



Organized by the LFS
Graduate Student
Council

2024 GRADUATE STUDENT CONFERENCE

FEBRUARY 28TH
9:15 AM - 5:00 PM
GSS LOFT

Official Program



THE UNIVERSITY OF BRITISH COLUMBIA
Faculty of Land and Food Systems

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PROGRAM

9:15 - 10:00 AM
REGISTRATION

10:00 - 10:15 AM
OPENING REMARKS

10:15 - 11:00 AM
KEYNOTE -
DR. WARREN CARDINAL-MCTEAGUE

11:00 AM - 12:00 PM
ORAL PRESENTATIONS
SESSION 1

Stretch Break - 10 min

12:10 - 1:10 PM
ORAL PRESENTATIONS
SESSION 2

Lunch Break - 20 min

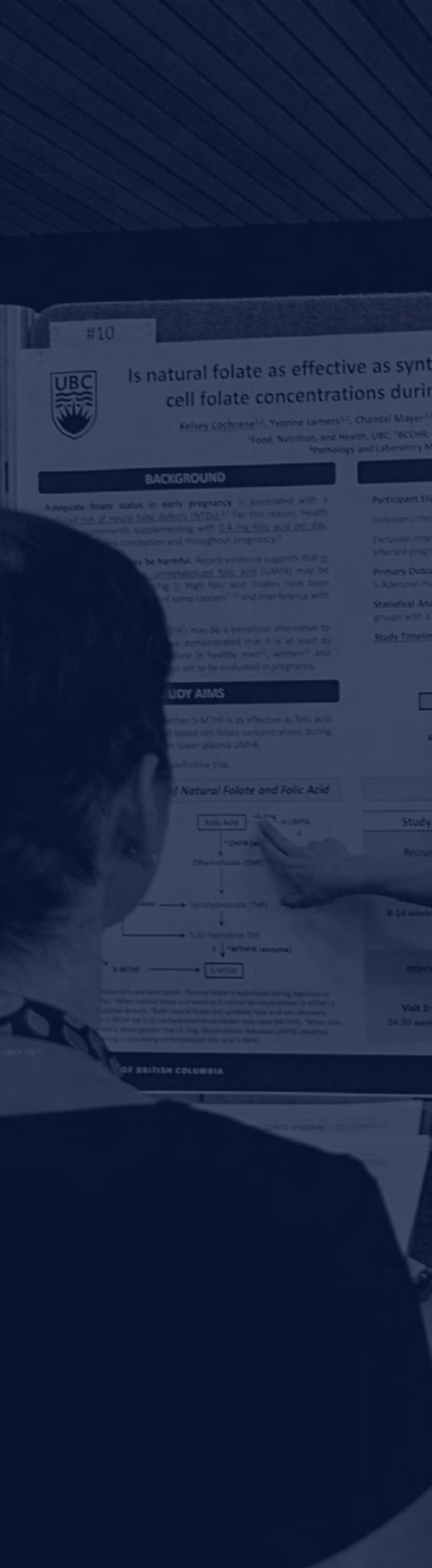
1:30 - 2:30 PM
POSTER SESSION

2:30 - 3:30 PM
ORAL PRESENTATIONS
SESSION 3

Stretch Break - 10 min

3:40 - 4:40 PM
ORAL PRESENTATIONS
SESSION 4

4:40 - 5:00 PM
AWARD CEREMONY
CLOSING REMARKS





MESSAGE FROM THE DEAN

The Graduate Student Conference is an outstanding event that gives us an overview of the innovative research taking place right across the Faculty.

During the conference, please ensure you take time to meet other researchers and find synergies in your work. As we tackle pressing local and global issues, the world needs creative minds such as yours to come together to find solutions. Changing weather patterns and their social impact are evident right here in B.C., and many of you are working on projects that can help.

I am proud of the graduate students in the Faculty of Land and Food Systems who are truly world-class, and who are working on many of the UN Sustainable Development Goals which form the Faculty of Land and Food Systems' five priority areas:

- Addressing climate change and resilient food systems
- Ending hunger and improving food security
- Enhancing regional agriculture for sustainable cities
- Promoting nutrition and wellbeing for healthier communities
- Ensuring the health and welfare of animals in society

Finally, congratulations to the Graduate Student Council for organizing this conference! Volunteers have spent hours in planning and showcasing the research of their peers, and I am very excited to attend the 2024 conference! Best of luck to the students who are showing their research today.

RICKEY YADA, PHD
PROFESSOR AND DEAN
FACULTY OF LAND AND FOOD SYSTEMS
THE UNIVERSITY OF BRITISH COLUMBIA | VANCOUVER CAMPUS
TRADITIONAL ANCESTRAL UNCEDED X^wMƏƏK^wƏYƏM MUSQUEAM
TERRITORY





MESSAGE FROM THE COORDINATORS

Welcome to the 2024 Annual Land and Food Systems Graduate Student Conference! We are excited for a full day of events to showcase the diversity and excellence of graduate students in our Faculty.

Each year, the many departments of LFS come together for the LFS Graduate Student Conference. This blending of MCML and FNH allows us to connect and share ideas. Throughout the day, we have both oral and poster presentations scheduled which showcase the breadth of qualitative and quantitative research that's happening throughout LFS.

This year the LFS Graduate Student Conference will be hosting 16 oral presentations and 21 poster presentations. We will hear from students in both professional and research programs at LFS: Applied Animal Biology, Food Science, Integrated Studies in Land and Food Systems, Human Nutrition, Plant Science and Soil Science.

The LFS Graduate Student Council has worked hard to ensure an educational and engaging day. We hope today allows you to consider different perspectives, and facilitate connections and collaborations between the various programs. Above all, we look forward to the opportunity to gather in celebration of our hardworking graduate students. We believe today's program will allow everyone to renew old connections, foster new ones, and engage with new ideas.

So please enjoy these presentations prepared by our outstanding graduate students, and we look forward to seeing you throughout the day!

Enjoy the day!

The 2024 LFS Graduate Student Council

CHELSEA GOWTON
ELIZABETH RUSSEL
JESSICA MARQUES
SASHA POLLET
ANNIKA WALSH

DANIELLE SCHULTZE
JENNIFER LIPKA
ALISHA BUTTAR
JORDY KERSEY
PIN-JIU CHEN



ORAL PRESENTATIONS SCHEDULE

11:00 AM - 12:00 PM

SESSION 1
MAYA BODNAR
HAOMING YANG
TERRELL ROULSTON
PATRICIA ACOSTA

12:10 PM - 1:10 PM

SESSION 2
MALINA SUCHON
HAOXIN YE
KARYNA HOWELL
HANNAH ANDERSON

2:30 PM - 3:30 PM

SESSION 3
NISA CHAVEZ MOLINA
LEAH WESSLER
CASSANDRA KLAAS
NIKOLAS WILSON

3:40 PM - 4:40 PM

SESSION 4
ELIZABETH RUSSELL
JIMMY (KYU BAIK) HA
SABA JALALI
LIZETH ARDILA

POSTER PRESENTERS

1:30 - 2:30 PM

AMALIA URLOIU
ALYSSA ROBINSON
CELESTE C. BOUCHAUD
CHRISTINA R. DOELLING
CHRISTINE KUO
CLAUDIA BALDASSI

GEORGIA RUYTER
GRACE W.C. WANG
ISAAC QI
JESSICA MARQUES
KELLY WANG

LULU PEI
MELODY SIZER
MORGAN HAMILTON
OLIVIA Y. WU
SASHA POLLET

SONJA BIALOBZYSKI
SYDNEY MOORE
SYLVIA NYAMAIZI
TATHYANA PIAU
VIRGINIE CHALIFOUX

ART INSTALLATION

Simmer: An Invitation of Interconnectedness

Simmer is an immersive installation that embodies the essence of communal nourishment and connection. In this space you are invited to sit down, curl up, lie down - whatever method of pausing you feel comfortable taking in this moment.

At its core, Simmer, is a reference to chicken noodle soup - a communal dish, the centerpiece around which friends and family gather around for comfort. As it is, we typically surround pots of this dish but today, Simmer, has the dish surrounding us. The basic elements of chicken noodle soup are emulated here through pillows and lanterns. As you enter this bowl, I encourage you to reflect, remember, and rest - bringing forward notions of nostalgia, food as memory, and food as solace.

A celebration of community and connection, Simmer, welcomes you as you are.

So come, take a seat within the brave soupy world.

Annika Walsh is an emerging transdisciplinary artist who challenges the boundaries between art, artist, and viewers. Annika is a graduate student at the University of British Columbia completing a MSc. in Integrated Studies in Land and Food Systems, as well as a University of Ottawa BFA alumni. They explore identity and interconnectedness through the relational entity that is: food.



ABSTRACTS

ORAL PRESENTATIONS

Refining the drop method for isoflurane induction in mice

Maya J. Bodnar (1), I. Joanna Makowska (1), Anna S. Ratuski (1), Courtney T. Boyd(1), Catherine A. Schuppli (1), Daniel M. Weary (1)

1. Animal Welfare Program, Faculty of Land and Food Systems, University of British Columbia, Vancouver, BC V6T 1Z4, Canada

Laboratory mice are often euthanized with carbon dioxide (CO₂) alone. Exposure to CO₂ is aversive, but this procedure can be refined by first rendering the animal unconscious with isoflurane. Some facilities lack access to a vaporizer used to administer isoflurane, preventing adoption of this refinement. A practical alternative to a vaporizer is the 'drop' method, whereby a fixed volume of isoflurane is introduced into the induction chamber. Previous work suggests that isoflurane administered at a concentration of 5% via the drop method is effective, but aversive to mice; lower concentrations have not been tested. We assessed insensibility with induction using the drop method for isoflurane concentrations below 5%. Mice (n=27) were randomly allocated to one of three isoflurane concentrations: 1.7%, 2.7%, and 3.7%. During induction, measures of insensibility and stress-related behaviors were recorded. All mice reached a surgical plane of anesthesia, and mice exposed to higher concentrations did so more quickly; as concentrations increased from 1.7 to 2.7 and 3.7%, the time to recumbency (Least squares means \pm SE: 120.5 s \pm 8.1, 97.9 s \pm 8.1, and 82.8 s \pm 8.1, respectively), loss of righting reflex, (149.1 s \pm 8.5, 127.7 s \pm 8.5, and 100.7 s \pm 8.3, respectively), and loss of pedal withdrawal reflex (214.5 s \pm 8.3, 172.2 s \pm 8.3, and 146.4 s \pm 8.3, respectively) all declined. Rearing was the most frequently performed behavioral response and was most pronounced immediately after isoflurane administration for all treatments. In a subsequent study, we assessed mouse aversion to this method using a light-dark conditioned place aversion (CPA) paradigm, based on the innate preference of mice for dark versus light spaces. Mice (n=28) were randomly allocated to the same three isoflurane concentrations: 1.7%, 2.7%, and 3.7%. Before and after conditioning sessions, mice underwent an initial and final preference assessment; the change in the duration spent in the dark (+ isoflurane) chamber between preference tests was used to calculate a CPA score. Aversion increased with increasing isoflurane concentrations; from 1.7% to 3.7% isoflurane, mean \pm SE CPA score decreased from 19.6 s \pm 20.1, to -25.6 s \pm 23.2, and finally to -116.9 s \pm 30.6. We conclude that the drop method provides a practical alternative to effectively anesthetize mice with isoflurane concentrations as low as 1.7%, and that the use of lower concentrations (between 1.7 and 2.7%) can further refine CO₂-based euthanasia methods.

Supported by the National Sciences and Engineering Research Council of Canada (NSERC) and the Animal Welfare Institute (AWI) Refinement Grant.

Effects of honey bees (*Apis mellifera* L.) On the structure of plant-pollinator networks

Terrell Roulston(1), Risa Sargent (1)

1. Plant Science, Faculty of Land and Food Systems, University of British Columbia, Vancouver, BC V6T 1Z4, Canada

Global biodiversity is under threat from a variety of factors, including habitat loss, land use change, climate change, and invasive species. Pollinators are crucial for biodiversity maintenance and global food security and are experiencing declines. One pollinator, the Western honey bee (*Apis mellifera* L.; Hymenoptera: Apoidea) is nearly ubiquitous in human altered landscapes. Despite honey bees being geographically widespread, knowledge of their impacts on plant-pollinator communities is incomplete. My study represents the first macroanalysis of honey bee competition in plant-pollinator networks from around the globe. Using an open-access database, I summarized bipartite network statistics for 123 plant-pollinator networks to test whether the proportion of interactions with honey bees in a network is associated with changes in network topology. Specifically, I calculated the normalized degree of interactions with honeybees (NDHB), defined as the total number of interacts divided by the richness of plant species. I predicted higher NDHB would be associated with (1) increased connectance (the realized proportion of possible interactions), (2) decreased modularity (degree of compartmentalization of subcommunities), and (3) increased nestedness (the amount of redundancy of interactions between specialist and generalist) of networks. I quantified these associations for entire networks containing all pollinators, as well as for Hymenopteran sub-networks. I also investigated whether honey bee normalized degree was associated with increased plant generalization (i.e., the mean number of links per species), and decreased pollinator generalization within Hymenopteran sub-networks. Overall, I found that honey bees were widespread, present in 77% (95/123) of networks worldwide. Results revealed that higher honey bee normalized degree was associated with decreased modularity, as well as increased plant generalization and increased pollinator generalization. Contrary to expectations, honey bee introduction was not associated with changes to network connectance or nestedness. While the results are correlational, they suggest that this widely introduced species is capable of modifying the structure of plant-pollinator networks leading to the homogenization of interactions, which could impact the persistence and coexistence of native plants and pollinators.

Supported by NSERC Discovery and CGS-M grants, along with the Mary and David Macaree Fellowship, and the Philip A. Jones Fellowship.





ABSTRACTS

ORAL PRESENTATIONS

Assessing Protein Cards as a Nutrition Education Tool for Adolescents Undergoing Metabolic Bariatric Surgery: A Study Protocol

Patricia F.C. Acosta (1,2), Peggy Alcindor (3), Carla Farnesi (3), Angela S. Alberga (3,4,5,6), Julius Erdsetein (3), Tamara R. Cohen (1,7)

1. Food, Nutrition and Health, Faculty of Land and Food Systems, The University of British Columbia, Vancouver, BC, Canada
2. Montreal Behavioural Medicine Centre (MBMC), Centre intégré universitaire de santé et de services sociaux du Nord-de-l'Île-de-Montréal (CIUSSS-NIM), Quebec, Canada
3. Centre of Excellence in Adolescent Severe Obesity, Montreal Children's Hospital, McGill University Health Centre, Montréal, QC, Canada
4. Department of Health, Kinesiology, and Applied Physiology, Concordia University, Montréal, QC, Canada
5. Department of Pediatrics, Faculty of Medicine, McGill University, Montréal, QC,
6. Canada Research Institute of the McGill University Health Research Center (RI-MUHC), Montréal, QC, Canada
7. BC Children's Hospital Research Institute, BC Children's Hospital, Vancouver, BC, Canada

Metabolic Bariatric Surgery (MBS) is a safe and effective treatment for severe obesity in adolescents. Adherence to post-operative dietary guidelines is crucial to prevent nutritional deficiencies yet this remains a challenge. Moreover, resources to help guide the nutrition requirements of adolescents post-MBS are limited. This study aims to examine the suitability, acceptability, and usability of Protein Cards, a nutrition education tool that includes 40 high-protein recipes, developed to assist adolescents in meeting protein requirements during the various post-MBS diet progression stages (fluid, purée, soft, and regular diet). This two-year mixed-methods study will be conducted at the Centre of Excellence in Adolescent Severe Obesity (Montreal Children's Hospital) and administrated through the Faculty of Land and Food Systems at the University of British Columbia. A total of 30 participants aged 14-19 who have undergone MBS within six months of study launch, will be recruited. Measures will be performed in two rounds (n = 15/ group) and will include dietary food-recalls collected at baseline and up to three months after receiving Protein Cards to assess changes in protein intake and adherence to protein recommendations. An online adapted Suitability Assessments of Material questionnaire will evaluate the suitability of content, literacy demand, graphic illustrations, layout and typography, learning stimulation and motivation, and cultural appropriateness of Protein Cards. Additionally, a short semi-structured interview based on the Capabilities, Opportunities, Motivation-Behaviour (COM-B) model will explore facilitators and barriers to using Protein Cards. Data analysis will include descriptive statistics and interviews will be transcribed and analyzed using thematic analysis. Findings from Round 1 will inform the refinement of Protein Cards and recruit Round 2 participants to collect the same types of data of the improved Protein Cards. This study aims to enhance adolescent MBS dietetic practice and lay the groundwork for future, larger-scale intervention trial studies.

Supported by 'Start Up Research Fund' UBC

Rapid On-Site and Sensitive Detection of Microplastics Using Zirconium (IV)-Assisted SERS Label

Haoming Yang (1), Haoxin Ye (1), Song Yan (1), Tianxi Yang (1)

1. Food, Nutrition and Health, Faculty of Land and Food Systems, University of British Columbia, Vancouver, BC V6T 1Z4, Canada

Microplastics have emerged as significant pollutants in both terrestrial and marine ecosystems, with their accumulation posing a threat to human health through biomagnification along the food chain. The imperative development of rapid and sensitive methods for detecting microplastics in agri-food and environmental systems underscores the importance of our research. In this study, we introduce a cutting-edge surface-enhanced Raman spectroscopy (SERS) method for the precise quantification of polystyrene microplastics. This technique employs zirconium-assisted SERS label strategies, utilizing Rhodamine B as a Raman reporter. Rhodamine B uniformly assembles onto polystyrene microplastics through cation- π interaction facilitated by zirconium ions, presenting a novel and efficient approach for SERS analysis of microplastics. Our method enables the quantification of rhodamine B-labeled polystyrene microplastics (10 μ m) at concentrations as low as 0.1 ppm, achieving a detection limit of 1 ppb. Furthermore, the method exhibits robust performance, with ideal recovery (exceeding 90%) for polystyrene concentrations ranging from 5 ppm to 30 ppm in tap water. When integrated with a portable Raman spectrometer, our method showcases rapid and highly sensitive detection of polystyrene microparticles. This innovative approach holds promise for real-world applications, providing on-site, accurate, and sensitive detection of microplastics in agri-food systems and the environment.

KEYWORDS: microplastics, surface-enhanced Raman spectroscopy, rhodamine B, Raman reporter, zirconium, polystyrene

Supported by UBC Faculty of Land and Food Systems Fund (AWD-020249), Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grant (RGPIN-2023-04100) and NSERC Discovery Launch Supplement (DGECR-2023-00386)





ABSTRACTS

ORAL PRESENTATIONS

Discrimination of conspecifics by socially reared dairy calves

Malina Suchon (1), Daniel M. Weary (1), Marina A. G. von Keyserlingk (1)

1. Animal Welfare Program, Faculty of Land and Food Systems, University of British Columbia, Vancouver, BC V6T 1Z4, Canada.

Groups of cattle form stable dominance hierarchies implying their ability to recognize other individuals. Discrimination of conspecifics, a prerequisite of individual recognition, has been studied in adult dairy cows; however, little is known about this ability at younger ages. In addition, early-life environments have been shown to impact the development of cognitive abilities. We explored the effect of environmental complexity on the ability of socially reared dairy calves to discriminate between unfamiliar conspecifics. Holstein heifers (n=16) were housed in pairs from day 6 of life, and pairs were pseudo-randomly allocated to one of two treatments: 1) regular pair housing for 22.5 h/d and 1.5 h of daily access to an enriched pen which included 3 other calves and several enrichment items (enriched calves, n= 4 pairs) or 2) regular pair housing for 24 h/d (control calves, n=4 pairs). After 10 days of treatment, calves were trained to discriminate between two unfamiliar calves in a Y-maze. Approaches to one calf were rewarded with access to 0.2 L of milk, while approaches to the other calf were punished with 1 min of confinement in the test area. Training sessions were performed once a day over 20 days, and each session consisted of 10 trials. Performance probability (P) was calculated per session with the R function pbinom using a probability parameter for binomial distribution of 0.5. The discrimination task was considered learned when calves' performance over four consecutive sessions resulted in $P < 0.003$ and did not include any session with less than 6 correct answers. Whilst 8 of the 16 calves reached this learning criterion, requiring 15.75 ± 2.64 (mean \pm SD) training sessions (12 – 18), 6 of the successful calves showed a side bias, exclusively approaching a single side during 1 to 7 sessions. Among the 8 calves that did not meet the learning criterion, 6 also exhibited a side bias. The environmental enrichment treatment had no clear effect on the number of sessions needed to reach the criterion. Our findings suggest that dairy calves are able to discriminate between two unfamiliar conspecifics.

Funded by NSERC Discovery Grant awarded to MvK.

Rapid Detection of Micro/Nanoplastics Via Integration of Luminescent Metal Phenolic Networks Labeling and Quantitative Fluorescence Imaging in A Portable Device

Haoxin Ye (a), Xinzhe Zheng (b), Haoming Yang (a), Matthew D. Kowal (c), Teresa M. Seifried (c), Gurvendra Pal Singh (a), Krishna Aayush (a), Guang Gao (d), Edward Grant (c), David Kitts (a), Rickey Y. Yada (a), Tianxi Yang (a)*

- a. Food, Nutrition and Health, Faculty of Land and Food Systems, The University of British Columbia, Vancouver V6T1Z4, Canada
- b. Department of Computer Science, Faculty of Engineering, The University of Hong Kong, Hong Kong 999077, China
- c. Department of Chemistry, Faculty of Science, The University of British Columbia, Vancouver V6T1Z4, Canada
- d. Life Sciences Institute, The University of British Columbia, Vancouver V6T1Z2, Canada

The accumulation of micro/nanoplastics (MNPs) in ecosystems poses tremendous environmental risks for terrestrial and aquatic organisms. Designing rapid, field-deployable, and sensitive devices for assessing the potential risks of MNPs pollution is critical. However, current techniques for MNPs detection have limited effectiveness. Here, we design a wireless portable device that allows rapid, sensitive, and on-site detection of MNPs, followed by remote data processing via machine learning algorithms for quantitative fluorescence imaging. We utilized a supramolecular labeling strategy, employing luminescent metal-phenolic networks composed of zirconium ions, tannic acid, and rhodamine B, to efficiently label various sizes of MNPs (e.g., 50 nm – 10 μ m). Results showed that our device can quantify MNPs as low as 330 microplastics and 3.08×10^6 nanoplastics in less than 20 min. We demonstrated the applicability of the device to real-world samples through determination of MNPs released from plastic cups after hot water and flow induction, and nanoplastics in tap water. Moreover, the device is user-friendly and operative by untrained personnel to conduct data processing on APP remotely. The analytical platform integrating quantitative imaging, customized data processing, decision tree model and low-cost analysis (\$0.015 per assay) has great potential for high-throughput screening of MNPs in agrifood and environmental systems.

Supported by Natural Sciences and Engineering Research Council of Canada (NSERC) Discovery Grants Program





ABSTRACTS

ORAL PRESENTATIONS

Root Exudation of Hazelnut Plants Under Drought and Nutrient-Limited Conditions

Karyna Howell (1), JT Cornelis (1), Thorsten Knipfer (2)

1. Soil Science, Faculty of Land and Food Systems, University of British Columbia, Vancouver, BC V6T 1Z4, Canada
2. Plant Physiology, Applied Biology, Faculty of Land and Food System, University of British Columbia, Vancouver, BC V6T 1Z4, Canada

Climate change is bringing about more extreme weather events challenging agricultural production in British Columbia [KT1] (BC). Drought conditions during the growing season can have devastating impacts on soil health, plant performance, and crop yield. A critical process that mediates soil-plant-microbe interactions is root exudation, i.e., the release of organic molecules from roots into the soil that benefits carbon cycling and stabilization, soil structure, enhances the availability of soil nutrients, and shapes microbial populations. However, drought's effects on root exudation are currently not well understood, with some research finding that water stress by drought increases exudation while others find it decreases. Moreover, drought conditions generally decrease nutrient availability and uptake in plants, which emphasizes the importance of root exudation under these conditions. Recent research has shown that in nutrient-limited conditions, plants increase root exudation and increase root exploration area creating more robust root systems. In this project we will study root exudation in hazelnut plants – an emerging [KT2] woody perennial crop in BC - under both drought and nutrient-limited [KT3] conditions. The overarching research goal [KT4] is to monitor nutrient and exudate flows in the soil-plant continuum and investigate how the observed dynamics are linked to plant performance and resiliency.

Supported by Fulbright USA

Not just the birds and the bees: Moth pollination in berry agroecosystems

Hannah Anderson (1), Eva Burghardt (1), Juli Carrillo (1)

1. Plant-Insect Ecology and Evolution Lab, Faculty of Land and Food Systems, The University of British Columbia, Vancouver, BC, V6T 1Z4, Canada

Agricultural crops are facing a pollination crisis, yet the bulk of current research is on daytime pollinators. Night-dwelling insects, specifically moths, are important pollinators for wild plants, but their pollination services for horticultural crops are underrecognized. Nocturnal moths are the most prominent and efficient nighttime pollinators – many plant species depend solely on nocturnal moths for reproduction. Emerging research suggests the critical, unsung contributions of nocturnal pollinators to agriculture and stresses the urgency of investigating nocturnal pollination in crop systems. We sampled nocturnal moths during peak flowering season in fields of cultivated blueberry and strawberry crops. We counted and identified pollen carried on each moth as an indication to the flowering plant species they had potentially pollinated. We identified moths to species and found an assemblage previously unknown to be pollinators carrying pollen from a variety of plant species including blueberry and strawberry crops. We confirmed that previously reported pollinating species of moths such as those in the family Sphingidae also occurred and collected pollen in berry agroecosystems in BC. We identified *Plusia putnami*, *Egira simplex*, and *Pero behrensaria*, previously unknown pollinators carrying pollen. We also recorded *Peridroma saucia*, *E. simplex*, and *P. behrensaria* species carrying berry pollen for the first time. We found a wide range of pollen loads, ranging from one grain to >3000 grains and saw clear shifts in species assemblages over the growing season. We provide further support to the importance of moths as pollinators and stress the need to include nocturnal insects in future pollination studies.

Supported by 'NSERC Alliance grant'





ABSTRACTS

ORAL PRESENTATIONS

Spatiotemporal prevalence of two *Agriotes* pest species at the UBC Farm

Nisa Chavez, Carly McGregor, Wim Van Herk, and Juli Carrillo

Plant-Insect Ecology and Evolution Lab, Faculty of Land and Food Systems, Centre for Sustainable Food Systems, Biodiversity Research Centre, The University of British Columbia, Unceded x̓m̓əθk̓w̓əy̓əm Musqueam Territory, Vancouver, BC, Canada

The soil-dwelling larvae of *Agriotes lineatus* and *Agriotes obscurus* are major invasive pests in agricultural areas across the Lower Mainland of British Columbia. The larvae, known as wireworms, consume a broad assortment of vegetative material in the soil for several years before emerging as adults, damaging the below-ground plant structures of field crops and causing substantial economic losses. Wireworms are difficult to control due to their polyphagous feeding capabilities, prolonged occupation in cryptic subterranean environments, and limited management options, compelling integrated pest management programs to target the adult, aboveground stages of these pests. However, little information on the seasonal abundance and activity periods of these click beetle species are available across a range of environments which poses problems for the development and implementation of mitigation strategies. As such, we monitored *Agriotes lineatus* and *Agriotes obscurus* from April to September each year from 2018 to 2022 at the University of British Columbia Farm using pheromone-lured pitfall traps to describe their spatiotemporal patterns. In total, we captured 13,399 adult click beetles. The record for the highest yearly click beetle catch occurred in 2018, with decreasing abundance in subsequent years. The record for the highest monthly catch occurred in May, and the lowest occurred in August. *Agriotes lineatus* was more common than *Agriotes obscurus* and neither showed a preference for specific trap locations at the farm. This study informs the optimal timing and location of pest control strategies at the UBC Farm for adequate suppression of adult click beetles.

Supported by 'Organic Science Cluster 3' Agricultural and Agri-Food Canada

Potential of the macroalgae dulse (*Devaleraea mollis*) to mitigate effects of ocean acidification on larval Pacific oysters (*Magallana gigas*) in land-based co-culture

Leah Wessler (1), Jennifer Clark (2), Andrea Frommel (1)

1. Aquaculture and Climate Change Lab, Faculty of Land and Food Systems, University of British Columbia, Vancouver, BC V6T 1Z4, Canada
2. Cascadia Seaweed, Sidney, BC V8L 3A4, Canada

Ocean acidification (OA) conditions along the west coast of Canada and the US are corrosive and can negatively impact economically important marine calcifiers such as Pacific oysters. Currently, shellfish hatcheries combat ocean acidification by making artificial seawater, transporting larvae to other countries during vulnerable stages, or buffering water chemically. These methods can be unsustainable, expensive, or can affect the health of oysters later in life. Through photosynthesis, marine macroalgae uptake carbon from seawater, functioning as a potential tool for mitigating OA while providing a range of important products such as nutritious food, cosmetics, and biofuels. To quantify effects and fill knowledge gaps, our research examines the potential of tank cultivated macroalgae (dulse) to mitigate the harm caused by OA on oyster larvae in land-based co-culture. Preliminary data from this study shows that presence of dulse can increase tank pH by over 0.4 units, depending on OA condition. We hypothesize that negative effects of OA on oyster larvae survival and calcification, and changes to the larval microbiome due to OA, will be mitigated by co-culturing the oysters with dulse. Carbonate chemistry will be modified to represent three OA conditions corresponding to ambient (400 $\mu\text{atm CO}_2$), local upwelling (1000 $\mu\text{atm CO}_2$), and upwelling + future projections (3000 $\mu\text{atm CO}_2$). Two groups of larval oysters, one in co-culture with dulse and one in monoculture, will receive water from each OA level. Oyster samples taken across both 48-hour and 2-week timescales will be analyzed for survival, growth, shell shape, and expression of shell formation genes. At the end of each timescale, larvae from each experimental unit will be pooled for microbiome analysis, which has been linked to oyster immune function. Findings will provide data to model the CO₂ uptake potential of macroalgae, applicable to industry and restoration efforts for both shellfish and macroalgae. Outcomes of this study will aid the shellfish industry in adapting to climate change while increasing sustainability and net income through increasing yield and providing crop diversification.

Supported by: Mitacs Accelerate Fellowship, UBC Affiliated Fellowship





ABSTRACTS

ORAL PRESENTATIONS

A One-Health assessment of extended-spectrum beta-lactamase-producing *Escherichia coli* in the Fraser Valley

Cassandra Klaas (1, 2), Rhiannon Wallace (1), Siyun Wang (2)

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2. Department of Food, Nutrition, and Health, University of British Columbia, Vancouver, British Columbia, Canada

Escherichia coli are Gram-negative bacteria that are ubiquitous in a variety of environments. Some pathotypes of *E. coli* are important human pathogens. Extended-spectrum beta-lactamase (ESBL) producing *E. coli* are particularly concerning as infections resulting from them are difficult to treat because ESBL-producing bacteria are generally resistant to multiple categories of antimicrobials. The World Health Organization (WHO) recently listed ESBL-producing Enterobacteriaceae as a priority pathogen for new antibiotic development. The Fraser Valley is an agriculturally diverse peri-urban region with a high density of livestock operations. Approximately 75% of the province's milk is produced in the Fraser Valley, with some of the dairy operations located in close proximity to residential communities and water used for recreational activities. Presently, limited baseline data is available on the risk of the transmission of ESBL *E. coli* to surrounding environments and humans from dairy operations. This study will assess antimicrobial resistance patterns across the One Health continuum and determine if potential hotspots for AMR transmission exist. Bacterial isolates will be collected over a two-year period from both conventional and organic dairy operations and surrounding environments throughout the Fraser Valley. ESBL-producing *E. coli* will be identified using selective plating techniques and molecular methods. In the first year of sampling, 277 ESBL *E. coli* were obtained from dairy operations and 62 ESBL *E. coli* were recovered from municipal wastewater. Preliminary data supports our hypotheses and will allow for the identification of AMR hotspots in dairy operations within the Fraser Valley and points along the One Health continuum for resistance mitigation.

This project is funded by the Government of Canada's Genomics Research & Development Initiative (GRDI), 2022-2027.

Grapevine (*Vitis vinifera* L.) stomatal behavior, fruit cuticular water loss rates, and their relationship with fruit growth and metabolite content changes during progressive drought

Nikolas Wilson (1,2), Thorsten Knipfer (1), Melissa Marthias (1,2), Simone Castellarin (1,2)

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2. Wine Research Centre, University of British Columbia, Vancouver, BC V6T 1Z4, Canada

Climate change is a major concern for agriculture across the world, as many regions are becoming drier and hotter with possible negative implications on fruit yield and quality. Wine grapes are often grown in warm, dry regions and have become a model fruit crop for studying plant hydraulics and drought tolerance. Grapevine varieties often display contrasting hydraulic behavior during droughts, with some varieties behaving more conservative than others and closing leaf stomata earlier to prevent transpirational water loss. Furthermore, grapevine varieties can differ in their rates of water loss from fruit cuticles, which is the primary route of water loss from the fruit during drought. However, it remains unclear whether the different leaf stomatal behaviors and/or fruit cuticular water loss rates of grapevine varieties are related to differences in changes to fruit growth and quality during droughts. This study sought to determine whether any relationships were present by comparing four grapevine varieties ('Cabernet Franc', 'Semillon', 'Grenache', and 'Riesling'). Progressive drought was applied by fully withholding irrigation and leaf stomatal behaviors were tracked with a porometer. Fruit growth was tracked using handheld digital calipers and important metabolites related to wine quality were tracked using HPLC-RID. Detached grapes were weighed daily in a desiccator to determine cuticular water loss rates. The study was repeated prior to and after ripening to determine whether phenological stage impacted any relationships (if present). This study found that 'Cabernet Franc' was more resistant to changes in fruit size and metabolite contents than 'Semillon' and 'Grenache' prior to ripening and had more resistant fruits than all other varieties after ripening. This coincided with maintaining similar leaf stomatal behavior to controls for longer, and lower water loss rates through fruit cuticles in 'Cabernet Franc' compared to other varieties. 'Riesling' maintained similar leaf stomatal behavior to controls for longer and had more resistant fruit to changes in size and metabolite contents than 'Semillon' and 'Grenache' prior to ripening. The results of this study indicate that maintaining similar leaf stomatal behavior to well-watered plants helps prevent growth losses and metabolite content increases in fruit prior to ripening, and that low fruit cuticular water loss rates likely help prevent growth losses and metabolite content increases in fruit both prior to and after ripening.

Supported by 'NSERC Discovery Grant'





ABSTRACTS

ORAL PRESENTATIONS

A survey of dairy calf rearing practices in British Columbia

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Decades of research has helped inform ‘best practices’ on how to house, feed, and care for dairy calves, but little is known about how these practices are adopted on commercial farms. The aims of this study were to describe the rearing practices of dairy calves and the methods used assess calf performance on farms in British Columbia (BC). All 437 dairy farms in the province were invited to participate in an online survey distributed from June-December 2023. A total of 63 responses were received (representing 14.4% of the farms in BC). Participants identified themselves as farm owners (63.5%), farm managers (25.4%), farm workers (3.2%), or as holding multiple roles (7.9%). The average milking herd size was 166.7 ± 172.1 cows, and the primary breed was Holstein (84.1%). Participants reported that on average 2.8 ± 1.5 employees were responsible for the daily care of pre-weaned calves. Our results showed that 63.5% of participants housed calves individually, 23.9% socially housed calves in groups of two or more and, 12.7% of farms housed calves with a combination of individual and social housing. The mean maximum milk allowance offered was 9.5 ± 2.8 L/d with 87.1% providing >8 L/d. Teat feeding was used on 71.7% of farms with 16.3% using automated milk feeding systems and two responses reported feeding calves via the dam or nurse cows. Weaning age averaged 75.8 ± 16.3 d, with age being the primary indicator to determine weaning readiness. Only 33.3% of farms reported having a target growth rate, and only one participant stated that they had access to a scale. These results indicate that most dairy farms in BC are already feeding higher milk rations as now required in Canada’s Code of Practice for Dairy Cattle. In addition, a few farms have adopted social housing, well in advance of the requirement to do so by 2031. Finally, the results suggest that there is considerable room for improvement in monitoring calf growth; improved tracking of calf performance is likely to help farmers make better weaning decisions, including when and how to wean the calves from milk onto solid feed.

Funding source: NSERC Industrial Research Chair in Cattle Welfare

The impacts of elevated CO₂ on plant-insect interactions across multiple insect species

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Atmospheric CO₂ has been rising rapidly. Elevated CO₂ may disrupt plant-insect interactions by inducing changes in plant chemistry. Elevated CO₂ can suppress jasmonic acid (JA)-regulated hormonal defense and enhance salicylic acid (SA)-regulated defense against insect herbivores. However, insect responses to CO₂-induced changes in plant chemistry are unpredictable and species-dependent. Many factors such as differences in adaptation to host defense or mode of feeding can contribute to the wide diversity of insect responses. However, many herbivore studies at elevated CO₂ only consider one herbivore species. To fill this knowledge gap, we tested multiple insect species to examine species-specific responses to plants grown under elevated CO₂. We evaluated the change in weight and leaf matter consumed for two caterpillars (*Plutella xylostella* and *Spodoptera exigua*), and the change in population growth of one aphid species (*Myzus persicae*), on *Arabidopsis thaliana* reared at elevated CO₂ conditions as a model Brassica plant. We investigated the performance of three lepidopteran pests (*Manduca sexta*, *Spodoptera exigua* and *Trichoplusia ni*) on tomatoes (*Solanum lycopersicum*) grown at elevated CO₂ levels as a model Solanaceae plant. To evaluate the role of CO₂-induced changes in hormonal defense, we tested insect herbivory on plant genotypic mutants under-expressing JA or SA (JA- and SA-) in *A. thaliana*, and JA over-expressing (JA+) or JA- mutants in *S. lycopersicum*. We also investigated CO₂-induced changes in plant biomass, and for tomato, levels of terpenes, which can have anti-herbivory effects. Plant genotype affected caterpillar performance in both plant species, where insects weighed more on JA- plants. Caterpillars did not respond to CO₂-treatment in *A. thaliana* trials, while there were species-specific differences in insect responses to CO₂-treatment in *S. lycopersicum* trials. In *S. lycopersicum*, *M. sexta* weight increased while *S. exigua* weight decreased and *T.ni* weight did not change on CO₂-enriched plants. Elevated CO₂ decreased the concentration of two monoterpenes in wild type tomato. *M. persicae* performance was unaffected by CO₂ or genotype. These results suggest that elevated CO₂ may not significantly alter the performance of *P. xylostella*, *S. exigua* and *M. persicae* on *A. thaliana*, while *M. sexta* feeding on tomato may increase at higher CO₂.

Supported by Genome BC and Mitacs





ABSTRACTS

ORAL PRESENTATIONS

Burden of Cardiovascular Diseases, All-cause Mortality and Hospitalization Attributable to poor dietary patterns among different socio-demographic groups

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Poor diet quality is one of the largest and most common contributors to the burden of morbidity and mortality among Canadians leading to chronic diseases, reduced quality of life, increased hospitalization, and premature death. The latest published Canada Food Guide (CFG-2019) aims to address this significant issue by promoting healthy eating and overall nutritional well-being of Canadians. While the impact of adherence to this guideline on the population health and hospitalization burden is not yet fully understood, several studies have found that adhering to healthy dietary patterns can reduce the risk of cardiovascular disease and all-cause mortality. Indeed, impact of non-adherence to the Canada's Food Guide and major Canadian dietary patterns on future incidence of cardiovascular diseases, all-cause mortality, and hospitalization needs further investigation. Canadian risk-assessment tools (for predicting future health) based on health behaviors- including the Cardiovascular Disease Population Risk Tool (CVDPoRT) and Mortality Population Risk Tool (MPoRT) only define diet quality as the frequency of fruit and vegetable intake. This approach neglects the importance of totality of diet that consider the quantity, proportion, variety, and combination of different foods and beverages consumed.

Therefore, this study aims to estimate the burden of cardiovascular diseases, all-cause mortality, and hospitalization attributed to unhealthy dietary patterns among different socio-demographic groups (based on income, education, food security) using the Canadian Community Health Surveys (CCHS)-Nutrition data linked to health administrative databases. In addition, we aim to modify current risk prediction tools, the CVDPoRT and MPoRT and Hospitalization model by incorporating dietary pattern in these algorithms. Updating these tools based on dietary patterns will be invaluable for developing Canada's first population health models to estimate current and future burden attributable to poor adherence to dietary guidelines. For assessing dietary pattern, both a priori and data-driven techniques (based on ongoing literature review) will be used. Burden of disease among population subgroups will be estimated using updated predictive risk algorithms.

This project has the potential to support development of future evidence-based dietary guidelines useful among socioeconomic groups and can be used for demographic and clinical purposes.

Supported by Canadian Institute of Health Research (CIHR) Project Grant

Decolonizing Urban Alternative Food Organizations in Winnipeg: Centering the Voices of Indigenous, Black, and People of Colour

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Indigenous Peoples, newcomers, and racialized communities are at greater risk of poverty in Winnipeg, limiting food access. Winnipeg's inner-city poverty rates are higher amongst Indigenous People, recent immigrants, visible minorities, and people with disabilities – 49.2%, 36.6%, 27.3% and 34.8%, respectively. In response, many Winnipeg grassroots projects, and Alternative Food Movements (AFM) have emerged and contributed to efforts to meet the needs of diverse communities. Despite the good intentions and works of AFMs in Canada, the discourses and leadership that shape them tend to lack the diversity of the communities they serve and are led mostly by white settlers. IBPOC, despite the disproportionate burden of food insecurity and structural racism in the food system, has shown agency in determining alternative foodways to feed their communities. Yet, their knowledges and voices continue to stay at the margins of alternative food organizations. More diverse leadership of AFMs by IBPOC could better determine and ensure their success. Information on the importance of diversity in food leadership and its impacts on addressing urban food insecurity and other cultural needs in Winnipeg is unknown. Borrowing from Indigenous methodologies and based on anticolonial and decolonial theory, this research aims to make visible the knowledge, voices, and responses of IBPOC working in AFOs, a subgroup of Alternative Food Movements. Culturally and community-appropriate food initiatives must be created to improve food security while unsettling the knowledge and structures that inform food organizations. AFOs in urban Winnipeg must continue to work in decolonizing efforts to create a just food system further. This research evaluates one of the ways this may be achieved, that is, through centring the voices and knowledges of IBPOC in food practices.

Supported by the Social Sciences and Humanities Research Council funding.





ABSTRACTS

POSTER PRESENTATIONS

Canadian dairy farmer perspectives on dairy cattle and calf welfare issues during the periparturient period

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The majority of dairy cows in Canada and the United States live in indoor compared to pasture-based, or outdoor, housing systems. Indoor dairy cow housing systems exhibit higher rates of lameness, hoof lesions, and aggressive interactions among the herd compared to housing systems with pasture access. Previous research also indicates a public preference for outdoor dairy cow housing systems, with perceptions of greater naturalness and improved physical health and emotional wellbeing of cows. Researchers suggest that the public is overall unaware that most dairy cows are housed indoors without pasture access. With increased awareness, housing dairy cows indoors may mis-align with public expectations and damage the reputation of the Canadian and American dairy industries. Therefore, understanding public attitudes towards farm housing practices is valuable for dairy farmers. Aligning with societal values can ensure that the public does not shift their purchasing away from dairy, which could jeopardize dairy farmer livelihoods. This study aims to investigate attitudes of the Canadian and American public towards dairy cow welfare attributes in both indoor and outdoor housing systems through an online quantitative survey. Attitudes will be investigated through a quantitative survey, distributed to a representative sample of Canadian and United States public recruited using Amazon Mechanical Turk, calibrated using census data. Participants will respond on their level of preference of hypothetical farm scenarios, a tradeoff task and ranking of statements describing characteristics of dairy farms for cow welfare, willingness to pay for higher-welfare vs. conventional dairy, and general preference for indoor or outdoor housing of dairy cows. Participants will also answer a true/false knowledge test on dairy industry practices, 5-pt Likert scale questions under a selection of validated scales on specific sets of beliefs and values and demographics questions. The findings of this study can inform the Canadian and American dairy industries on welfare-attributes of dairy cow housing systems preferred by the public for efficient development of farm housing changes, ultimately improving cow and farmer wellbeing by aligning with public's values and expectations.

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Exploring concordance in eating behaviours in parents and children: A cross-sectional study.

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Eating behaviours refer to the interplay between physiological, psychological, social, and genetic factors that influence mealtime, food intake, and food selection in adults and children. Eating behaviours are measured using appetitive traits which include Food Approach traits (such as food responsiveness or emotional overeating) and Food Avoidance traits (such as slowness in eating or emotional undereating). Higher scores on Food Approach subscales are associated with higher energy intake and higher adiposity in children. Higher Food Avoidance scores and lower Food Approach scores are associated with lower adiposity in adults and children. Parents have a large impact on the development of child eating behaviours which is linked with long term health in the child. Parental and child eating behaviours have found to be correlated in two previous studies, but there is a lack of data pertaining to the Canadian context. The goal of this study is to examine concordance between parental appetitive traits and child appetitive traits in a sample of Canadian children between 5 and 11 years old. Canadian parents (n=781) of school-age children (5-11 years) completed a cross-sectional online survey between May and December 2022. Appetitive traits in children were assessed using the Child Eating Behaviour Questionnaire. Appetitive traits in parents were measured using the Adult Eating Behaviour Questionnaire. These two questionnaires measure Food Approach using the following appetitive traits: Food Responsiveness, Enjoyment of Food and Emotional Overeating. They measure Food Avoidance using the following appetitive traits: Satiety Responsiveness, Slowness of Eating, Emotional Undereating and Food Fussiness. Descriptive statistics were conducted (mean±s SD); values were considered significant at $p < 0.05$. Pearson correlations were conducted to assess associations between the child and parent appetitive traits. Parents responding (n=781) were mainly women, white, highly educated, and of high socioeconomic status. All Food Approach subscales were correlated between parents and children: Enjoyment of Food ($r=0.22$; $p < 0.001$), Emotional Overeating ($r=0.21$; $p < 0.001$) and Food Responsiveness ($r=0.22$; $p < 0.001$). Two of the four Food Avoidance traits were correlated between parents and children: Emotional Undereating ($r=0.21$; $p < 0.001$) and Food Fussiness ($r=0.20$; $p < 0.001$). This study found that self-reported parental appetitive traits are correlated to similar appetitive traits in children, notably within the Food Approach subscales. Aligned with other work, this study highlights the continued need to address parental eating behaviours when discussing changes in child eating behaviors.

Funding source: R. Howard Webster Foundation





ABSTRACTS

POSTER PRESENTATIONS

Wounding Rates in Socially Housed Zoo Primates

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Many zoo-housed primate species are managed in large, complex social groups that approximate group compositions in the wild. Social housing is beneficial as it provides a socially stimulating environment. However, a risk of social housing is that it allows opportunities for social conflict, which may lead to injury or otherwise compromise animal welfare. Here, we present an overview of prevalence and severity of injuries across four species of socially housed primates in institutions accredited by the Association of Zoos and Aquariums (AZA). We set out to quantify wounding rates in 95 bonobos (*Pan paniscus*) using wound report forms received from eight participating AZA institutions and one Japanese sanctuary housing bonobos. Husbandry staff filled out wound report forms for all socially inflicted wounds and noted the location of the wound(s), if the assailant was known, if veterinary intervention took place and what kind, if the individual wounded had to be separated from the group and for how long, and the severity of the wound(s) on a 1-5 scale. Wound severity was measured from superficial (rated as 1), defined as a small scratch/partial skin break to severe (rated as 5), defined as a gaping wound or a missing body part. Completed wound forms were sent to the lead researcher at the end of each month. Overall, wounding rates reported in bonobos during a 7-month period were low and primarily superficial (0.21 average wounds per month per individual, 0.71% of wounds rated deep/severe). When comparing bonobo average wound rates reported in the literature for gorillas (*Gorilla gorilla gorilla*), chimpanzees (*Pan troglodytes*) and Japanese macaques (*Macaca fuscata*) using the same protocol, we found risk of wounding and severity was similar across all four species (gorillas = 0.39 average wounds per month per individual, 2.9% of wounds rated deep/severe; chimpanzees = 0.79 average wounds per month per individual, 2.7% of wounds rated deep/severe; Japanese macaques = 0.38 average wounds per month per individual, 3.9% of wounds rated deep/severe). We conclude that the risk of wounding is low in bonobos in the participating AZA accredited facilities. Although efforts to further reduce the risk of wounding are important, we suggest that the risk of injury is sufficiently low that it should not deter facilities from adopting socially housing for these species when using species-appropriate housing and management.

Supported by the Women's Board of Lincoln Park Zoo

The legitimacy of industry-led dairy cattle welfare governance: A case study comparison of Canada and the United States

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The Farmers Assuring Responsible Management (FARM) program in the United States and the proAction program in Canada are dairy industry led efforts to create animal welfare standards and audit farms for compliance in their respective countries. 99% of US milk is subject to FARM standards, and all Canadian milk is subject to proAction standards. Industry-led standards have been criticized for lacking legitimacy, which can be understood as the acceptability of an entity to create and enforce rules and is an important factor in a governance system's effectiveness. Legitimacy has two components; normative legitimacy is determined by the characteristics of the entity, and empirical legitimacy is determined by how stakeholders perceive the legitimacy of the entity. This study aimed to analyze the normative legitimacy of the FARM program and proAction according to an input, throughput, and output framework using publicly available documents from their websites. Input legitimacy is determined by the ability of stakeholders to give input into the standard development process. Both programs face limited legitimacy due to prioritizing industry representation; the FARM program in particular has no input from non-industry stakeholders. Throughput legitimacy is determined by the quality of government processes, including transparency, accountability, inclusiveness, and openness to consultation. Notably, both programs have some transparency about their governance structure and internal actions, but proAction is limited by a lack of transparency about the outcomes of farm audits. Finally, output legitimacy is determined by the efficacy of the standard. Both programs benefit from having high participation across their respective dairy industries, but may face limited legitimacy because their standards are lower than those created by non-industry groups. Although there are tradeoffs between input, throughput, and output legitimacy, our analysis suggests that enhancing representation of different stakeholder interests and transparency may enhance the legitimacy of these programs. In addition, little research exists on the empirical legitimacy of these programs; therefore, we call for additional research on this topic, particularly from the perspective of non-industry members. Although industry-led animal welfare governance likely has greater perceived legitimacy by dairy producers, it may face low perceived legitimacy by non-industry members of the public which may undermine the social sustainability of the current governance system.

Supported by the Social Sciences and Humanities Research Council





ABSTRACTS

POSTER PRESENTATIONS

Unraveling the genetic control of red raspberry fruit color

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Red raspberries (*Rubus idaeus* L.) are a high-value crop, and are acclaimed for their fruit quality characteristics and putative health benefits. Among fruit quality characteristics, color is a critical trait in determining market acceptability and consumer preference. Red fruited cultivars are the most common in commercial settings and market selection is dependent on the color intensity: while the processing industry needs dark berries for most applications, the fresh market requires bright red and non-darkening fruit. Anthocyanins, a group of water-soluble phenolic compounds, are regarded as the major contributors to raspberry red fruit color. Knowledge on the genetics of raspberry fruit pigmentation would be valuable for breeding programs, but to date the genetic control of the different red intensities of raspberries remains elusive. The present study aims to map the genetic regions underlying the red shades of raspberry fruit through a genome-wide association study (GWAS). Fruits from 765 red raspberry cultivars and selections were harvested over four seasons (2018-2021) and analyzed for total anthocyanin content and color parameters collected through digital phenotyping. Total anthocyanin content averaged 50 mg/100 g fresh weight (FW) peonidin-3-O-glucoside equivalents and color coordinate L* (representing lightness) averaged 21.71. Leaves from all genotypes were harvested in summer 2022 and used for genomic DNA extraction. Whole-genome sequencing of DNA samples was conducted with Illumina technology. Sequences were aligned to the 'Malling Jewel' reference genome and are currently being processed for the detection of single nucleotide polymorphisms (SNPs). The GAPIT toolkit will be used to perform the association between phenotypic and genotypic data. The results of this study will detect associations between genetic variants, fruit color, and fruit total anthocyanin content, and identify SNP markers associated with the trait. Such markers will be used in raspberry breeding programs to facilitate the development of cultivars with desired fruit color.

Supported by: the Canadian Agricultural Partnership project ASP-007 "Competitive BC Berry Production through Innovative Genetics and Practices"

Identifying Housing and Breeding Practices in Home Dog Breeding Facilities

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As the demand for purebred dogs persists and rescues alone cannot meet market needs, understanding the practices of home breeders is becoming crucial. Previous literature suggests that the main components of stress-induced psychopathology in kennel-housed dogs are related to the absence of socialization and exposure to novelty, as well as spatial confinement and exposure to the elements. Notably, the breeding method known as "home breeding" exists as a potential mitigating factor due to its smaller scale and the provision of a more typical home environment for dogs. Despite its popularity as a source for a substantial number of dogs in the market, home breeding practices remain largely understudied. My study aims to bridge this gap by examining the housing and breeding practices of home breeders in British Columbia. Through surveys conducted across BC, I plan to analyze trends based on breed, location, and housing methods, shedding light on the distinctive characteristics of these facilities. Additionally, my investigation will explore whether the practices of home breeders are influenced by external factors. The findings from this research will not only provide insights into the landscape of home breeding but also inform the development of legislation and policies aimed at ensuring the well-being of commercial breeding dogs in British Columbia.

Supported by Life of Riley, Inc





ABSTRACTS

POSTER PRESENTATIONS

Interactions among diet density and resource levels for *Drosophila suzukii* and its associated larval parasitoids

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Drosophila suzukii, also known as spotted-wing drosophila, feeds on numerous cultivated and wild fruits in British Columbia. Current management strategies for *D. suzukii* rely heavily on regular application of broad-spectrum insecticides, necessitating additional control methods for sustainable management. Candidate biological control agents include *Leptopilina japonica* and *Ganaspis brasiliensis*, both introduced within British Columbia and specialized on *D. suzukii*. Previous studies have shown that penetration force determines some *D. suzukii* host fruit selection, with preferences across different host plants dependent on fruit ripeness and fruit tissue density. Fruit tissue density can also influence parasitoids' fitness as oviposition success depends on their ability to probe with their ovipositors through the fruit to locate larvae. We explored the optimal conditions and fitness effects on both *D. suzukii* larvae and their associated larval parasitoids using a novel plant-based diet at different agar, resource and antimicrobial concentrations. These findings may benefit future research for laboratory or mass rearing of *D. suzukii* and its associated larval parasitoids.

Supported by: Organic Science Cluster 3, NSERC, British Columbia Strawberry Grower Association, British Columbia Raspberries, BC Blueberries

An-udder way forward: positive reinforcement training for dairy cattle automatic milking system acclimation and its effects on cow-level production factors as an indicator of stress

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Recent developments in dairy farming practices have been characterized by an increased adoption of Automatic Milking Systems (AMS), signifying notable advancements in dairy farming technology. The implementation of AMS enhances the welfare of dairy cattle through the reduction of adverse human interactions during traditional parlour milking, giving cattle the agency to partake in voluntary milking, and contributing to more refined precision livestock farming methodologies by incorporating sophisticated monitoring tools essential for early disease detection. However, AMS transitions are often accompanied by challenges such as stress-related diseases in cattle as well as decreased milk production, which can be attributed to traditionally aversive training approaches or lack of training prior to transition. This study aims to investigate the efficacy of positive reinforcement training as a method to mitigate stress and enhance productivity during AMS transitions. A controlled study was conducted where half of a dairy pen received positive reinforcement training for AMS acclimation over a 2-week period, while the other half of the pen served as the control group. Cow-level production factors are then monitored post-AMS transition using the integrated data collection system within the AMS. The hypothesis driving this study was that dairy cattle exposed to positive reinforcement training prior to AMS transition would demonstrate increased milk yield and observable differences in milking intervals compared to the control group, as milk letdown is inhibited by stress. Results from this study will provide valuable insights to inform future training strategies prior to AMS transitions, with the objectives of augmenting production efficiency while concurrently mitigating stress levels in dairy cattle, thereby improving dairy cattle welfare.

Supported by the UBC Animal Welfare Program, as part of APBI 499 - Undergraduate Thesis in Applied Biology





ABSTRACTS

POSTER PRESENTATIONS

Bovine endometrial response to different concentrations of progesterone before estrus and different intensities of estrous expression

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4. Institute of Biological Sciences, University of Brasilia

This study aimed to evaluate if different concentrations of progesterone before estrus and different intensities of estrous expression impact endometrial gene expression in lactating Holstein cows. A total of 125 lactating cows were randomly assigned into two experimental groups: Low progesterone (n = 64) and High progesterone (n = 61). Cows received a pre-synchronization protocol followed by the progesterone treatment. Physical activity was monitored by an activity monitor, and the duration and intensity of estrus were measured. A subsample of 33 cows (High progesterone: n = 16; Low progesterone: n = 17) were submitted to uterine biopsy 7 and 14 d after identified estrous event. Total RNA was extracted from each sample and NanoString nCounter system was used to determine the abundance of specific mRNA molecules for 92 genes. Preliminary analysis suggested that greater progesterone concentrations before estrus as well as greater intensity and duration of estrus were associated with changes in endometrial gene expression of lactating Holstein cows. These modifications were linked to significant changes in the normalized number of reads for a total of 26 and 47 gene transcripts on days 7 and 14, respectively ($P < 0.05$). On day 7, molecular functions represented often in the list of increased gene transcripts included: eicosanoid metabolic process (AKR1C4, HPGD, PTGIS, AKR1B1), growth factor signalling (IGF1, IGF2, MEP1B, EGF), steroid signalling (PGR) and Wnt signalling (WNT5A, WNT6, WIF1). On day 14, genes with an increased number of reads and their functions included: growth factor signalling (IGF1, IGF2, MEP1B), steroid signalling (PGR, PGRMC1, PGRMC2) and nutrients/solute transport (FOLR1, FABP, SLC27A6, SSLP1, SLC27A6, CYP26A1). A considerable number of gene transcripts associated with immune response were included in the list of genes with decreased expression on day 14 (IL1B, CCL2, NFKB2, CCL4, CXCL8, IL1A, CXCL12, PTX3, CCL17, CCL22). Interestingly, a significant interaction between estrous expression and the progesterone treatment was found for several gene transcripts ($P < 0.05$). On day 7, greater intensity and duration of estrus were found to increase the number of reads for genes related to growth factor signalling (IGF2, MEP1B) and nutrients/solute transport (FOLR1, SLC1A4, CYP26A1) only in low progesterone treatment. Similarly on day 14, greater intensity and duration of estrus increased the number of reads for genes related to steroid signalling (PGR, PGRMC2) and nutrients/solute transport (FOLR1, FABP, SLC1A4, SSLP1, SLC6A20), whereas it decreased the number of reads for genes associated with the immune response (CCL2, CCL4, CXCL8, IL1A, CCL17) only in low progesterone treatment. Together, greater progesterone concentrations before estrus and greater intensity and duration of estrous expression seem to be promoting changes in endometrial gene expression that might be related to the uterine support for early embryonic development.

This study was supported by the 'Resilient Dairy Genome Project' and NSERC.

Historical trends in cranberry pest populations and their dependence on key climate variables

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Early pest detection determined by weekly monitoring of cranberry fields, is crucial for growers to develop effective crop protection and management plans. Insect pest levels and crop losses are expected to rise alongside the warming climate. However, the effects may be species dependent, affecting our ability to predict and generalize crop-specific risks. Canada is the second largest producer of cultivated cranberries (*Vaccinium macrocarpon*) globally, with British Columbia (BC) and Quebec accounting for approximately 95% of the Canadian market. The blackheaded fireworm (*Rhopobota naevana*) is a cranberry pest and has a long monitoring history in BC. To understand how climate affects long-term blackheaded fireworm population levels and dates of key management events, we analyzed decades of pest monitoring and weather records from the lower mainland, BC. We found that temperature represented as accumulated degree days (ADD) influenced larvae development but was not the main driver for changes throughout the season and over the years. Additionally, we found that ADD for the end of May and year does not show an increasing pattern from 1991 – 2020. However, there are yearly periods of low and high ADD that could be driven by natural changes influencing air and water currents. When analysing all years together, ADD calculated from the start of the year shows a significant effect with higher ADD delaying the julian date of first larvae emergence and first larvae spray. Additionally, higher ADD increases the emerging larvae population but decreases larvae population size on the julian date of the first larvae spray. There are also yearly variations that are not completely explained by changes in temperature. We did not find that warmer years with higher ADD follow the same trends. Additionally, larval population growth from the beginning of monitoring season increases as the days progress up to the first spray with differences among years. However, this data did not show that population growth was affected by ADD. These findings provide evidence that temperature can play a role in influencing insect development, but other climate variables or host plant variables need to be researched to determine if they contribute to variations seen over time.

Supported by Agriculture and Agri-food Canada (Federal Research Affiliate Program), Faculty of Land and Food Systems, University of British Columbia and Natural Science and Engineering Research Council of Canada





ABSTRACTS

POSTER PRESENTATIONS

Umbilical cord plasma ferritin concentration as a proxy measure of infant iron status: An exploratory analysis among term and preterm infants born in Vancouver, Canada

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Iron is vital for early brain growth and function. Low iron status at birth may adversely influence neurocognitive and physiological development. Prevalence of iron deficiency in pregnancy remains high; however, literature on iron status indicators in infants is limited. The aims of this study were to: 1) summarize cord blood iron biomarkers, as a proxy measure of infant iron status, from a cohort of births in Vancouver, Canada; and 2) explore factors influencing iron status. Cord blood specimens (n=46) were obtained from the BC Children's Hospital BioBank. The primary outcome was cord plasma ferritin concentration, measured using sandwich-ELISA. Multivariable quantile regression was performed to explore the effect of maternal age, gestational age, and infant sex on cord plasma ferritin. Median (IQR) maternal age and gestational age at delivery was 33.5 (29.3-35.8) years and 36.5 (30-39) weeks, respectively, and 44% of infants were female. Median (IQR) cord plasma ferritin concentration was 100.4 (75.7-128.9) $\mu\text{g/L}$, and only one infant was deemed to have low iron status, based on ferritin $<30 \mu\text{g/L}$. Among preterm deliveries, a one week increase in gestational age at delivery was associated with a 8.41 (95% CI [0.88, 12.1]) $\mu\text{g/L}$ increase in median cord ferritin. Interestingly, among term deliveries, a negative trend was observed where increasing gestational age was associated with decreasing cord ferritin. This non-linear relationship between gestational age and cord ferritin may indicate potential exhaustion of maternal iron stores and decreased placental iron transfer to the fetus beyond 37 weeks gestation. Female term infants were found to have higher cord ferritin compared to male term infants, suggesting differences in maternal iron mobilization and fetal iron acquisition dependent on infant sex. Further research is needed to investigate the underlying physiological mechanisms behind these sex- and gestational age-specific differences and inform appropriate thresholds to define iron deficiency using ferritin concentration in cord blood.

Supported by Canada Research Chairs Program

Multiple methods of evaluating pest and parasitoid presence in the field

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Drosophila suzukii, an invasive fruit fly which infests pre-harvest berries and stone fruits, is a major agricultural pest across North America. Natural enemies may play a key role in reducing our overreliance on synthetic insecticides for *D. suzukii* management. Parasitoid wasps, which infest and kill *D. suzukii*, are of interest as biological pest control agents. Adventive populations of two species of parasitoid wasp have recently been discovered in British Columbia, but their population dynamics and impact on *D. suzukii* infestation are not yet understood. The goal of this study is to determine whether apple cider vinegar (ACV) traps, a simple and low-cost method of insect monitoring, can be used to predict levels of *D. suzukii* and parasitoids in fresh fruit. ACV and fruit sampling were conducted weekly across an organic, biodiverse farm for three growing seasons, from 2021 to 2023. We will assess the strength of linear correlations between numbers of insects in ACV traps and in fruit samples for *D. suzukii* and for its parasitoids, testing time delays as well as assessing the predictiveness of ACV traps in the early, middle, and late season. If ACV traps are found to be strong predictors of insect populations, they may be useful as tools to inform management decisions, such as timing of pesticide application. The results of this study will also guide future work on statistical models of *D. suzukii* and parasitoid populations within our farm site.

Supported by the Organic Science Cluster III and Wisbey Veggies.





ABSTRACTS

POSTER PRESENTATIONS

Effects of Low Soil Biochar Application Rates on Nutrient Dynamics in a Coarse Textured Agricultural Soil

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Biochar is an agricultural soil amendment, used as both a carbon sequestration technique and to improve nutrient-use efficiency and water-holding capacity. Commonly studied biochar application rates exceed 10 t/ha, a rate that represents a large environmental draw and economic investment. The objective of this study is to examine the effects of a more “realistic” biochar application rate (3 t/ha) on soil nutrient availability, wheat yield, and nutrient-use efficiency on a coarse textured soil. To examine these effects, both a field trial, and a greenhouse trial that encompassed two growing seasons each were performed. In spring of 2022, biochar was applied in its original “pristine” state and a “charged” state after prolonged contact with nutrient-rich dairy manure slurry. A crop of spring wheat was grown in both 2022 and 2023 and the concentration of nutrients in soil and wheat were quantified after each growing season. While the impact of the 3 t/ha application, as either pristine or charged biochar, on soil nutrient bioavailability was not significant during the first cropping season, there was a decrease in yield and crop phosphorus uptake associated with the pristine biochar treatment (relative to control). The findings of the field trial were complemented by the greenhouse trial, in which spring wheat was grown in treatment amended field soil in columns, and leachates were collected. There was an increase in leached potassium associated with the charged biochar treatment (relative to pristine biochar). Together, these findings suggest that charged biochar can increase retention and availability of phosphorus, and the levels of leached potassium. It is hypothesized that phosphorus availability increase is due to organo-mineral coatings (formed in the charging of biochar) containing phosphorus on both biochar surface and within biochar pores. It is hypothesized that the increase of leached potassium is related to the high levels of potassium present due to the inclusion of potassium-rich dairy manure. While these results were both observed in the first growing season, they did not persist to the second growing season, suggesting that surface oxidation or biochar “aging” may have an impact. These studies suggest that 3 t/ha of biochar can have a discernable impact on crop yield and nutrient dynamics, and in order to avoid yield decrease and to address nutrient surplus, biochar may be charged with a nutrient source prior to application.

Supported by: Investment Agriculture Foundation of BC

A Qualitative Analysis of Sustainability Messaging in Food-Based Clinical Practice Guidelines used in Medical Nutrition Therapy for Type 2 Diabetes: Preliminary Findings

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Global food systems contribute to climate change, threaten food security, and increase the prevalence of chronic diseases, such as type 2 diabetes (T2D). To encourage more sustainable dietary practices, international organizations and governments have begun including sustainability messaging in national food-based dietary guidelines (FBDG). The widespread dietary shifts needed to mitigate the harms engendered by food systems will depend on the sizable populations living with T2D. However, little research has considered if and how sustainability messaging is provided to people living with T2D, who rely on medical nutrition therapy (MNT) instead of national FBDGs to guide dietary decision making. To address this, we examined food-based clinical practice guidelines used in MNT for T2D using the Sustainability in Food Based Dietary Guidelines Framework. We conducted a systematic search and quality appraisal of grey literature to identify n=46 documents used by Canadian dietitians in MNT for T2D. Using qualitative content analysis, we explored if and how five interconnected domains of sustainability (health and nutrition; food security and agriculture; markets and value chains; sociocultural and political; environment and ecosystems) are framed in these documents. In line with previous work examining sustainability in national FBDGs, we found that health was the primary domain represented in food-based clinical practice guidelines in MNT for T2D, followed by sociocultural and food security domains. The least represented domains were environment and markets, with most discussion on environmental concepts originating from guidelines specific to Indigenous populations. We found opportunities for synergy between health, environment, food security, and sociocultural domains, such as through the promotion of plant-based dietary patterns. Possibilities for trade-offs between these domains were also identified, such as through endorsement of low and very low carbohydrate dietary patterns. Overall, health, food security, and sociocultural domains were frequently framed as interconnected. Environment and market domains were only framed as connected to other domains in guidelines for Indigenous populations but were either absent or discussed in silos in other guidelines. This work shows that clinical practice guidelines used in MNT for T2D are versed in communicating the health, sociocultural, and food security-related concepts of sustainable eating, but rarely address market- and environment-related concepts. Future work should examine how sustainability concepts can be more comprehensively included in food-based clinical practice guidelines in MNT for T2D to help guide people living with chronic diseases towards dietary patterns that benefit both personal and planetary health.

Funding: O Wu is supported by the CIHR CGS-M Award and the Anne and John Brown Fellowship in Diabetes and Obesity Related Research.





ABSTRACTS

POSTER PRESENTATIONS

Maximizing root exudates in response to soil nutrient limitation and its potential benefits for agroecosystems

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Harnessing the benefits of soil-plant feedback can contribute to optimizing nutrient-use efficiency while maximizing soil carbon storage in agroecosystems. The evolution of symbiotic associations with microorganisms and of mechanisms such as the alteration of shoot-to-root ratio, change in root architecture, and root exudation allow plants to thrive in suboptimal nutrient conditions. Root exudation influences two key soil processes: (1) nutrient acquisition through root-induced bioweathering processes, and (2) carbon storage through the formation of organo-mineral associations. This project focuses on root exudation and aims at understanding how plants respond to phosphorus (P) limitation and how this contributes to mineral bioweathering. To achieve this, we conducted a hydroponic experiment in a growth chamber. White lupin (*Lupinus albus*) was grown in a P fertilization gradient (5, 10, 20, 30 and 50 μM P) for 6 weeks. Over the growing period, root exudates were collected, and photosynthesis was measured with a leaf gas exchange system (Li-COR) weekly. This was complemented with bi-weekly measurements of total leaf area, root and shoot biomass, and root systems morphological traits. RhizoVision Explorer and SmartRoots softwares were used to assess total root length, number of root tips, total root surface area and number and total length of cluster roots i.e. an evolutionary adaptation consisting of hairy rootlets aggregated in longitudinal rows forming distinct clusters. The concentration of 14 metabolites (organic acids, amino acids, and sugars) in the root exudates were analyzed by gas chromatography-mass spectrometry. To assess how soil type influences the contribution of root exudates to mineral bioweathering, batch dissolution tests with the collected root exudates were conducted on 3 soils with contrasting physicochemical properties (eluvial, illuvial and parent material from the Cox's Bay podzolic soil chronosequence). This research sheds light on how the strategic application of moderate nutrient-limiting growth conditions to agroecosystems can contribute to maximizing root exudation and the associated benefits in terms of mineral dissolution.

Funding source: 'WBI.world' Wallonie-Bruxelles Internationale.

A portion of this research was performed under the Large-Scale Research program (proposal: <https://www.emsl.pnnl.gov/project/60372>) at the Environmental Molecular Sciences Laboratory, a Department of Energy (DOE) Office of Science User Facility sponsored by the Biological and Environmental Research (BER) program under Contract No. DE-AC05-76RL01830.

Identification of prophages in the genomes of five primary methane-producing archaea in cattle for novel methane mitigation targets

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Methane (CH₄) is a potent greenhouse gas that is naturally produced in cattle to remove hydrogen and maintain proper rumen fermentation. Methanogenic archaea (methanogens) produce CH₄ in the rumen of cattle through one of four pathways (hydrogenotrophic, methylotrophic, methyl reduction, acetoclastic), with methyl reduction being associated with high CH₄-producing cattle. There are no effective methods to date for CH₄ emission control in cattle, and therefore, effective, long-lasting, and cost-effective solutions to manage enteric CH₄ emissions are needed for cattle production. We propose that bacteria- and archaea-specific phages can allow for precise and targeted control of methanogens in the rumen microbiome, which could be a novel and effective method for CH₄ mitigation. Previous research has identified five primary methanogen species in the rumen of cattle, namely *Methanobrevibacter ruminantium* M1, *Mbb. boviskoreani* JH1, *Mbb. smithii* DSM 861, *Methanosphaera stadmanae* DSM 3091, and *Mbb. gottschalkii*. These five methanogens are associated with different methanogenesis pathways and with high or low CH₄-producing cattle. We speculate that the phages for these methanogens have the potential to be exploited as a novel CH₄ mitigation tool. Thus, the objective of this study was to identify prophages encoded in the genomes of the five primary methanogen strains. Using PHASTER (PHASTER.ca), a software developed to identify and annotate prophage regions, we revealed the presence of prophage regions encoding for phages and phage proteins in the genomes of three of the methanogens. Specifically, *M. ruminantium* M1 contained three prophage regions (chr:417460-424654;435879-445003;1904044-1912968) that corresponded to a total of 13 phage species and 26 phage proteins, *M. smithii* DSM 861 contained one prophage region (chr:1323885-1337018) that corresponded to 6 phage species and 10 phage proteins, and *M. gottschalkii* contained one prophage region (chr:430066-438217) that encoded 3 phage species and 11 phage proteins. These prophages have the potential to be novel targets to reduce methanogenesis, however, further research is needed to confirm whether these prophages can be induced in vivo and whether they are correlated to high or low CH₄ emissions in cattle.

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ABSTRACTS

POSTER PRESENTATIONS

Impact of subclinical ketosis on the behaviour and productivity of dairy cows milked in robotic milking systems

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The use of robotic milking systems is increasing exponentially worldwide. Cows in these systems milk more often and typically produce higher quantities of milk. The increase in energy required to support this production level has been linked to an increase in beta-hydroxybutyrate (BHB) concentrations, indicative of subclinical ketosis (SCK). However, many studies investigating SCK are conducted on cows milked in conventional milking systems. Therefore, the objective of this study is to explore BHB concentrations, and SCK events within robotically milked herds, to further understand the impact on milking characteristics and cow behaviour. Multiparous Holstein cows (n=300) were enrolled from a robotic milking herd in the Fraser Valley of British Columbia, Canada, 1-week prior to dry off and followed until 60 days in milk (DIM). Behavior outcomes (rumination, eating time) were measured continuously, with production outcomes followed until 60 DIM and blood samples collected across the first 21 DIM. Blood was analyzed cow-side for BHB concentrations. Area under the curve (AUC) for each cow's BHB values throughout the first 21 DIM was calculated. For every 1-unit increase in AUC, milk yield increased by 0.9 kg/d, eating time decreased by 7.2 min/d, and rumination decreased by 7 min/d ($P=0.01$, $P=0.02$, $P=0.05$, respectively). The effects of testing positive for SCK on each sample day were tested to determine which days had the largest impact on milk and behaviour outcomes. Cows who tested positive for SCK at 6 DIM, produced 4.8 kg/d less of milk on average, compared to non-SCK cows, across the first 60 DIM (SCK=31.2 kg/d, Non-SCK=36 kg/d, $P=0.03$). While cows who tested positive at 8, 12, and 14 DIM, produced 3.7 kg/d, 6.5kg/d, and 4.3 kg/d more milk than non-SCK cows ($P=0.05$, $P=0.01$, $P=0.05$, respectively). The largest impacts on daily eating and rumination time across the first 60 DIM, occurred from positive SCK test at 3 DIM, with SCK cows eating on average 107.2 min/d less ($P<0.01$) and ruminating 120 min/d less ($P<0.01$) than non SCK cows. This research highlights the importance of time of SCK testing and the potential to customize testing days depending on the unique needs of each herd.

Supported by NSERC, BC Dairy and Genome Canada

Starter phosphorus fertilization for silage corn in dairy manured soils in the Fraser Valley, Canada

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Starter fertilizer phosphorus (P) is crucial to crop production, but its application beyond what is needed for plant growth can result in high soil P concentrations and increase P loss from agricultural land to water. The objectives of this work were to assess the effects of increasing rates of starter fertilizer P on: (1) silage corn dry matter (DM) yield, plant P uptake, and root growth at early growth stages (3-leaf (V3) and 6-leaf, (V6)); and (2) changes in soil phosphate concentrations using anion exchange membranes (AEMs) during the growing season. We conducted field trials in 2020 and 2021 with increasing starter P rates (0, 5, 10, 15 and 20 kg P ha⁻¹) on eight farmers' fields across the Fraser Valley (British Columbia, BC, Canada). At the V3 and V6 leaf stages, corn DM weight response to starter fertilizer P was not significant, except at one site where the critical rate was 5 kg P ha⁻¹. Starter P fertilizer application did not affect root length and root diameter, but decreased root surface area, volume, and dry matter weight. The concentrations of AEM-P increased with starter fertilizer P only during the first week after application, but not during the rest of the growing season. These results showed that starter fertilizer P could be reduced or even eliminated completely without affecting the growth of young plants and yield at harvest, decreasing the need for off-farm P inputs and the risk of P loss to the environment.

Supported by Agriculture and Agri-Food Canada





ABSTRACTS

POSTER PRESENTATIONS

Gene expression analysis in in vitro cultured cumulus cells of female dogs treated with BMP15 and GDF9 growth factors: Implications for canine folliculogenesis

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Brazil faces significant challenges in conserving its canid species, many of which are on the verge of extinction. Preserving the genetic diversity of these animals is crucial for their survival and long-term reproductive health. Establishing germplasm banks emerges as a vital strategy to safeguard their genetic material and contribute to research and conservation efforts. Thus, this study aimed to evaluate the gene expression of six genes (PTX3, COX2, HAS2, CX43, STAR, and KITLG), related to folliculogenesis, in in vitro cultured cumulus cells from female dogs treated with growth factors (BMP15 and GDF9). In the initial tests, 2 ovaries were collected, and their follicles (>2mm) were aspirated. Cumulus cells were then extracted and placed in culture. After 7 days, when reaching confluence, 50,000 cells per well were seeded to initiate the tests. Four treatments were conducted: (1) 200 ng/mL BMP15, (2) 200 ng/mL GDF9, (3) 200 ng/mL BMP15+200 ng/mL GDF9, and (4) control. The tests lasted for 15 days, with the medium containing factors being changed every 3 days. On the 15th day, RNA was extracted using the Relia Prep Kit from Promega. The NanoDrop was used to approximate RNA quantity, and the RNAs were then converted to cDNA using the GoScript RT System Kit from Promega. The qPCR was performed for the 6 genes plus ACTB. All exposure steps were carried out in biological triplicates, and qPCR was run in technical triplicates. Among the six genes analyzed, the BMP15 treatment produced significant results ($P < 0.05$), with COX2 and PTX3 reinforcing trends of increase observed in previous experiments. It is noteworthy that COX2 also showed a significant expression increase ($P < 0.005$) with the BMP15 + GDF9 treatment. Although KITLG and STAR exhibited increased expression trends, statistical significance was not reached. CX43 and HAS2 did not show any significant increase or decrease, nor did they exhibit trends like KITLG and STAR. In conclusion, BMP15 treatments demonstrated significantly more favorable responses than GDF9 treatments, increasing gene expression. Therefore, future tests should focus on using only 200 ng/mL of BMP15 and 200 ng/mL BMP15+200 ng/mL GDF9 in the culture medium, as these treatments contribute to increased gene expression related to folliculogenesis in female dogs.

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Quantification of soil properties in the Kitselas Canyon Indigenous Forest Garden

Alyssa Robinson (UBC), JT Cornelis (UBC), and Chelsey Armstrong (SFU)

Indigenous peoples in Pacific Northwest actively managed their territories for millennia, yet scholars know little about the extent to which their management practices impacted contemporary forests. Recent research has shown that the legacies of historical peoples' active management of temperate forests can still be observed today in native plant foodsheds called "forest gardens" composed largely of deciduous fruit trees and shrubs, growing near archaeological village sites. Forest garden ecosystems and plant foods were historically actively managed through practices such as burning, transplanting, clearing, and fertilizing. Historical soil management may play a vital role in maintaining these landscapes; however, little is known about the properties and functioning of soil in forest gardens. Therefore, to sufficiently guide the revitalization of Indigenous forest garden stewardship, we have partnered with Kitselas Canyon First Nation to gain a deeper understanding of how ancestral practices in forest gardens have influenced changes in soil properties and functioning.





ABSTRACTS

POSTER PRESENTATIONS

Climate change effects on Pacific herring exposed to air during their development.

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Climate change can exacerbate seasonal and spatial variations in environmental conditions. In the coastal waters of British Columbia, increases in CO₂ levels can already reach more than 1000 μatm in some regions through local oceanographic processes. These high CO₂ levels can impact commercially important fish for British Columbia, such as Pacific herring with spawning grounds located between Vancouver Island and mainland BC. Salinity, temperature, and hypoxic conditions are challenging in those waters with hypoxic events closely related to ocean acidification. It has been shown that the embryos of Pacific herring are particularly vulnerable to high levels of aquatic CO₂. A potential refuge could be air exposure as Pacific herring spawn in the intertidal where embryos are exposed to air during low tide. During air exposure, excess CO₂ could be off-gassed and embryos could take up O₂ due to air having a higher O₂ concentration and diffusion rate compared to water. The goal of this study was to expose Pacific herring embryos to air at different temperatures in order to determine if it alleviates the impacts of high aquatic CO₂ during low tide and if there are any carry-over effects on the larvae. In a fully crossed design, embryos were reared in one of three treatments which were either fully immersed or two durations of daily air exposure that would mimic the mid (2x 2h/day) and high (5h + 8h/day) intertidal at two constant temperatures (9 and 16 °C) and two levels of CO₂ in the water (400 μatm and 3000 μatm CO₂). Embryos and larvae were sampled through the course of their development to measure growth, developmental rate, and hatch success.

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