to control them”, Olympus Frontiers Workshop, Orlando.

“Orthopaedic screws: Reprocessing issues, Manitoba Operating Room Nursing Association Conference, Winnipeg.

“Outbreaks of infections related to gastrointestinal endoscopy”, University of Sao Paulo, Sao Paulo (Brazil).
Training/Mentoring

Technical Staff
Pat DeGagne, Research Technologist
Nancy Olson, Research Technologist

Students Graduated

PhD
Cristiana da Costa
Maira Ribiero

Honours, Awards & Scholarships

Cristiana da Costa Luciano, Best Student Poster Award, Pan American Sterilization Conference, Montevideo (Uruguay).

Service

Graduate Student Committees

PhD
Jessica Forbes, Medical Microbiology

Professional Service
Reviewer for – Journal of Hospital Infection, American Journal of Infection Control, Journal of Medical Microbiology, Infection Control and Hospital Epidemiology, Journal of Clinical Microbiology

Outreach Activity
St. Boniface Research Foundation: Donor breakfast
Dr. Michel Aliani  
Metabolomics Laboratory

Our multi-disciplinary laboratory largely focuses on Mass Spectrometry and Nuclear Magnetic Resonance (NMR)-based metabolomics, incorporating elements of sensory and clinical research. We are interested in the development of functional foods for use in clinical trials, flavour perception, how diet impacts health, and understanding the disrupted metabolism involved in certain disease states and conditions such as peripheral arterial disease (PAD), cancer, diabetes mellitus and hypertension, in order to provide insights in early detection, monitoring treatment response, and detecting recurrence to improve clinical outcomes.

This year we were pleased to host The Minister of Health (Manitoba), Kelvin Goertzen, and The Minister of Agriculture (Manitoba), Ralph Eichler, who exclusively visited our lab to see the exciting research we are doing, and for us to showcase the capabilities of our NMR lab.

Our lab celebrated Amalia Santiago, Ruiyin Zhao and Le Wang’s completion of their MSc Programs, and Omkar Ijare’s new job in Texas (he was a former Research Associate specializing in NMR). Ms. Santiago was studying the effect of flaxseed addition and storage conditions on the acceptability, sensory properties, and bioactive concentrations in muffins used in a clinical trial. Ms. Zhao’s thesis investigated the role of low molecular weight peptides as Maillard reactant flavour precursors in meat. Ms. Wang’s thesis consisted of a metabolomics study of the effect of bean consumption on PAD patients.

Current lab members include Technician, Shiva Shariati, PhD Students, Ronak Fahmi and Ala’a Eideh, and Postdoctoral Fellow, Erin Goldberg. Ms. Fahmi is currently working on a project with Warburton’s, the largest bread producer in the United Kingdom, and the Canadian International Grains Institute, to develop healthful breads with added pulse flours. Ms. Eideh’s project involves a clinical component, focused on designing low glycemic index foods like yogurt fortified with Manitoba-grown Saskatoon berries, destined for individuals with diabetes mellitus. Dr. Goldberg’s project with Maple Leaf is looking at genetic and metabolic markers to improve pork flavour in Maple Leaf’s meat products. Donna Ryland, our Sensory Specialist, is based on the Fort Garry Campus, in our state-of-the-art, food-grade Weston Sensory and Food Lab, instrumental in the design and execution of our sensory trials.

This year’s publication record demonstrated the breadth of research our lab is involved in. In a recent article published in Magnetic Resonance Insights, our group found an absence of glucose in sputum and lower concentrations of methanol in exhaled breath condensate from lung cancer patients, pointing towards these as promising metabolic biomarkers for cancer detection. In the Journal of Functional Foods, we published data
on urinary and plasma metabolite changes from hypertensive rats fed chicken skin hydrolysates, a novel and promising use of a waste product in industry.

Another major focus of our laboratory has been pulse research. Mrs. Shariati published work on the physicochemical properties and consumer acceptability of low-fat beef burgers containing micronized lentil and chickpea flours in the Journal of Food Science. She found that micronization successfully decreased lipoxygenase activity, which can lead to off flavours caused by the formation of volatile organic compounds. Our group also found that lentils could significantly reduce blood pressure, and so exploring metabolomics differences became a goal. In comparing the urine from hypertensive rats fed lentils or control diets, we determined that arginine and related compounds may be partially responsible for attenuating blood pressure. In another study, analysis of serum and urine from patients with peripheral arterial disease after consuming beans revealed numerous metabolic changes.

Research from Dr. Erin Goldberg’s PhD was also published in Poultry Science; she used special dietary blends for laying hen diets, and studied their impact on the fatty acid profile and sensory characteristics of eggs. Dr. Goldberg and Dr. Aliani also published a review on orthonasal and retronasal olfaction, information that is useful for scientists and industry alike for the development of food products that will positively impact the consumer experience.

Finally, we have embarked on an exciting research collaboration with Dr. Lisa Cooper from Northeast Ohio Medical University, for metabolomics studies relating to aging in bats. Bats do not outwardly show signs of aging, and it is our hope that our work will reveal some of the reasons behind this phenomenon.

Our laboratory will continue to be actively involved in several nutritional, medical and food related metabolomics research activities in collaboration with regional, national and international partners.
## Research Funding

<table>
<thead>
<tr>
<th>Name of Granting Agency</th>
<th>Names of Investigators</th>
<th>Project Title</th>
<th>Funding Amount for Current Year</th>
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<td><strong>OPERATING:</strong></td>
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<td>Natural Sciences and Engineering Research Council of Canada</td>
<td>M. Aliani</td>
<td>Elucidating the role of low molecular weight peptides (&lt; 1 KDa) as Maillard reactant flavour precursors in selected cooked white and red meats using a flavouromics approach</td>
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<td>Manitoba Agri-Health Research Network</td>
<td>M. Aliani, C. Taylor &amp; P. Zahradka</td>
<td>Urinary and plasma metabolomics studies of fully characterized Saskatoon berry powder (SBP) fortified yogurt in healthy individuals</td>
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<td>Flavour Analysis of Packaged Meat</td>
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<td>Saskatchewan Pulse Growers</td>
<td>M. Aliani</td>
<td>Growing the Market for Pulse Flours: Creating Innovative Bakery Products and a Pulse Database for the Food Industry</td>
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<td>Description and intensity of the sensory attributes of beer made from Canadian malting barley varieties including AC Metcalfe</td>
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<td>M. Aliani, C. Taylor &amp; P.</td>
<td>Gas-Chromatography with Atmospheric Pressure Chemical</td>
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Zahradka Ionization interface (GC-APCI) for Flavouromics Research

**SALARY:**

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<td>NSERC USRA</td>
<td>Hannah Chan</td>
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**TOTAL FUNDING:** $479,855

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**Collaborative Activity**

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<td>Drs. C. Taylor and P. Zahradka</td>
<td>CCARM</td>
<td>Characterization of selected pulses, development of pulse-fortified food products, metabolomics investigation of biological fluids and tissues after consumption of these products in animal and human populations. Discovering new biomarkers of obesity in urine (a non-invasive tool to monitor the development of obesity, and nutrients and drugs affecting it)</td>
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<td>Drs. P. Shand and M. Nickerson</td>
<td>University of Saskatchewan</td>
<td>Micronization of lentil flours as binder to low fat beef burgers</td>
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<td>Dr. Rhonda Bell</td>
<td>University of Alberta</td>
<td>Substantiating a health claim for pulses (beans and peas) and cholesterol lowering</td>
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<td>Drs. D. Ramdath and T. Wolever</td>
<td>Agriculture and Agri-Food Canada &amp; University of Toronto</td>
<td>Post-prandial metabolomics studies of lentil varieties in healthy adults</td>
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<td>Dr. T. Netticadan</td>
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<td>Metabolomics studies of resveratrol in hypertensive rat models</td>
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<td>Dr. H. Blewett</td>
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<td>Dr. J. House</td>
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<td>Omega-3 Eggs</td>
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<td>Dr. M. Suh</td>
<td>Human Nutritional Sciences</td>
<td>Effect of egg-derived choline on brain development. Investigation of beta-carotene effects on retina function in rats</td>
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<td>Drs. D. Brown and C. Siow</td>
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<td>Drs. V. Dolinsky, G. Hatch, C. Doucette</td>
<td>The Children’s Hospital Research Institute of Manitoba (CHRIM)</td>
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<td>Dr. N. Ahmed</td>
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<td>Metabolic Signatures of Lung Cancer in Sputum and Exhaled Breath Condensate Detected by 1H Magnetic Resonance Spectroscopy</td>
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<td>Dr. Christina Kim</td>
<td>Internal Medicine</td>
<td>Pancreatic cancer</td>
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<td>Dr. Girgih Shah</td>
<td>University of Laval</td>
<td>Lung cell cultures treated with mustard extracts</td>
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<td>Dr. A. Ravendi</td>
<td>Institute of Cardiovascular Sciences</td>
<td>A common project to identify biomarkers of heart attack</td>
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<tr>
<td>Dr. A. Halayko</td>
<td>The Children’s Hospital Research Institute of Manitoba (CHRIM)</td>
<td>The effect of inhaled statin</td>
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Dr. B. Albensi  
Division of Neurodegenerative Disorders  
Alzheimer research

Dr. E. Khafipour  
Animal Science and Medical Microbiology  
The gut microbiome in several animal models

Warburtons Bread, Saskatchewan Pulse Growers and Canadian International Grains Institute (CIGI)  
Recent funding to collaborate with the largest bread industry in the United Kingdom and Canadian industry to incorporate pulses into daily breads.

Dr. L. Cooper  
University of Ohio  
Using our developed metabolomics technique to identify markers of aging in “Bats”.

Publications & Presentations

Peer-Reviewed Articles


Abstracts


Academic Teaching

Composition, Functional and Nutritional Properties of Foods, HNSC 2150, Human Nutritional Sciences
Sensory Evaluation of Foods, HNSC 4270, Human Nutritional Sciences
Food Product Development Food, FOOD 4510, Food Science

Training/Mentoring

Postdoctoral Fellows
Erin Goldberg

Graduate Students - PhD
Ala’a Eideh
Jennifer Grant (co-supervised with C. Taylor)
Ronak Fahmi

Graduate Students - MSc
Amalia Santiago (co-supervised with H. Blewett)
Le Wang (co-supervised with C. Taylor)
Ruiyin Zhou

Undergraduate Student
Hannah Chan

Technical Staff
Shiva Ievari-Shariati, Technician
Omkar Ijare, Research Associate
Donna Ryland, Technician

Students Graduated

Msc
Amalia Santiago (co-supervised with H. Blewett)
Le Wang (co-supervised with C. Taylor)
Ruiyin Zhou
Service

Graduate Student Committees

PhD
Jaime Clark, Human Nutritional Sciences
Cara Isaak, Physiology and Pathophysiology
Ifeanyi Nwachukwu, Human Nutritional Sciences
Ethendhar Rajendiran, Human Nutritional Sciences
Fatemeh Ramezani Kapourchali, Human Nutritional Sciences
Victoria Sid, Physiology and Pathophysiology
Aleksandra Stamenkovich, Physiology and Pathophysiology

MSc
Olena Kloss, Human Nutritional Sciences
Michelle Leaf, Human Nutritional Sciences
Tara Loader, Human Nutritional Sciences
Mark Pinder, Human Nutritional Sciences
Umar Rassoul, Animal Sciences
Japandeep Sethi, Physiology and Pathophysiology
Jennifer Vencuran, Human Nutritional Sciences

Professional Service
External Reviewer, NSERC Discovery Grants
Member, Institute of Food Technology (IFT)
Member, Metabolomics Society
Member, Analytical Chemistry
A significant interest of the lab is novel signaling mechanisms that underlie cardiac hypertrophy. One important example is our focus on the endocannabinoid system as a therapeutic target to achieve protection of the heart after hemodynamic stress or injury. This CIHR-funded project constituted the thesis work of Yan Lu, a recent Ph.D. student in the laboratory. Yan discovered that activating cannabinoid receptors results in stimulation of signalling pathways that prevent abnormal growth of the heart. Moreover, the activated endocannabinoid system leads to protection of mitochondria in heart muscle cells. The mitochondria are responsible for generating energy; since heart muscle cells contract and relax constantly (and this requires a continuous supply of energy), mitochondria are very important. Yan’s data will be published soon, and Yan was awarded her PhD from the University of Manitoba in October, 2016. Also, Yan submitted a review on cannabinoid signaling in health and disease to the Canadian Journal of Physiology and Pharmacology. We are excited about this work and will now focus our efforts on translating our findings to a novel pharmacological approach to the treatment of heart disease. To do this, we need to address the problem of cannabinoid receptors in the brain, which leads to undesirable side effects. Thus, we are aggressively pursuing funding to continue this work by pursuing strategies (i.e. targeted drug design) to limit activation to cannabinoid receptors in the heart (and not the brain).

The role of resistance arteries in hypertension is another important focus of the lab. Blood pressure is influenced by peripheral resistance to blood flow, and resistance increases as the arterial lumen diameter narrows (whether by structural, functional, and/or mechanical mechanisms). An important therapeutic aim, for which we are testing nutritional interventions, is to prevent this narrowing. In past years, we reported the microvascular (and cardiac) effects of resveratrol. Resveratol is a stilbenoid polyphenol that became popular after putative links to benefits such as increased longevity. There is, in fact, a significant body of evidence that resveratrol might be protective in the context of cardiovascular disease. However, resveratrol exhibits low oral bioavailability and a short half-life. Thus, we recently completed a study investigating stilbenoid compounds with improved bioavailability (i.e. pterostilbene, a dimethylated analog of resveratrol) or a history of medicinal use (i.e. gnetol). We determined that pterostilbene and gnetol indeed exhibit protective effects on arteries and the heart in the spontaneously hypertensive heart failure (SHHF) rat, an experimental model of human hypertension and heart disease. Crystal Acosta (PhD student) and Danielle Lee (MSc student) found stilbenoid-dependent improvement of brain and peripheral arteries, respectively, and Bolanle Akinwumi (with Pema Raj – Netticadan lab), detected improved heart structure and function. Interestingly, some of the signalling pathways differ from those induced by resveratrol and from those detected in the spontaneously hypertensive rat (SHR), which models hypertension but
not heart failure. These findings were presented locally, nationally, and internationally at the Therapeutic Applications of Functional Foods and Bioactives Conference (Winnipeg), Natural Health Product Research Society of Canada Annual Conference (Charlottetown), Canadian Society for Pharmaceutical Sciences (CSPS) Annual Symposium (Vancouver), and the Annual Meeting of the Society for Neuroscience (San Diego). In fact, Danielle received the 2016 Antoine A. Noujain Award of Excellence for best poster presentation at the CSPS conference. Finally, two scientific manuscripts were submitted to the journal *Molecules* for publication.

Bolanle is now interrogating further the signaling mediators involved; her data suggest that a signalling mediator recently discovered as a player in hypertrophy might be a stilbenoid target.

Our newest project is predicated on our hypothesis that aberrations of brain-penetrating arterioles contribute to cerebral vascular insufficiency in the context of cardiovascular disease, and that this potentiates the risk of cognitive decline and dementia during heart failure. Crystal Acosta (PhD student) is characterizing these aberrations using a combination of pressure myography and multi-photon laser scanning microscopy in isolated arteries and brain slices. She is also exposing co-cultured cerebral and vascular cells to mechanical strain and assessing signaling effectors by biochemical assays. Crystal is progressing well through her PhD program; in 2016, she successfully completed her coursework, candidacy exam, and thesis proposal, and will now have the opportunity to focus her attention solely on her experiments.
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<td><strong>OPERATING:</strong></td>
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<td>Canadian Institutes of Health Research</td>
<td>H. Anderson</td>
<td>Protective mechanisms of endocannabinoids in cardiac hypertrophy</td>
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<td>Research Manitoba</td>
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<td>GETS</td>
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## Collaborative Activity

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<td>Chris Anderson</td>
<td>University of Manitoba</td>
<td>Aberrant neurovascular coupling during hypertension</td>
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<td>Paul Fernyhough</td>
<td>University of Manitoba</td>
<td>Effects of cannabinoid receptor antagonism on cardiac myocyte mitochondrial bioenergetics cardiac myocyte mitochondrial bioenergetics</td>
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<td>Neal Davies</td>
<td>University of Manitoba</td>
<td>Cardioprotective actions of stilbenoid polyphenols</td>
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<tr>
<td>Michel Aliani</td>
<td>University of Manitoba</td>
<td>Metabolomic profiling of stilbenoid polyphenols in SD and SHHF rats</td>
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<tr>
<td>Thomas Netticadan</td>
<td>CCARM</td>
<td>Cardioprotective actions of stilbenoid polyphenols</td>
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Luiz Romeiro/Carolyn Cummins  
Universidade de Brasília/University of Toronto  
Cardiovascular effects of cashew nut shell extracted compounds

Shawn Owen/Casey Sayre  
University of Utah/Roseman University  
Novel strategies to circumvent anti-HER2-induced cardiotoxicity

**Publications & Presentations**

**Peer-Reviewed Articles**


**Abstracts**


Invited Presentations
“Cardioprotection – might cannabinoid receptor activation be a novel therapeutic approach?”, College of Pharmacy, University of Utah, Salt Lake City.

“Cardioprotective effects of cannabinoid receptor signaling in cardiac myocytes”, Department of Physiology and Pathophysicsiology, University of Manitoba, Winnipeg.

Academic Teaching
Natural Products, PHRM 3430, College of Pharmacy
Pharmacy Seminar I, PHRM 7160, College of Pharmacy
Pharmacy Seminar II, PHRM 7170, College of Pharmacy
Drugs in Human Disease II, PHAC 4040, Pharmacology & Therapeutics

Training/Mentoring
Graduate Students - PhD
Crystal Acosta
Bolanle Akinwumi
Yan Lu

Graduate Students - MSc
Danielle Lee

Students Graduated
PhD
Yan Lu

Honours, Awards, Scholarships
Danielle Lee – Antoine A. Noujaim Award of Excellence for Best Poster Presentation, Canadian Society for Pharmaceutical Sciences

Danielle Lee (left) receiving her award
Service

Graduate Student Committees

PhD
Jaime Clark, Human Nutritional Sciences
Mihir Parikh, Physiology and Pathophysiology
Maryam Samsamikor, Food Science

MSc
Yongbo She, Food Science

Academic Committees and Related Administrative Duties
Member – Graduate Studies Sub-Committee of the University of Manitoba Strategic Enrolment Management Planning Committee
Member – Ad Hoc Review Committee to review the Asper Institute for Leadership Development proposal (associated with Senate Committee on Academic Review)
Mentor – University of Manitoba, Teaching and Learning Certificate Program
Nominated/Elected Member – Advisory Committee to the University of Manitoba President for the search for the position of Dean, College of Pharmacy
Member – University of Manitoba, Faculty of Health Sciences Research Advisory Committee
Member – University of Manitoba, Faculty of Health Sciences Graduate Studies Committee
Member – University of Manitoba Senate Committee on Academic Review
Member – Appeals Committee, Faculty of Graduate Studies
Member – University of Manitoba Internal Grants Peer Review Committee
Member – Program Evaluation Committee, College of Pharmacy
Member – Faculty Council, Faculty of Graduate Studies
Chair – Graduate Studies Committee, College of Pharmacy
Member – Executive Committee, Faculty of Graduate Studies
Member – College of Pharmacy Curriculum Program Subcommittee (Clinical and Applied Sciences Stream)
Member – University of Manitoba College of Pharmacy Tenure Committee
Poster Judge - Canadian Student Health Research Forum - Manitoba Student Research Poster Competition

Professional Service
Peer Review – Internal Review Committee Member for Canadian Institutes of Health Research Project Grants Stage 1 & Canadian Institutes of Health Research Doctoral Awards
Member – Children’s Hospital Research Institute of Manitoba Operating Grants Review Committee
Reviewer - miscellaneous journals
Bioactive lipids in health and disease
Our laboratory examines the roles of bioactive lipids in normal and diseased tissues and cells. In particular, we study bioactive metabolites of fatty acids called oxylipins. Prostanoids are one class of oxylipins that are blocked by common drugs such as aspirin. Using a targeted lipidomics approach, our current work is demonstrating that dietary interventions (such as with flax oil, fish oil and soy protein) alter the levels these bioactive compounds. This analysis has led to the discovery of novel compounds in response to dietary interventions (e.g. unique oxylipins produced from dietary flax and canola oil feeding) and unique oxylipin patterns in aging and in several types of disorders (e.g. kidney disease, peripheral artery disease, hypertension), in response to diet (e.g. dietary lipid and protein), as well as in cultured cells (e.g. brain endothelial cells). This work also illustrates that fatty acid composition does not necessarily reflect bioactive lipid levels. This has implications for dietary recommendations for fatty acids because they have often been based on fatty acid composition without knowledge of these bioactive lipids.

Dietary interventions in early kidney disease
The laboratory also examines the roles of dietary interventions in the early progression of kidney disease. This includes nutritional, functional food and pharmacological interventions in several types of kidney disease, including polycystic kidney disease (using conditional knockout models), obesity related renal disorders and pediatric forms of renal cyst disease. These studies are being carried out in collaboration with investigators at Fujita Health University in Japan.

High protein diets in obesity and normal weight
Our work on the effects of dietary proteins on normal kidney physiology has implications for the dietary recommendations for dietary protein. Findings in both rat and pig models suggest that, despite the potential benefit of high protein diets on body composition, long-term intakes of protein at the upper limit of the dietary recommendations may compromise renal health. We have also found that high dietary protein ameliorates insulin resistance and hepatic steatosis independent of its effect of reducing obesity, but that the effect of high protein diets on these metabolic syndrome parameters depends on the protein source in the high protein diet.

Jessay Devassy (PhD) and Shan Leng (MSc) graduated. Jessay’s work involved examination of the effects of diet on various forms of cystic renal disease and the effects of diet and disease on oxylipins in diseased kidneys and livers. Shan’s work involved a comprehensive oxylipin analysis of normal rat tissues provided differing dietary fats. Both presented at Experimental Biology 2016 and both won awards in the ASN Emerging Leaders in Nutrition Science Poster Competition.
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<td>Canadian Institutes of Health Research</td>
<td>H. Aukema, P. Zahradka &amp; C. Taylor</td>
<td>Effects of dietary essential fatty acids on octadecanoid production and biological actions in obesity-induced inflammation: Implications for dietary requirements</td>
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<td>Effects of diet on oxylipins</td>
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<td>Canada-Manitoba Agri-Food Research and Development Initiative</td>
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<td>Effect of dietary flaxseed on alpha-linolenic acid (ALA) metabolism</td>
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<td>Canada Foundation for Innovation</td>
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<td>Canada-Manitoba Agri-Food Research and Development Initiative</td>
<td>H. Aukema</td>
<td>Effects of dietary flaxseed protein in kidney disease</td>
<td>$28,990</td>
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<td>Children’s Hospital Research Institute of Manitoba</td>
<td>H. Aukema</td>
<td>Identification of a modifier locus for cystic kidney disease in the rat</td>
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**Collaborative Activity**

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<td>Shizuko Nagao</td>
<td>Fujita Health University</td>
<td>Models of polycystic kidney disease</td>
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<td>Matt Picklo</td>
<td>Grand Forks Human Nutrition Research Centre</td>
<td>Dietary studies in experimental models</td>
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<tr>
<td>Jing Zhou</td>
<td>Harvard University</td>
<td>Knockout models of polycystic kidney disease</td>
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**Publications & Presentations**

**Peer-Reviewed Articles**


Abstracts


Leng S & Aukema HM (2016) Dietary linoleic acid (LA) increases linoleic and arachidonic acid (ARA) derived bioactive lipids, despite not altering tissue fatty acid levels. Northern Great Plains Lipids Conference, Grand Forks. [oral presentation]


Leng S & Aukema HM (2016) Dietary α-linolenic acid (ALA) is sufficiently converted to docosahexaenoic acid (DHA) to increase bioactive lipids derived from DHA. Therapeutic Applications of Functional Foods and Bioactives Conference, Winnipeg.


Leng S & Aukema HM (2016) Dietary linoleic acid (LA) increases linoleic and arachidonic acid (ARA) derived bioactive lipids, despite not altering tissue fatty acid levels. Experimental Biology Meeting, Abstract 130.7, San Diego. [Oral presentation and *ASN Emerging Leaders in Nutrition Science Poster Competition award winner].


Leng S & Aukema HM (2016) Dietary α-linolenic acid (ALA) is sufficiently converted to docosahexaenoic acid (DHA) to increase bioactive lipids derived from DHA. Experimental Biology Meeting, Abstract 1163.23, San Diego.


**Invited Presentations**

“Oxygenated bioactive lipids derived from fatty acids: Composition data reveals novel effects of dietary fatty acids”, American Oil Chemists’ Annual Meeting, Salt Lake City.

“Omega-3 interventions and their effects on bioactive lipids”, Therapeutic Applications of Functional Foods and Bioactives, Winnipeg.

“Dietary fat effects from a bioactive lipids point of view”, Faculty of Agriculture and Food Sciences, University of Manitoba, Winnipeg.

**Academic Teaching**

Graduate Seminar, HNSC 7200, Human Nutritional Sciences
Basic Principles of Human Nutrition, HNSC 2140, Human Nutritional Sciences
Vitamins and Minerals in Human Health, HNSC 3300, Human Nutritional Sciences

**Training/Mentoring**

**Post-doctoral Fellows**
Samantha Pauls (co-supervised with P. Zahradka and C. Taylor)

**Graduate Students – PhD**
Jessay Devassy
Adriana Mudryj (co-supervised with N. Yu)

**Graduate Students – MSc**
Md Ariful Islam
Afroza Ferdouse
Melissa Gabbs
Shan Leng
Md Monirujjaman

**Undergraduate Students**
Lucien Cayer
Anne Medonca, Science Without Borders student
Chelsea Penner
Nikhil Sidhu

**Technical Staff**
Tanja Winter, Technician
Students Graduated

PhD
Jessay Devassy

MSc
Shan Leng

Honours, Awards, Scholarships

Jessay Devassy – Bronze Medal in ASN Emerging Leaders in Nutrition Sciences Poster Competition, Experimental Biology

Shan Leng – ASN Emerging Leaders in Nutrition Science Poster Competition Award Winner, Experimental Biology

Md Monirujjaman – 2\textsuperscript{nd} prize, oral poster presentation at the 5th Functional Foods and Nutraceuticals Graduate Research Symposium

Md Monirujjaman – University of Manitoba Faculty of Graduate Studies Travel Award

Md Monirujjaman – University of Manitoba Graduate Student Association Travel Award

Service

Graduate Student Committees

PhD
Youjia Du, Physiology and Pathophysiology
Zahra Solati, Physiology and Pathophysiology

MSc
Alie Johnston, Human Nutritional Sciences
Qian Li, Pathology

Professional Service
CIHR College of Reviewers
Lipids, Associate Editor
Applied Physiology, Nutrition and Metabolism, Associate Editor
External reviewer, NSERC grant
Ad hoc reviewer for Journal of Agricultural and Food Chemistry, Molecular Nutrition and Food Research, Lipids, Prostaglandins and Other Lipid Mediators, Journal of Lipid Research, Applied Physiology Nutrition and Metabolism
Organizing committee, Northern Great Plains Lipids Conference
Pre-review of 2 NSERC grants
Outreach Activity
Poster judge for Child Health Research Day
External examiner of PhD thesis of Kristin Marks, University of Waterloo
Presentations to PSYC 4520 class on animal ethics at the University of Manitoba
Faculty mentor for CNS-SCN University Student Representative Initiative
Board member for CanU, a Winnipeg-based charity that runs an after-school program for children from priority schools in Winnipeg and surrounding areas
Dr. Heather Blewett
Nutritional Immunology Laboratory

As an AAFC scientist working at CCARM, my research program is focused on investigating the health benefits of Canadian crops. I have several projects currently underway aimed at filling the gaps in the scientific literature that are necessary to substantiate the following food health claims for the following crops:

- Lower blood sugar rise after a meal: peas, barley, Saskatoon berry
- Satiety (ie. feeling fuller for longer): peas, barley
- LDL-cholesterol lowering: flax

I am a team member of the Manitoba Personalized Lifestyle Research (TMPLR) project, whose overall objective is to bring together an interdisciplinary team to implement a cross-sectional study to identify the complex interactions that exist between lifestyle, genetics, and gut microbiota and explore how these relate to risk factors for chronic conditions in Manitoba. My focus is on immune function and how its dysregulation is related to lifestyle factors, genetics and gut microbiota.

I also have projects that are investigating the effect of polyphenols on immune function. Polyphenols are antioxidants found in foods like berries that give them their distinctive color. A type of immune cell called a T-lymphocyte has been implicated in the etiology of hypertension and tissue damage caused by a heart attack, so we are exploring whether polyphenols extracted from berries can restore appropriate T-lymphocyte responses. These projects have been done in collaboration with Dr. Thomas Netticadan.

I also have collaborations with Dr. Michel Aliani who has been doing “metabolomics” on the samples collected in the flax and pea clinical trials. Through this collaboration, we are able to not only track bioactives from food into the blood and urine of participants in our trials, but also the metabolites of these bioactives and link them to the specific health benefits we are studying. This gives us a better understanding of how bioactives in foods are metabolized in our bodies resulting in better health.

I was on maternity leave until March 2016. The bulk of our research time in 2016 was spent recruiting for and executing a study on the effect of peas on blood sugar levels after a meal. It has 2 arms (arm 1 rice; arm 2 potato). We are exploring how replacing part of the starch (rice/potato) in a meal with different varieties of peas will affect a person’s glycemic response. The first participant started on Oct 22, 2015, the first arm was completed on Dec 2/16 and the second arm will be completed in May 2017.

Amalia Santiago defended her MSc from the Department of Human Nutritional Sciences on March 9, 2016 (co-supervised with Michel Aliani). The title of her thesis is: Effect of
milled flaxseed and storage conditions on sensory properties and selected bioactive compounds in banana and cinnamon muffins used in a clinical trial.

### Research Funding

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<tr>
<th>Name of Granting Agency</th>
<th>Names of Investigators</th>
<th>Project Title</th>
<th>Funding Amount for Current Year</th>
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<tr>
<td>Agriculture and Agri-Food Canada</td>
<td>D. Brown et al.</td>
<td>Characterization of Heritage Ginseng</td>
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<td>Agriculture and Agri-Food Canada</td>
<td>D. Ramdath, H.J. Blewett, S. Tosh, Q. Liu, R. Cao, M. Aliani, &amp; A. Duncan</td>
<td>Blood glucose attenuation and satiety levels in humans following consumption of whole lentil and yellow pea and their food products; effect of processing and starch fractions.</td>
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**TOTAL FUNDING:** $439,179
## Collaborative Activity

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<td>Peter Jones, Meghan Azad, Peter Eck, Sharon Bruce, Jared Carlberg, Amir Ravandi, Ehsan Khafipour, Todd Duhamel, Navdeep Tangri, Semone Myrie, Lisa Lix, Diana McMillan, Kristy Wittmeier</td>
<td>University of Manitoba</td>
<td>The Manitoba Personalized Lifestyle Research (TMPLR) Program</td>
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<tr>
<td>Dan Ramdath</td>
<td>AAFC, Guleph</td>
<td>Blood glucose attenuation and satiety levels in humans following consumption of yellow pea and their food products; effect of processing and starch fractions</td>
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<td>Nancy Ames</td>
<td>AAFC, RCFFN</td>
<td>Development of high beta-glucan barley waffles and clinical trial testing of its effect on postprandial glucose and appetite control</td>
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<td>Sora Ludwig</td>
<td>St. Boniface Hospital</td>
<td>Barley and pea postprandial glucose response trials</td>
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## Publications & Presentations

### Abstracts


### Invited Presentations

“The reduced proportion of new splenic T-cells in the zinc-deficient growing rat is not due to increased susceptibility to apoptosis”, Department of Immunology, University of Manitoba, Winnipeg.
Training/Mentoring

Graduate Student - PhD
Basma Aloud (co-supervised with T. Netticadan)

Graduate Student - MSc
Amalia Santiago (co-supervised with M. Aliani)

Technicians
Sasanda Nilmalgoda, Technician
Danielle Perera, Technician
Jay Petkau, Technician
Heidi Pylypjuk, Technician
Li Ren, Technician

Students Graduated

MSc
Amalia Santiago (co-supervised with M. Aliani)

Service

Graduate Student Committees

PhD
Ala’a Eideh, Human Nutritional Sciences
Gerado Medina, Human Nutritional Sciences
Veronika Shulgina, Human Nutritional Sciences

MSc
Adrianne Cardillo, Human Nutritional Sciences
Danielle Lee, Pharmacy

Academic Committees and Related Administrative Duties
Member of the SBGH-Research General Safety and Bio-Safety Sub-Committee

Member of AAFC’s Human Research Ethics Committee

Adjunct Professor in the Departments of Physiology & Pathophysiology and Human Nutritional Sciences

Professional Service
Associate Editor for the Journal of Applied Physiology, Nutrition, and Metabolism.
Outreach Activity


Interview on CTV morning live describing the Human Nutrition & Immunology program at St. Boniface Hospital (2016/06/24)

Representative at the CCARM booth at Agriculture in the City (2016/03)

Presented a lecture about my research program to high school students who were selected to participate in the Grade 11 Leadership in Biomedical Science at the Youth BioLab at the St. Boniface Research Centre. I also gave the students a tour of the 3rd floor of the I. H. Asper Institute. (2016/11/24)

Presented a lecture about designing clinical experiments to EDUB 4140 students to help them think about how to get kids involved in the inquiry process (2016/10/20)

Presented a lecture about my research program for Take Your Kid to Work Day (2016/11/02)
Dr. Brown retired in May of 2016, thus the laboratory has been busy wrapping up activities and transferring the research projects to other investigators.

Drs. Brown and Chris Siow have been co-supervising Aakangchhya Bhusal and she successfully defended her Msc thesis “A comparative study of the antioxidant potential and metabolic profiling of lingonberry (Vaccinium vitis idaea) from Northern Manitoba and Newfoundland” on March 9. The focus of her project was the comparison of Northern Manitoba-grown lingonberry fruit and Newfoundland greenhouse-grown fruit. The Northern Manitoba fruit was shown to have extremely high anti-oxidant levels. In cooperation with Dr. Michel Aliani’s laboratory, a metabolomics screen yielded some 4000 separate compounds. Dr. Chris Siow will continue leading the research on lingonberries and further investigate the health benefits.

Work on evaluating compositional and bioactivity variation in North American Ginseng (Panax quinquefolius) continued this past year. A collaborative study with Drs. Thomas Netticadan, Chris Siow and Heather Blewett has been investigating the total phenolics of ginseng berry pulp extracts and protection against ischemia/reperfusion injury. Ginseng berries for these studies were provided by C and R Atkinson Farms of St Williams, Ontario. The research on North American Ginseng will be completed by the rest of the AAFC scientists at CCARM.
## Funding

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<td>Agriculture and Agri-Food Canada</td>
<td>C. Siow, D. Brown &amp; S. Debnath</td>
<td>Canadian Lingonberry: Health Attributes</td>
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## Collaborative Activity

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<tr>
<td>Ed Lui</td>
<td>University of Western Ontario</td>
<td>Immune regulation / Characterization of Heritage Ginseng</td>
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<tr>
<td>Carl Atkinson</td>
<td>Atkinson Farms</td>
<td>Field study, ginseng clonal lines</td>
</tr>
<tr>
<td>Dr. Aiming Wang</td>
<td>London Research and Development Centre, Agriculture and Agri-Food Canada</td>
<td>Virus infection in <em>Prunus</em> sp.</td>
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</table>


**Publications**

**Peer-Reviewed Articles**

**Abstracts**


**Training/Mentoring**

**Graduate Student - MSc**
Aakangchhya Bhusal (co-supervised with C. Siow)

**Technical Staff**
Jo-Ann Stebbing, Technician

**Students Graduated**

**MSc**
Aakangchhya Bhusal (co-supervised with C. Siow)
Service

Member, St. Boniface Hospital Research Enterprise Committee
Member, CCARM Program Committee
Co-Chair, St. Boniface Hospital Research Centre, Safety Committee
Member, St. Boniface Hospital Research Centre, Support Committee
Director, Manitoba Agri-Health Research Network
Director, CCARM
Co-chair with Dr. Thomas Netticadan of the Therapeutic Applications of Functional Foods and Bioactives (TAFFB) Conference

Aakangchhya Bhusal, MSc, at Convocation
Dr. Randolph Guzman
Vascular Surgery Research
Professor of Surgery and Head, Section of Vascular Surgery
University of Manitoba
Regional Lead, Section of Vascular Surgery, WRHA
Site Medical Manager, Department of Surgery
St. Boniface Hospital

Dr. Randolph Guzman, MD is the Director of the Vascular Clinical Research Program at the Asper Clinical Research Institute, St. Boniface Hospital which consists of a full time Clinical Research Nurse/Coordinator and two part-time Research Assistants. His experience has included various clinical research trials with the vascular/vascular surgery population including outpatient and inpatient pharmaceutical trials, surgical and endovascular interventions and diagnostic imaging on a local, national, and international level. Dr. Guzman has been a principal investigator for 42 research studies and a co-investigator for 25 research studies. Currently, there are six clinical trials and two research projects ongoing.

For more information, see his webpage: http://www.sbrc.ca/ccarm/faculty/dr-randy-guzman/

Publications & Presentations

Peer-Reviewed Articles


Abstracts
Dr. Mohammed Moghadasian  
Pathology Research Laboratory

The Pathology Research Laboratory continues to carry out a series of animal studies to establish metabolic benefits of several functional foods and nutraceuticals. In particular, we started an investigation of metabolic benefits of okra through collaboration with Ibadan University, Nigeria. We obtained a university research grant to continue our investigation on okra. We will continue applying for funding from various sources to maintain our research activities on the functional foods and nutraceuticals. We will continue and expand our local, national and international collaboration.

In 2016, we were able to establish anti-atherogenic effects of corn fractions; this work was accepted for publication in Nutrition Research as listed below. This research project was a collaborative work with Dr. Trust Beta, Professor, Food Science, University of Manitoba to investigate the cardiovascular benefits of 3 corn fractions, namely aleurone, germ and endosperm. These fractions were incorporated into experimental diets. We fed 3 groups of experimental mice with these diets for 16 weeks. Through this project, we investigated cardiovascular health benefits of individual corn fractions through assessments of antioxidant biomarkers, lipid profiling, integrity of vascular wall by morphological and morphometrical examinations of the aortic roots. We observed that dietary consumption of these fractions in experimental mice were associated with beneficial changes in lipoprotein profiles, however, the impact on endogenous antioxidant system and prevention of atherosclerosis were not comparable among the 3 groups mice fed the fractions.

We also carried out another research project in collaboration with Dr. Garry Shen, Professor of Internal Medicine and Physiology and Pathophysiology, University of Manitoba, on the cardiovascular health benefits of germinated Chinese brown rice. Germinated Chinese brown rice was provided by Dr. Shen’s collaborator from China. The rice samples were ground and incorporated in the mouse chow. Using our well established hypercholesterolemic mouse model, we were able to demonstrate to some degree anti-atherogenic effects of germinated brown rice as compared to conventional white rice. Further investigation revealed that the anti-atherogenic effect of germinated brown rice is most likely mediated through inhibition of monocyte adhesion to the endothelium.

In 2016, Kabo Masisi (co-supervised with Dr. Trust Beta, Food Science) completed his PhD program; his thesis was entitled “Antioxidant Potential of Specific Cereal Grain Fractions: In Vitro and In Vivo Studies.” His studies resulted in publication of several scientific papers, as well as abstracts. During his PhD program, he received the CCARM BMO Graduate Student Scholarship plus other awards and recognitions.
In 2016, Nora Ghazzawi (co-supervised with Dr. Garry Shen, Internal Medicine) completed her research work and presented her studies at a couple of conferences, including the 2016 Canadian Nutrition Society Meeting in Ottawa. Her MSc thesis is entitled “Beneficial Effects of Germinated Brown Rice on Cardiovascular Risk Factors in LDL Receptor Knockout Mice.”

In 2016, 2 new MSc students (Ms. Rokiatou Kone Berethe and Ms. Hibah Khawar) started their programs in the lab in the fall of 2016 by taking required courses.

Recently, we have started a new exciting collaborative project with Botswana University of Agriculture & Natural Resources to investigate the impact of consumption of native African seeds on the cardiovascular system in experimental mice. Detailed information will be available soon.
## Research Funding

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<tr>
<th>Name of Granting Agency</th>
<th>Names of Investigators</th>
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<td>M. Moghadasian</td>
<td>Anti-atherogenic effects of Okra</td>
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<td>Huazhong Agricultural University, China</td>
<td>M. Moghadasian &amp; L. Chan</td>
<td>Seabuckthorn lipid profile</td>
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<td>Anti-atherogenic effects of germinated brown rice</td>
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<tr>
<td>Garry Shen</td>
<td>University of Manitoba</td>
<td>Anti-diabetic effects of Saskatoon berry</td>
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<td>Anti-atherogenic effects of germinated brown rice</td>
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<td>Trust Beta</td>
<td>University of Manitoba</td>
<td>Anti-atherogenic effects of various grain fractions</td>
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<td>Rita Rezzani</td>
<td>University of Brescia, Italy</td>
<td>Anti-aging effects of melatonin</td>
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Khuong Le
Publications & Presentations

**Peer-Reviewed Articles**


**Books & Chapters**

**Abstracts**


Invited presentations

“Cardiovascular benefits of plant sterols”, Therapeutic Applications of Functional Foods and Bioactives Conference, Winnipeg.

“Research goals, activities and achievements”, From Idea to Wealth Conference, Isfahan (Iran) (video presentation)

Academic Teaching

Functional Foods and Nutraceuticals, HNSC/FOOD 4540, Human Nutritional Sciences and Food Science
Nutrition for Health and Changing Lifestyles, HNSC 1210, Human Nutritional Sciences
Nutrition Through the Life Cycle, HNSC 2130, Human Nutritional Sciences
Lipid Nutrition and Metabolism, HNSC 4540, Human Nutritional Sciences

Training/Mentoring

Graduate Student - PhD
Adewale Esan (visiting student) Kobo Masisi (co-supervised with Trust Beta)

Graduate Students – MSc
Nora Ghazzawi (co-supervised with Garry Shen) Rokiatou Kone Berethe
Hibah Khawar

Technical Staff
Khuong Le, Technician

Students Graduated

PhD
Kobo Masisi (co-supervised with Trust Beta)
Honours, Awards, Scholarships

Kabo Masisi – Finalist, Nestle Nutrition Student and Trainee Oral Competition & Recipient, Christine Gagnon Travel Award, Canadian Nutrition Society Annual Conference, Gatineau

Service

Graduate Student Committees

MSc
Afroza Ferdouse, Human Nutritional Sciences
Anthonia Olatinsu, Human Nutritional Sciences
Hui Xu, Human Nutritional Sciences

Chairperson for Thesis Defense
Ronak Fahmi, Human Nutritional Sciences
Maria Morales, Human Nutritional Sciences
Linda Siemens, Human Nutritional Sciences

Academic Committees and Related Administrative Duties
Chair, Graduate Committee, Human Nutritional Sciences, University of Manitoba
Reviewer, James Gordon Fletcher PhD Fellowship for Research in Functional Foods and Nutraceuticals, Faculty of Graduate Studies, University of Manitoba
Judge, HNS Functional Foods and Natural Health Products Symposium, Human Nutritional Sciences, University of Manitoba

Professional Service
Health Canada, Member of Canadian Nutrition Society Expert Working Group for consultation to Health Canada on Trans Fats

Editorial Board member for the following journals:
- Molecular and Cellular Biochemistry
- Transplant Research and Risk Management
- World Journal of Clinical Cases

Reviewer, for various journals
In 2016, the laboratory worked on 4 projects focused on exploring the cardioprotective properties of polyphenols, a family of bioactive compounds.

(1) We examined the in vivo cardioprotective effects of a dark fruit/vegetable/grain polyphenol, cyanidin glucoside, in the left anterior coronary artery ligated rat, an animal model of ischemic heart disease. Heart structure and function in the animal model was examined by echocardiography. The molecular mechanisms underlying the effects of cyanidin glucoside were examined by biochemical analysis in heart tissues.

(2) We studied the in vitro effects of an oat polyphenol, avenanthramide, in adult rat cardiomyocytes exposed to endothelin, an in vitro cell culture model of heart disease. The molecular mechanisms underlying the effects of avenanthramide were examined by biochemical analysis.

(3) We examined the in vivo cardioprotective effects of ginseng polyphenols in the left anterior coronary artery ligated rat. Heart structure and function was examined by echocardiography.

(4) We collaborated with Dr. Hope Anderson on her project examining the in vivo comparative effects of polyphenols belonging to the stilbene class - resveratrol, pterostilbene and gnetol, in the spontaneously hypertensive heart failure rat, an animal model of hypertension and heart failure. Heart structure and function was examined by echocardiography.

Therapeutic Advances in Functional Foods and Bioactives Conference:
In April 2016, Dr. Thomas Netticadan co-organized with Dr. Dan Brown the Therapeutic Applications of Functional Foods and Bioactives (TAFB) Conference in Winnipeg. The goal of this conference was to disseminate the latest information on health benefits of functional foods and food-derived bioactive compounds. The conference also celebrated 10 years of the development of functional foods/bioactives research at CCARM by showcasing research done by CCARM scientists.

Furthermore, The Functional Foods and Natural Health Products Graduate Research Symposium (FFNHP), organized by graduate students from the Department of Human Nutritional Sciences, University of Manitoba, collaborated with TAFB as a pre-conference event. The symposium was an opportunity for graduate students to showcase their research and achievements, and it provided them with the opportunity to network and engage in discussions with researchers and other students in their field.
Trainee Award:
PhD student Pema Raj (Supervisor Dr. Thomas Netticadan; Co-Supervisor Dr. Shelley Zeiroth) was the recipient of Research Manitoba Fellowship. He was also awarded the James Gordon Fletcher Fellowship for Research in Functional Foods and Nutraceuticals, which he declined.

Other News:
Prof. Ali Movahed from the Persian Gulf Tropic Medicine Center, Iran was a Visiting Scientist in our laboratory during October and November.

A new student Mihir Parikh (co-supervised with Dr. Grant Pierce) joined our group.

PhD student Basma Aloud (Supervisor Dr. Thomas Netticadan; Co-Supervisor Dr. Heather Blewett) had a baby boy named AbdurRahman.
## Research Funding

<table>
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<tr>
<th>Name of Granting Agency</th>
<th>Names of Investigators</th>
<th>Project Title</th>
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<td>T. Netticadan, N. Ames, S. Thandapilly, J. Mitchell Fetch</td>
<td>Oats and heart health</td>
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<td>The Conrad and Evelyn Wryzykowski Cardiovascular Research Opportunity, St. Boniface Hospital Foundation</td>
<td>J. Wigle &amp; T. Netticadan</td>
<td>Effects of Cyanidin 3-Glucoside on cardiovascular function in an experimental model of Myocardial Infarction: Role of Adiponectin</td>
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## Publications & Presentations

**Peer-Reviewed Articles**


**Invited Presentations**

“Cardioprotection with Polyphenols”, 7th Annual Conference of the American Council of Medicinally Active Plants, Lima.

“Resveratrol and cardioprotection – where are we now and where do we go from here?”, Therapeutic Advances in Functional Foods and Bioactives Conference, Winnipeg.

**Training/Mentoring**

**Graduate Students - PhD**

Basma Aloud (co-supervised with H. Blewett)  
Pema Raj

Mihir Parikh (co-supervised with G. Pierce)

**Volunteer Research Assistant**

Prasanga Ketawalamulla

**Technical Staff**

Gurman Grewal, Technician  
Liping Yu, Technician

**Honours, Awards, Scholarships**

Basma Aloud, Libyan Program for International Education Scholarship  
Pema Raj, Research Manitoba Fellowship
Service

Graduate Student Committees

PhD
Bolanle Akinwumi, Pharmacy
Shivika Gupta, Physiology and Pathophysiology
Raghu Nagalingam, Physiology and Pathophysiology

MSc
Danielle Lee, Pharmacy

Academic Committees and Related Administrative Duties
Chair, Local Animal User Committee, St. Boniface Hospital Research Centre

Professional Service
Co-organizer of the Therapeutic Advances in Functional Foods and Bioactives Conference in Winnipeg

Chair of the Food Bioactives and Health II session in the Therapeutic Advances in Functional Foods and Bioactives Conference in Winnipeg

Outreach Activity
Coordinator, CCARM Visiting Scientist Seminar Series
Appeared on CJOB
Volunteered for Agriculture in the City

Representation on behalf of CCARM
Gave and participated in tours of Agriculture and Agri-Food delegates visiting CCARM
Our current research mainly focuses on the molecular mechanisms of metabolic disorders (NAFLD, obesity, hyperhomocysteinemia), ischemia-reperfusion induced acute kidney injury (AKI, CKD) and health related benefits of agriculture products in humans and animals. Specifically, we investigate molecular mechanisms and cellular targets in multi-experimental models including (1) antioxidant properties using the in vitro and in vivo assays, (2) inflammatory responses by measuring biomarkers to detect inflammation in humans and livestock at the molecular, protein and gene levels, (3) regulation of lipid metabolism, and (4) functional evaluation including blood parameters, lipoprotein profile, enzyme activities, cardiovascular, liver and kidney functions. Understanding the molecular mechanisms that are responsible for abnormalities in blood vessels and multiple organs is important in developing effective strategies for treatment and prevention of metabolic, cardiovascular disease and renal dysfunction associated with a single or multiple risk factors i.e. hyperhomocysteinemia, obesity, dyslipidemia, fatty liver disease, kidney ischemia-reperfusion injury.

In the past year, one of our graduate students Peggy Wang received her PhD degree. Her thesis research was on the investigation of mechanisms responsible for increased oxidative stress and inflammation in kidney injury. We have discovered that ischemia-induced acute kidney injury (AKI) not only impairs kidney function but also causes oxidative stress and injury in the distant organs including liver and blood circulation (Shang et al. 2016). In another study, we have reported that chronic consumption of a diet rich in saturated fat induces fatty liver. We have found that one of the main compounds (tyrosol) in the Mediterranean diet is effective in attenuating oxidative stress in non-alcoholic fatty liver disease (NAFLD) (Sarna et al. 2016).
### Funding

<table>
<thead>
<tr>
<th>Name of Granting Agency</th>
<th>Names of Investigators</th>
<th>Project Title</th>
<th>Funding Amount for Current Year</th>
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<tr>
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<td>K. O</td>
<td>Regulation of cystathionine-beta-synthase (CBS) mediated hydrogen sulfide (H₂S) production and its biological function</td>
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<td>GETS</td>
<td>Yue (Yvette) Shang</td>
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<td>$10,500</td>
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<td><strong>TOTAL FUNDING:</strong></td>
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Back Row: Yvette Shang, Dr. Karmin O, Victoria Sid, Sirini Amarakoon
Front: Pengqi (Peggy) Wang
Publications & Presentations

Peer-Reviewed Articles


Abstracts


**Invited Presentations**


“Diet and nutritional modulation of cardiovascular disease and NAFLD”, Fudan Global Health Open Lecture, Fudan University, Shanghai.

“Dietary regulation of lipid metabolism and oxidative stress in NAFLD”, National University of Singapore, Singapore.


“Food: A key player in balancing health and disease”, Institute for Subtropical Agriculture, Chinese Academy of Sciences, Changsha (China).

**Academic Teaching**

Special Topics in Animal Nutrition – Nutritional Biochemistry & Metabolism, ANSC 7510, Animal Science
Advanced Animal Science Seminar, ANSC 7390, Animal Science
Cell Biology, IMED 7090, Physiology and Pathophysiology

**Training/Mentoring**

**Graduate Students** - PhD
Yvette Shang
Pengqi (Peggy) Wang

**Graduate Student** - MSc
Sirini Amarakoon

**Students Graduated**

PhD
Pengqi (Peggy) Wang
Service

Graduate Student Committees

**PhD**
Jessay Devassy, Human Nutritional Sciences
Yan Lu, Pharmacy
Gerado Medina, Human Nutritional Sciences

**MSc**
Ruiyin Zhou, Human Nutritional Sciences

**Academic Committees and Related Administrative Duties**
Department of Animal Science Graduate Studies Committee
Department Head Search Committee
Promotion Committee

**Professional Service**
Review Mitacs Accelerate research proposals
Review abstracts submitted to the Canadian Cardiovascular Congress
Review manuscripts for Canadian Journal of Physiology and Pharmacology
It is with some sadness and a great deal of happiness at the same time that our lab watches 2016 come to a close. Two outstanding PhD students have graduated and moved on which is the source of both the sadness and the happiness. Andrea Edel has been with our lab the better part of almost two decades as both a senior technician and a graduate student. Seeing her leave after her accomplishments in the lab and her friendship to all who came through our lab over these many years feels like a fabulous time has finally come to an end. Stephanie Caligiuri has not been with our lab quite as long but she too made an indelible impression on our research efforts and on everyone she came in contact with during her time with us. Andrea and Stephanie were two of the best graduate students we have had the pleasure of working with in our lab and we will miss them dearly. However, both have gone on to great appointments elsewhere and I have little doubt that they will make us all proud as their careers continue to develop over time. Our research efforts in 2016 were a reflection of their contributions in the lab. Five manuscripts were published in peer reviewed journals. Four were in the nutritional area, three were focused on flaxseed as a dietary intervention and one continued our long standing interest in nucleocytoplasmic trafficking. We now have obtained critical information on what flaxseed does to central blood pressure, what doses of flax are needed, what food choices containing flaxseed are best accepted by the public, where trans fats go in the body when they are ingested, and how the cell receives messages from the outside world to create adaptive changes necessary for life and growth. I am indebted to all of the staff and students involved in these publications and the collaborative colleagues who gave their time and expertise to make our science better. This year that includes Drs. Aliani, Ravandi, Aukema, Malcolmson and Guzman. I would also like to personally thank Dr. Pavel Dibrov for the continuing, quietly productive collaboration we have had in the area of antibiotic design and testing. A successful WCPT application was launched for a new antibiotic drug that we have been working on and it looks like this may yield exciting new directions for our labs in the years to come. All of this would not be possible without the dedicated service of our technicians, Thane and Alex, and our senior Research Associates, Elena and Kim. The additions of Aleksandra, Mihir and Jo-Anne to the mix have made us even better! And welcoming Thomas back from his medical school studies is always refreshing! Thank you to the Universities of Winnipeg and Manitoba, Agriculture and Agri-Food Canada, St Boniface Hospital and particularly the St Boniface Hospital Foundation for their help in providing us with the environment necessary to carry out this work. Thank you especially to Chuck LaFleche for his inspiring work as CEO of the Foundation! Your efforts allow us to advance health care research in Manitoba!
## Research Funding

<table>
<thead>
<tr>
<th>Name of Granting Agency</th>
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<td>Regulation of nuclear protein import in cardiovascular states</td>
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<td>Canadian Institutes of Health Research</td>
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<td>The anti-hypertensive action of dietary flaxseed in hypertensive patients</td>
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<td>University of South Queensland</td>
<td>Lindsay Brown</td>
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**TOTAL FUNDING:** $577,704
Publications & Presentations

Peer-Reviewed Articles


Invited Presentations
“What we know and what we need to know about dietary flaxseed and cardiovascular disease”, Therapeutic Advances in Functional Foods and Bioactives, Winnipeg.


“Addressing the problem of hypertension”, 3rd European Section Meeting of the International Academy of Cardiovascular Sciences, Marseille (France).

“Powerful results from a tightly controlled clinical trial using flaxseed in hypertensive patients”, 66th Meeting of the Flax Institute of the United States, Fargo.

“The unique technical challenges that natural health products pose as a therapeutic intervention in a clinical trial”, North American Section Meeting of the International Academy of Cardiovascular Sciences, Sherbrooke.


Food Matters Live, London (UK).
2016 Friesen International Prize Program Roundtable talk on “The Role of Early Career Scientists in Research Policy Development”, Royal Canadian Institute for the Advancement of Science Meeting in collaboration with the Canadian Science Policy Conference, Ottawa.

Meeting of the Board of Directors, Canadian Agri-Food Policy Institute, Winnipeg.

Keynote Speaker for the Prairie Grains Development Committee, Saskatoon.

Institute of Cardiovascular Sciences, St. Boniface Hospital Albrechtsen Research Centre, Winnipeg.

Faculty of Health Sciences, University of Manitoba Research Plan Refresh Workshop, Winnipeg.

Research Enterprise Committee of the Board of Directors, St. Boniface Hospital, Winnipeg.

**Academic Teaching**

Cardiovascular Physiology & Pathophysiology, PHGY 7254, Physiology & Pathophysiology

**Training/Mentoring**

**Graduate Students - PhD**
Stephanie Caligiuri
Andrea Edel
Mihir Parikh
Aleksandra Stamenkovic

**Graduate Students - MSc**
Thomas Hedley

**Technical Staff**
Alex Austria, Technician
Elena Dibrov, Research Associate
Jo-Anne Gilchrist, Research Associate
Thane Maddaford, Technician
Kimberley O’Hara, Research Associate

**Students Graduated**

**PhD**
Stephanie Caligiuri
Andrea Edel
Honours, Awards & Scholarships

Grant Pierce
Suresh K. Gupta Award for Excellence in Cardiovascular Sciences from the International Academy of Cardiovascular Sciences India Section, Anand, India

Makato Nagano Award for Distinguished Achievements in Cardiovascular Education from the European Section Meeting of the International Academy of Cardiovascular Sciences, Marseille, France

Research Canada Leadership Award

Stephanie Caligiuri
Manitoba Medical Service Foundation Poster Award at the Canadian Health Student Research Forum

Diagnostic Services Manitoba (Translation) Research Award for Outstanding Doctoral Research at the University of Manitoba

CIHR Postdoctoral Scholarship at Mount Sinai Hospital, New York, NY

Service

Graduate Student Committees

PhD
Crystal Acosta, Pharmacy
Pema Raj, Physiology and Pathophysiology
Victoria Sid, Physiology and Pathophysiology
Zahra Solati, Physiology and Pathophysiology

MSc
Tara Loader, Human Nutritional Sciences

Academic Committees and Related Administrative Duties
Member, Canadian Agri-Food Policy Institute Advisory Panel
Member, Integrated Risk Management Steering Team, St. Boniface Hospital
Co-Chair, Evelyn Wyrzykowski Chair in Cardiology Selection and Recruitment Committee
Member, International Academy of Cardiovascular Sciences Award Committee
Member, Heart and Stroke Foundation of Canada Integrated Research Investment Strategy (IRIS) Mission Advisory Panel
Member, Search Committee for Winnipeg Regional Health Authority Medical Director for the Cardiac Sciences Program
Member, St. Boniface Hospital Foundation Myles Robinson Memorial Heart Fund Committee
Member, Search Committee for Head, Section of Cardiology, College of Medicine, Faculty of Health Sciences, University of Manitoba
Member, Executive Committee, Manitoba Medical Service Foundation
Vice-Chairman, Awards Assessment Committee, Manitoba Medical Service Foundation
Interviewer, College of Medicine Admissions, University of Manitoba, Faculty of Health Sciences
Member, ex-officio, Audit Committee of Manitoba Medical Service Foundation
Member, ex-officio, Nominating Committee, Manitoba Medical Service Foundation
Member, ex-officio, Public Relations Committee, Manitoba Medical Service Foundation
Alternate member, Special (Non-Standing) Committee, Joint Manitoba Medical Service Foundation / University of Manitoba Committee
Advisor, Canada Caribbean Heart Health Education Committee
Secretary, Treasurer and Director, Academy of Cardiovascular Sciences Foundation
Member, Nutrigenomics Workshop and Engagement Steering Committee
External Consultant / Reviewer Ottawa Heart Institute
Member, Academic Health Sciences Network Research Council
Chair, Asper Endowment Oversight Committee for the Mayo Clinic and St. Boniface General Hospital
Member, Research Enterprise Committee, St. Boniface Hospital
Chair, Program Committee for the Canadian Centre for Agri-Food Research in Health and Medicine, St. Boniface Hospital
Member, Clinical Research Review Committee, St. Boniface Hospital
Member, ex-officio, Board of Directors, St. Boniface Hospital
Member, Ron Duhamel Innovation Fund Award Committee
Chair, Hoops from the Heart Steering Committee
Member, Communications and External Relations Committee, Genome Prairie Board of Directors
Member, Research Directors Committee, University of Manitoba
Career Mentor, Alberta Innovates Health Solutions Postgraduate Fellowship
Member, ex-officio, Board of Directors, St. Boniface Hospital Foundation
Member, Committee for the Institute of Cardiovascular Sciences Awards
Officer, Technology 2000 Inc. a wholly-owned subsidiary of St. Boniface Hospital
Executive Director of Research, St. Boniface Hospital

Professional Service
Assistant Executive Director, Manitoba Medical Service Foundation
President, North American Section of the International Academy of Cardiovascular Sciences
Member, Board of Directors, Friends of CIHR
Member, Genome Prairie Board of Directors
Secretary, Board of Directors, Diabetes Research and Treatment Centre
Chief Scientific Officer, KRIM Biopharma Inc.
Member - American College of Cardiology, American Heart Association, American Physiological Society, Canadian Academy of Health Sciences, Canadian Society of Atherosclerosis, Thrombosis and Vascular Biology, International Academy of Cardiovascular Sciences, Royal Society of Medicine, London, England
The research focus of our laboratory remains to be Evidence-Based Agri-Food with the aims to study how agri-food and herbal medicinal products exert their effects and to develop innovative strategies for disease prevention and management.

Two AAFC-funded projects were in progress this fiscal year. In the first project (Canadian Lingonberry: Health Attributes), the health benefits of Manitoba lingonberry was characterized and the results presented at the 12th European Nutrition Conference in Berlin, Germany. In the moderated poster presentation, we reported that lingonberry juice consumed daily for 3 weeks prior to kidney injury prevented ischemia-reperfusion injury and that the pre-treatment improved kidney function, modulated stress-induced JNK signaling, and reduced inflammation. We concluded that consumption of lingonberry juice rich in anthocyanins and antioxidants may be a preventative approach to reducing ischemia-reperfusion injury in the kidney. This newly initiated project is a continuation of a previously funded project and will focus on the health benefits of lingonberry-supplementation in specific-diet fed animal models.

In the second project, to discover new health attributes and bioactives of ginseng, all AAFC scientists at CCARM collaborated to determine whether ginseng berries which are normally discarded following harvest, have beneficial health benefits. Positive outcomes will benefit growers as they will be able to utilize material destined for the waste stream.

During the past year, my PhD student, Cara Isaak, was awarded the Mindel and Tom Melnick Research Studentship in Medicine, and the best oral presentation award in the students’ competition at the Therapeutic Application of Nutraceuticals and Bioactives conference hosted by CCARM in April 2016. Cara has also been approved to proceed to writing her thesis. Another student, Aakangchhya Bhusal, co-supervised with Dr Dan Brown, also graduated with a MSc degree in Human Nutritional Sciences. The laboratory also had a co-supervised summer research student to assist in its research activities: Amanda Wong, who is an undergraduate BSc student from University of Manitoba and captains the UM Bisons Women Soccer team.
# Research Funding

<table>
<thead>
<tr>
<th>Name of Granting Agency</th>
<th>Names of Investigators</th>
<th>Project Title</th>
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<tr>
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<tr>
<td>Agriculture and Agri-Food Canada</td>
<td>C. Siow, D. Brown &amp; S. Debnath</td>
<td>Canadian Lingonberry: Health Attributes</td>
<td>$43,500</td>
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<td>Agriculture and Agri-Food Canada</td>
<td>D. Brown, C. Siow, T. Netticadan &amp; H. Blewett</td>
<td>Characterization of Heritage Ginseng</td>
<td>$20,500</td>
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<td>Agriculture and Agri-Food Canada</td>
<td>M. Dorais, C. Siow &amp; 47 other participants</td>
<td>Sustainable Small Fruit Production</td>
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<td>Canadian Lingonberry: Health Attributes</td>
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<td>University of Manitoba, College of Medicine</td>
<td>Cara Isaak</td>
<td>Contribution towards technical service</td>
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Collaborative Activity

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<td>Samir Debnath</td>
<td>Atlantic Cool Climate Crop</td>
<td>Bioactivity/lingonberry cultivars from Atlantic Canada, Europe and USA</td>
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<td>Research Centre, St John’s,</td>
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<td>Michel Aliani</td>
<td>University Of Manitoba</td>
<td>Vitamin D₃ Saskatoon berry-fortified rooibos tea</td>
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<td>Karmin O</td>
<td>University of Manitoba</td>
<td>Dogwood, lingonberry and NAFLD</td>
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<td>Thomas Netticadan</td>
<td>AAFC/CCARM</td>
<td>Evaluation of the health benefits of ginseng berry</td>
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<tr>
<td>Heather Blewett</td>
<td>AAFC/CCARM</td>
<td>Evaluation of the health benefits of ginseng berry</td>
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Publications & Presentations

Peer-Reviewed Articles


Abstracts


**Invited Presentations**

“Health benefits of emerging crops in Canada”, Therapeutic Applications of Functional Foods and Bioactives Conference, Winnipeg. (Invited Session Speaker)

Lipid Research Group, Centre for Research and Treatment of Atherosclerosis (Invited Speaker)
**Academic Teaching**

Fundamentals of Medical Physiology, PHGY 1030, Physiology & Pathophysiology
Physiology & Pathophysiology for Physician Assistants I, PAEP 7000, Physiology & Pathophysiology
Neurosciences: Neurotransmission & Neurotransmitters, PGY- PGY-4, Didactic Seminar Series, Psychiatry, Health Sciences

**Training/Mentoring**

**Graduate Student – PhD**
Cara Isaak

**Graduate Student – MSc**
Aakangchhya Bhusal (co-supervised with D Brown)

**Undergraduate Student**
Amanda Wong

**Technicians**
Suvira Prashar, Technician
Jo-Ann Stebbing, Technician

**Students Graduated**

**MSc**
Aakangchhya Bhusal (co-supervised with D Brown)

**Honours, Awards, Scholarships**

Cara Isaak, Minden and Tom Olenick Research Studentship in Medicine,
Undergraduate Medical Education Award of the Rady Faculty of Health Sciences,
University of Manitoba

Cara Isaak, AAFC Award for Best Oral Presentation at the Therapeutic Applications of Functional Foods and Bioactives conference, hosted by CCARM.
Service

Graduate Student Committees

PhD
Victoria Sid, Physiology and Pathophysiology

Academic Committees and Related Administrative Duties
Co-Chair, St. Boniface Hospital Research Centre Safety Committee and Biosafety Sub-Committee

Professional Service
Associate Editor, Canadian Journal of Physiology and Pharmacology
Editorial Board, Journal of Acupuncture and Tuina Science
Founding Board Member and Regional Director, Canadian Institute of Chinese Medicinal Research
External Reviewer, Dairy Farmers of Canada Research Funding program
Reviewer, BMC Complementary and Alternative Medicine
Reviewer, Journal of Complimentary and Integrative Medicine

Outreach Activity
Agriculture in the City
Cara Isaak, Radiothon, Global News Morning Show (promoting TriHospital Lottery)

Representation on behalf of CCARM
Participated on separate tours of CCARM by AAFC’s Deputy Minister Andrea Lyon, Assistant Deputy Minister (Science and Technology Branch) Dr. Brian Gray, and the new Director for Research, Development and Technology for Manitoba, Dr. Esther Salvano
CCARM representative at the seminar on “Leveraging E-Commerce in China” by the Consul General of Canada, Mr. Weldon Epp, in Shanghai
CCARM representative at the industry consultation meeting with the Provincial Minister of Agriculture in Portage la Prairie, MB

The Lingonberry Winning Team

(Melissa Wong, Suvira Prashar, Dr. Chris Siow & Cara Isaak)
Dr. Carla Taylor
Metabolic Nutrition Laboratory

The Metabolic Nutrition Laboratory focuses on the investigation of dietary components and their effects on metabolism, particularly in the context of obesity and insulin resistance as these are key factors leading to the development of type 2 diabetes and cardiovascular disease. The scientific approach uses dietary interventions in both animal models and human studies, and investigates their effects at the whole body to molecular levels. This continuum of research requires a multi-disciplinary team approach and this has been made possible by a long-term collaboration with Peter Zahradka, and the skills and talents of our trainees and staff.

It has been very satisfying this year to finish participant recruitment and study visits for several human studies, including those investigating canola oil in individuals with metabolic syndrome, bioavailability of compounds present in dried beans and lentils, and identification of blood biomarkers present in peripheral artery disease, as well as a collaborative study with Dr. Aliani on glycemic index and bioavailability of compounds in Saskatoon berry frozen yogurt. Danielle Perera, study coordinator, and Angela Wilson, research nurse, have been instrumental for the successful execution of our clinical studies over the past several years and they deserve special recognition for all their contributions. On the other hand, we are saddened that Danielle and Angela had to move on to other positions but we wish them the very best.

Linda Siemens (co-advisor Peter Zahradka) defended her MSc thesis in March. She investigated the effects of endocannabinoids, which are synthesized from fatty acids, for their effects on adipocytes. She has some novel findings that endocannabinoids can stimulate lipolysis (breakdown of fat). Best wishes to Linda in her future endeavours.

Research of former trainees was published this year. Azadeh Yeganeh (co-advisor Peter Zahradka) investigated a natural source of trans fat called conjugated linoleic acid (CLA) which is present in dairy products and ruminant meats, for its effects on adipocytes (fat cells). Her two papers published this year show that one of the isomers of CLA reduces the amount of fat that accumulates in adipocytes and that this isomer affects pathways involved in the maturation of preadipocytes. Matt Hanson (co-advisor Peter Zahradka) had previously reported that lentils have positive effects on remodelling blood vessels in spontaneously hypertensive rats, and his current paper shows that green lentils can restore the elasticity of blood vessels. Danielle Defries (currently a faculty member at University of Winnipeg) returned to the lab for a few weeks last year to strengthen her dataset characterizing the different glucose transporters in various cell types and this resulted in a publication in the current year.
With Dr. Harold Aukema and his graduate students, we have been investigating the effects of high protein diets, and different sources of protein, on obesity, metabolic syndrome parameters and the kidney. This year, Jennifer Wojcik has reported that a high protein diet containing a mixture of animal and plant proteins was most effective for reducing insulin resistance and hepatic steatosis in obese rats.

For the past several years, Leslee Tworek has supported both our basic research and clinical studies. She has been the ‘go to’ person in the lab, and has provided training and support to many graduate students and summer students, as well as maintaining her own projects. Your knowledge of techniques and how things have been done in the lab is greatly missed. We wish you all the best with your move to Ontario and new opportunities!

Our current trainees, Tara, Jaime and Youjia, have been busy in the lab, and have enjoyed presenting their data at local and international conferences. Thank you to everyone in our group for your great work, enthusiasm, and making research fun and rewarding! Thank you to our collaborators for adding new research directions to joint projects.
## Research Funding

<table>
<thead>
<tr>
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<tr>
<td>Canadian Institutes of Health Research (CIHR)</td>
<td>H. Aukema, P. Zahradka &amp; C. Taylor</td>
<td>Effects of dietary essential fatty acids on octadecanoid production and biological actions in obesity-induced inflammation: Implications for dietary requirements</td>
<td>$134,793 (included in funding total for H. Aukema)</td>
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<td>C. Taylor</td>
<td>Metabolic and immune functions of zinc</td>
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<td>Mathematics of Information Technology and Complex Systems (MITACS)</td>
<td>P. Zahradka &amp; C. Taylor</td>
<td>Identification of blood biomarkers for diagnosis of peripheral arterial disease</td>
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<td>Cardiovascular health benefits of soybean crops</td>
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<td>Effects of processing on health benefits associated with bean consumption</td>
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<td>Cellular mechanisms by which estrogen induces a healthy adipose tissue phenotype</td>
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<td>Manitoba Agri-Health Research Network</td>
<td>M. Aliani, C. Taylor &amp; P. Zahradka</td>
<td>Urinary and plasma metabolomics studies of fully characterized Saskatoon berry powder (SBP) fortified yogurt in healthy individuals</td>
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<td>NSERC RTI</td>
<td>M. Aliani, P. Zahradka &amp; C. Taylor</td>
<td>Gas-chromatography with atmospheric pressure chemical ionization interface (GCAPCI) for flavouromics research</td>
<td>$68,954 (included in funding total for M. Aliani)</td>
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### SALARY:

<table>
<thead>
<tr>
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<td>Research Manitoba</td>
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<td>(co-supervised with P. Zahradka)</td>
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<td>Helen Tieu</td>
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**TOTAL FUNDING:** $131,666

### Collaborative Activity

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<td>AAFC, Guelph, University of Toronto/Glycemic Index Testing &amp; CCARM</td>
<td>AAFC Science Substantiation Project on lentils</td>
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<tr>
<td>S. West</td>
<td>Penn State University</td>
<td>Vascular Function for Effects of Canola Oil on Body Composition and Lipid Metabolism in Participants with Metabolic Syndrome / Canola Oil – Multi-Centre Intervention Trial (COMIT-II)</td>
</tr>
</tbody>
</table>
J. Wigle  
University of Manitoba  
Sex-dependent effects of adiponectin on metabolic disease risk

H. Aukema  
University of Manitoba  
Roles of dietary fatty acids and oxylipins in obesity and inflammation

M. Aliani  
University of Manitoba  
Metabolites associated with pulse consumption and with obesity

Publications

Peer-Reviewed Articles


Abstracts


Zahradka P, Yeganeh A & Taylor CG (2016) Trans-10, cis-12 conjugated linoleic acid (CLA) interferes with lipid droplet accumulation during 3T3-L1 adipocyte differentiation. Keystone Symposia on Obesity and Adipose Tissue Biology, Banff.


**Invited Presentations**

“Running effective clinical trials for vascular function”, Therapeutic Applications of Functional Foods and Bioactives Conference, Winnipeg.


Academic Teaching

Seminar in Foods and Nutrition Research (MSc), HNSC 7200, Human Nutritional Sciences
Advanced Seminar in Human Nutritional Sciences (PhD), HNSC 7200, Human Nutritional Sciences
Macronutrients and Human Health, HNSC 3310, Human Nutritional Sciences
Nutrition for Health and Changing Lifestyles, HNSC1210 (coordination of sections), Human Nutritional Sciences

Training/Mentoring

Post-doctoral Fellow
Samantha Pauls (co-supervised with H. Aukema and P. Zahradka)

Graduate Students - PhD
Jaime Clark (co-supervised with P. Zahradka)  Jennifer Grant (co-supervised with M. Aliani)
Youjia Du (co-supervised with P. Zahradka)

Graduate Students - MSc
Tara Loader (co-supervised with P. Zahradka)  Le Wang (co-supervised with M. Aliani)
Linda Siemens (co-supervised with P. Zahradka)

Undergraduate Students
Christian Palaschuk
Helen Tieu

Volunteer Research Assistant
Matthew Wiecek

Technical Staff
Danielle Perera (Study Coordinator)
Angela Wilson (Research Nurse)
Leslee Tworek (Technician)
Brenda Wright (Technician)

Students Graduated

MSc
Linda Siemens (co-supervised with P. Zahradka)  Le Wang (co-supervised with M. Aliani)

Honours, Awards, Scholarships

Jaime Clark, The Frederick Banting and Charles Best Canada Graduate Scholarship (CIHR)
Tara Loader, Research Manitoba Scholarship
Tara Loader, 2nd place for the Graduate Student Oral Presentations, Canadian Pulse Research Workshop
Youjia Du, Janice Dodd Award for Excellence in Endocrine Physiology, Department of Physiology and Pathophysiology, University of Manitoba

Service

Graduate Student Committees

PhD
Stephanie Caligiuri, Physiology and Pathophysiology
Md Monirujjaman, Human Nutritional Sciences
Haonan Zhouyao, Human Nutritional Sciences

MSc
Kristen Fleet, Human Nutritional Sciences
Amanda Gravelle, Human Nutritional Sciences
Kelsey Mann, Human Nutritional Sciences
Megha Murali, Biochemistry and Medical Genetics

Academic Committees and Related Administrative Duties
Chair, Program Committee for Human Nutritional Sciences, Faculty of Agricultural and Food Sciences
Committee Member, Faculty Curriculum Committee, Faculty of Agricultural and Food Sciences
Committee Member, Promotion Committee, Faculty of Agricultural and Food Sciences
External Committee Member, Faculty of Engineering Core Committee for Tenure Reviewer, Samuel Weiner Distinguished Visitor Award, University of Manitoba
Member, St. Boniface Research Centre Awards Committee

Professional Service
Associate Editor, Lipids
Associate Editor, British Journal of Nutrition
Ad hoc Reviewer for Canadian Foundation for Innovation, NSERC Discovery programs
Member, Program Committee and Chair for Conference Session, Canadian Pulse Research Workshop

Outreach Activity
KT with the public at CCARM booth at Agriculture in the City, March
“Linking Food and Health through Nutrition Research”, public presentation to the Rite Irees Luncheon Group, August
Radio interview on CJOB, Year of the Pulse, October
Radio interview on CJOB’s Health Report, Research on Pulses, November
Representation on behalf of CCARM
Team Leader, CCARM
Director, Manitoba Agri-Health Research Network (MAHRN)

Presentations and Tours:
Manitoba Dairy Farmers, January
Sylvie Verdon, Manager, Innovation, Science and Economic Development Canada, July
Agriculture and Agri-Food Canada Audit Committee, September
Esther Salvano, Director, Research Development Technology Transfer Science and Technology Branch Agriculture and Agri-Food Canada, September
Provincial Agriculture Minister and representatives from University of Winnipeg, November

Jaime Clark vs Tara Loader
Jaime Clark – CIHR Scholarship Award received
Although a major focus of the laboratory is on vascular function as it relates to both healthy and diseased states, a significant effort is underway to understand how the foods we eat affect the health of blood vessels. Additionally, we are striving to understand the processes that become activated in obesity and negatively impact our health by affecting normal metabolic homeostasis. As such, our research covers a broad spectrum of conditions, including cardiovascular disease, metabolic disease and the inflammatory processes that seem to be prevalent in the former conditions. Our major strength lies in the ability to utilize cell culture systems to model the effects of factors that modulate the dysfunctional state of certain tissues. However, at the same time, we are able through our long-term collaboration with Carla Taylor to translate our findings through clinical testing, and to perform animal experiments that examine the link between physiology and molecular mechanisms. We have been fortunate to receive, either directly or via our collaborators, funding from a variety of agencies to support our research program in areas that we anticipate will help Manitoba and Canadian growers and producers by providing information that will assist them with marketing their products.

Our basic research has led to the discovery that consuming conjugated linoleic acid (CLA), whether as a supplement or enriched in a food, has a significant effect on the property of fat cells – adipocytes. Information we published a number of years ago suggested that one isomer of CLA, t10,c12-CLA, was able to alter the properties of adipose tissue in a way that prevented the negative effects that normally are observed in obesity. Specifically, the pancreas worked better and so insulin sensitivity improved, the liver lost the fat that it accumulates in obesity and this improved overall lipid metabolism, and the cardiovascular system operated better. But these wonderful effects are only seen in rats, while in mice the complete opposite occurs. In the papers Azadeh published in 2016, it became obvious that the effects of t10,c12-CLA are due to its effects on the production of new fat cells. This importance of producing new adipocytes to maintain metabolic health is being recognized by various research groups and will soon have an impact on our approaches to treat obesity. While it is unlikely that CLA will ever be used for this purpose, it does provide a means of finding the cellular targets that may be pharmacologically (and hopefully nutritionally) manipulated to improve the health of persons who are obese.

Additionally, we had a paper published by Matt Hanson who left a couple of years ago to begin medical school. This is a follow-up to a study he completed to determine which pulse variety was responsible for the improved blood vessel health we observed in a human study we conducted. He showed that green lentils produced the best effect on blood vessel function, specifically by reversing the remodelling that occurs due to high
blood pressure. Indeed, Matt was able to show that the green lentils made the vessels more elastic and decreased the thickness of the vessel wall. The significance of these results lies in establishing that it is possible to reverse the effects of bad diet and ageing on the blood vessels, and that it should be possible to develop novel approaches that will treat the actual processes that lead to cardiovascular disease rather than waiting for the disease to manifest itself as a heart attack or stroke and then just treating the symptoms to prevent further decline.

In addition to the basic research we have been doing, the lab has been involved in a number of clinical trials. One study recently completed in collaboration with Harold Aukema examined the effect of sex on the absorption of polyunsaturated fatty acids. We are looking forward to publishing this work in the upcoming year as well as starting the next phase of this very interesting project.

The publication of these very stimulating results is possible only through the efforts of a wonderful group. While it would be happiest if everyone could stay members of the lab forever, there are times when projects come to an end and the personnel involved must leave. I would like to pay tribute in particular to Danielle Perera and Angela Wilson who served as the foundations of our clinical research projects. Similarly, Leslee Tworek said farewell as she and her partner left the province to begin a new adventure. Leslee has been the technician that we counted on to keep the lab operational, and she has been a key player in the training of our new students. Their leaving brought considerable sadness and we hope they do well in their future endeavours. As well, in 2016, we celebrated the graduations of Linda Siemens and Azadeh Yeganeh. Linda pushed the boundaries of our understanding of how the endocannabinoid system interacts with adipocytes. Likewise, Azadeh, by combining both cell culture and animal studies, was able to define new elements associated with how adipocyte maturation and lipid accumulation relates to obesity. We wish them both well as they move forward in their careers. At the same time, I am happy that our remaining trainees are putting in solid performances and enabling us to understand in greater detail the physiological features that lead to vascular dysfunction in the context of metabolic disease.

Jaime Clark and Tara Loader at Agriculture in the City
## Research Funding

<table>
<thead>
<tr>
<th>Name of Granting Agency</th>
<th>Names of Investigators</th>
<th>Project Title</th>
<th>Funding Amount for Current Year</th>
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<tbody>
<tr>
<td><strong>OPERATING:</strong></td>
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<tr>
<td>Canadian Institutes of Health Research (CIHR)</td>
<td>H. Aukema, P. Zahradka &amp; C. Taylor</td>
<td>Effects of dietary essential fatty acids on octadecanoid production and biological actions in obesity-induced inflammation: Implications for dietary requirements</td>
<td>$134,793 (included in funding total for H. Aukema)</td>
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<tr>
<td>Mathematics of Information Technology and Complex Systems (MITACS)</td>
<td>P. Zahradka &amp; C. Taylor</td>
<td>Identification of blood biomarkers for diagnosis of peripheral arterial disease</td>
<td>$18,750</td>
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<td>Agri-Food Research and Development Initiative</td>
<td>M. Aliani et al.</td>
<td>Genetic markers for flavor selection in pork</td>
<td>$126,000 (included in funding total for M. Aliani)</td>
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<td>Manitoba Agri-Health Research Network</td>
<td>M. Aliani, C. Taylor &amp; P. Zahradka</td>
<td>Urinary and plasma metabolomics studies of fully characterized Saskatoon berry powder (SBP) fortified yogurt in healthy individuals</td>
<td>$16,900 (included in funding total for M. Aliani)</td>
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<td>Agri-Food Research and Development Initiative</td>
<td>P. Zahradka &amp; C. Taylor</td>
<td>Cardiovascular health benefits of soybean crops</td>
<td>$27,500</td>
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<td>Manitoba Pulse and Soybean Growers</td>
<td>P. Zahradka &amp; C. Taylor</td>
<td>Effects of processing on health benefits associated with bean consumption</td>
<td>$46,747</td>
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<tr>
<td>Research Manitoba/University of Manitoba/St. Boniface Hospital Research Centre</td>
<td>P. Zahradka</td>
<td>Effects of adiponectin processing on adipose tissue function and metabolic disease risk</td>
<td>$65,000</td>
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<td>Natural Sciences and Engineering Research Council</td>
<td>P. Zahradka</td>
<td>Molecular mechanisms of gene regulation</td>
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<td><strong>Equipment</strong></td>
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<td>Research Manitoba</td>
<td>Tara Loader</td>
<td>$5,833 (included in funding total for C. Taylor)</td>
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<td>Canadian Institutes of Health Research (CIHR)</td>
<td>Jaime Clark</td>
<td>$23,333 (included in funding total for C. Taylor)</td>
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<td>Youjia Du</td>
<td>$10,500</td>
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<td>Helen Tieu</td>
<td>$4,500 (included in funding total for C. Taylor)</td>
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**TOTAL FUNDING:** $212,597

Susan Zettler, Helen Tieu, Youjia Du, Danielle Perera, Jaime Clark, Angela Wilson, Dr. Peter Zahradka, Dr. Carla Taylor, Tara Loader, Christian Palaschuk, Tracy Ewonchuk
Collaborative Activity

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**Commentary**

**Invited Presentations**
“Application of bioanalytical methods to foods for the optimization of health and nutritional benefits. 32nd International Symposium on Microscale Separations and Bioanalysis, Niagara-on-the-Lake. (Keynote Address)

“Vascular improvements resulting from pulse consumption”, Therapeutic Applications of Functional Foods and Bioactives Conference, Winnipeg.

**Academic Teaching**
Course Coordinator, Endocrine Physiology and Pathophysiology (PHGY 7256), Physiology and Pathophysiology

**Training/Mentoring**

**Postdoctoral Fellow**
Samantha Pauls (co-supervised with H. Aukema & C.Taylor)

**Graduate Students - PhD**
Jaime Clark (co-supervised with C.Taylor)
Youjia Du (co-supervised with C.Taylor)

**Graduate Students - MSc**
Tara Loader (co-supervised with C. Taylor) Linda Siemens (co-supervised with C. Taylor)

**Undergraduate Students**
Christian Palaschuk Helen Tieu

**Volunteer Research Assistant**
Matthew Wiecek

**Technical Staff**
Danielle Perera (Study Coordinator)
Leslee Tworek (Technician)
Angela Wilson (Research Nurse)
Brenda Wright (Technician)
Students Graduated

MSc
Linda Siemens (co-supervised with C. Taylor)

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Tara Loader, Research Manitoba Scholarship
Tara Loader, 2nd place for the Graduate Student Oral Presentations, Canadian Pulse Research Workshop
Youjia Du, Janice Dodd Award for Excellence in Endocrine Physiology, Department of Physiology and Pathophysiology, University of Manitoba

Service

Graduate Student Committees

MSc
Melissa Gabbs, Human Nutritional Sciences
Megha Murali, Biochemistry and Medical Genetics
Mohamad Reza Aghanoor, Pharmacology and Therapeutics
Nivedita Seshadri, Physiology and Pathophysiology
Bhavya Sharma, Physiology and Pathophysiology

Academic Committees and Related Administrative Duties
Chair, Division of Endocrinology and Metabolic Disease, Department of Physiology and Pathophysiology
Member, ad hoc Promotion and Tenure Committee, Department of Physiology and Pathophysiology
Chair, ad hoc student committees for annual evaluation, thesis proposal presentations and candidacy exams, Department of Physiology and Pathophysiology
Chair, PhD Defense, Samantha Pauls, Department of Biochemistry and Human Genetics

Professional Service
Associate Editor, Canadian Journal of Physiology and Pharmacology
Associate Subject Editor, FACETS
Member, CIHR Foundation Grants Review Committee
Ad hoc Reviewer for NSERC Discovery Grants program
Member, Program Committee and Chair for Conference Session, Canadian Pulse Research Workshop, Winnipeg, MB
Member, Program Committee and Chair for Conference Session, Therapeutic Applications of Functional Foods and Bioactives Conference, Winnipeg, MB
Member, Radiation Nuclide Safety Committee, Winnipeg Regional Hospital Authority
Outreach Activity
KT with the public at CCARM booth at Agriculture in the City, March
Radio interview on CJOB, Year of the Pulse, October
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Research was Here, St. Boniface Hospital Foundation

Representation on behalf of CCARM
Deputy Team Leader, CCARM

Presentations and Tours:
Manitoba Dairy Farmers, January
Esther Salvano, Director, Research Development Technology Transfer Science and Technology Branch Agriculture and Agri-Food Canada, September
Provincial Agriculture Minister and representatives from University of Winnipeg, November

Youjia Du receiving Janice Dodd Award for Excellence in Endocrine Physiology