**57th Symposium / 57e Symposium**

**December 7-9, 2025**

Courtyard Ottawa Downtown by Marriott
350 Dalhousie Street, Ottawa, ON K1N 7E9

# WHEN NATURE BECOMES TOXIC, LEARN FROM THE PAST TO PROTECT THE FUTURE.

# QUAND LA NATURE DEVIEN TOXIQUE, APPRENDRE DU PASSÉ POUR PROTÉGER L'AVENIR.

**Organized by / Organisé par:**

SOCIETY OF TOXICOLOGY OF CANADA
LA SOCIÉTÉ DE TOXICOLOGIE DU CANADA

President : Terence Ozolins, Queens University
Vice-President: Marc-Andre Verner, Université de Montréal

**Programme Committee / Comité du Programme**
Clotilde Maurice, Ph.D., Chair, Health Canada, Government Member
Ms. Ria Falvo, Altasciences, Industry Member
Arno Siraki, Ph.D., Chair , University of Alberta, Academic Member

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## STC Welcome Message

On behalf of the Society of Toxicology of Canada (STC), it is my great pleasure to welcome you to the 57th STC Symposium entitled "When Nature becomes toxic, learn from the past to protect the future". We acknowledge that we are gathered on the unceded traditional territory of the Algonquin Anishinaabe People, and we pay respect to their long-standing stewardship of this land. As scientists, we recognize our responsibility to honor that connection—to listen, learn, and ensure that our work contributes to the health and well-being of all.

Over the next three days, we come together as a community of scientists, regulators, educators, and students to explore a theme both timely and enduring: how the forces of nature—once benign, even beneficial—can under certain conditions turn toxic, and how our scientific heritage and lessons from history must guide us as we navigate future challenges.

This year's theme highlights key issues at the forefront of toxicology: the toxicological perspectives on climate change, the environmental and health impacts of post-consumer and pharmaceutical waste, the influence of the term "natural" on risk perception and risk assessment, and the forward-looking question, "may the future be greener?" These topics underscore the importance of integrating lessons from the past with present evidence to inform strategies that safeguard both human health and the environment.

We are honored to welcome Dr. Robert Barouki, Professor of Biochemistry at Université Paris Cité and Director of Inserm Unit T3S in Paris, as our keynote speaker. Dr. Barouki is internationally recognized for his leadership in exposome sciences and for advancing our understanding of how climate change interacts with chemical exposures to shape human health. His expertise at the interface of toxicology, environmental health, and policy will provide an essential perspective for this year's symposium.

Our program would not be possible without the generous support of our sponsors who we thank for making the 57th STC Symposium come to fruition.

Once again this year we will be providing opportunities for our trainees to share their work with us through the poster sessions supporting by STC/INTERTEK graduate research award (both MSc. and Ph.D.) with other selected trainees presenting short oral presentations. We encourage everyone to engage with our trainees at their posters during breaks and during the poster session on Monday afternoon and Tuesday morning (New this year). What better way to get to know our future leaders in toxicology!

Finally, the Programme committee looks forward to meeting you at the 57th annual symposium and welcomes feedback for future symposia. May this symposium inspire new collaborations, deeper insights, and strengthened resolve to apply the lessons of the past toward to ensure a sustainable future.

Sincerely,

**Clotilde Maurice, Ph.D.**
Chair, Programme Committee, 57th Annual STC Symposium
Health Canada

## Message de Bienvenue de STC

Au nom de la Société de toxicologie du Canada (STC), j'ai le grand plaisir de vous accueillir au 57e symposium de la STC intitulé « Quand la nature devient toxique, apprendre du passé pour protéger l'avenir ». Nous reconnaissons que nous sommes réunis sur le territoire traditionnel non cédé du peuple algonquin Anishinaabe et nous rendons hommage à sa longue intendance de cette terre. En tant que scientifiques, nous reconnaissons notre responsabilité d'honorer ce lien, d'écouter, d'apprendre et de veiller à ce que notre travail contribue à la santé et au bien-être de tous.

Au cours des trois prochains jours, nous nous réunirons en tant que communauté de scientifiques, de régulateurs, d'éducateurs et d'étudiants pour explorer un thème à la fois actuel et intemporel : comment les forces de la nature, autrefois bienveillantes, voire bénéfiques, peuvent dans certaines conditions devenir toxiques, et comment notre héritage scientifique et les leçons de l'histoire doivent nous guider alors que nous affrontons les défis futurs.

Le thème de cette année met en évidence des questions clés à l'avant-garde de la toxicologie : les perspectives toxicologiques sur le changement climatique, les impacts environnementaux et sanitaires des déchets post-consommation et pharmaceutiques, l'influence du terme « naturel » sur la perception et l'évaluation du risque, et la question prospective « l'avenir sera-t-il plus vert ? ». Ces sujets soulignent l'importance d'intégrer les leçons du passé aux preuves actuelles afin d'élaborer des stratégies qui protègent à la fois la santé humaine et l'environnement.

Nous avons l'honneur d'accueillir le Dr Robert Barouki, professeur de biochimie à l'Université Paris Cité et directeur de l'unité Inserm T3S à Paris, en tant que conférencier principal. Dr Barouki est reconnu internationalement pour son leadership dans le domaine des sciences de l'exposome et pour avoir fait progresser notre compréhension de la manière dont le changement climatique interagit avec les expositions chimiques pour façonner la santé humaine. Son expertise à l'interface de la toxicologie, de la santé environnementale et de la politique apportera une perspective essentielle au symposium de cette année.

Notre programme ne serait pas possible sans le généreux soutien de nos sponsors, que nous remercions d'avoir permis la réalisation du 57e symposium STC.

Cette année encore, nous offrirons à nos étudiants la possibilité de partager leurs travaux avec nous lors de sessions d'affiches soutenues par le prix de recherche STC/INTERTEK (pour les maîtrises et les doctorants), tandis que d'autres étudiants et stagiaires postdoctorants sélectionnés feront de brèves présentations orales. Nous encourageons tout le monde à discuter avec nos étudiants et stagiaires postdoctorants devant leurs affiches pendant les pauses et lors des sessions d'affiche le lundi après-midi et le mardi matin (nouveauté cette année). Quelle meilleure façon de faire connaissance avec nos futurs leaders en toxicologie !

Enfin, le comité du programme se réjouit de vous rencontrer lors du 57e symposium annuel et vous invite à lui faire part de vos commentaires pour les prochains symposiums. Puisse ce symposium inspirer de nouvelles collaborations, approfondir les connaissances et renforcer la détermination à appliquer les leçons du passé afin d'assurer un avenir durable.

Sincèrement,

**Clotilde Maurice, Ph.D.**
Présidente, Comité du Programme, 57e Symposium Annuel de STC
Santé Canada

## Sponsors Acknowledgement/ Remerciements de Sponsors

We would like to extend our sincere thanks to the following organizations for their valuable contributions to the Society of Toxicology of Canada. We are grateful for your generosity and commitment to help us fulfill our mission of promoting and advancing the field of toxicology in Canada. Your partnership is truly appreciated and we look forward to continuing our collaboration in the future.

Nous souhaitons exprimer nos sincères remerciements aux organisations suivantes pour leurs précieuses contributions à la Société de toxicologie du Canada. Nous sommes reconnaissants de votre générosité et de votre engagement à nous aider à remplir notre mission de promouvoir et de faire progresser le domaine de la toxicologie au Canada. Votre partenariat est vraiment apprécié et nous sommes impatients de poursuivre notre collaboration à l'avenir.

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# Schedule/Horaire

## DAY 1 – December 7, 2025

2:00-3:30 **STC Board of Directors Meeting –Oak Meeting Room**
4:00-5:00 **ICT-2028 Vancouver 1st Planning Meeting**
6:30-10:00 **Meet & Greet @ JOEY Rideau restaurant – 50 Rideau St E106/ Rideau Centre**

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## DAY 2 – December 8
**Chestnut Ballroom**

**Poster Boards**
**Oak/Pine Meeting Room**

### Virtual Attendance

Zoom Webinar access for the upcoming STC event:
https://ccrsolutions.zoom.us/j/87460116197?pwd=nSd3A3PJnadAESirQ89j5soxaJm72v.1
Passcode: 423776
Webinar ID: 874 6011 6197

8:15: 8:30 **Welcome and opening remarks**

**Session I. Toxicological perspective on climate change**
*Chairs* - Clotilde Maurice *Co-chair* – Marie-Hélène Nicolas

8:30-8:55 **The future is smoky: Wildfire smoke and human health in a changing climate**
Stephanie Cleland (Simon Fraser University)

8:55-9:20 **Impacts of climate change on infectious disease risks in Canada**
Nicholas Ogden (Public Health Agency of Canada)

9:20-9:45 **Climate change influence on the environmental fate of organic chemicals in the Arctic**
Hayley Hung (Environment and Climate Change Canada)

9:45-10:15 Break

10:15-11:00 **Gabriel Plaa Award – Dr. Louise Winn (Queen's University)**
*Introduction – Robin Walker and Terence Ozolins*

11:00-12:00 **Plenary - Exposome and Toxicology : the happy couple**
Pr Rober Barouki (INSERM-Université de Paris)

12 :00-1 :00 Lunch

**Session II. When nature becomes toxic, learn from the past to protect the future**

1:00-1:15 **Advancing New Approach Methods (NAMs) under CEPA: A multi-sector approach**
Shaarika Sarasija (Humane World for Animals)

1:15-2:05 **Short Oral Presentations, Selected Trainee Posters**
(10 min) *Chairs* – Ria Falvo *Co-chair* – Clotilde Maurice

| | |
|---|---|
| 1:15-1:25 | Jing Zeng, University of Calgary |
| 1:25-1:35 | Rodrigo Vargas, McMaster University |
| 1:35-1:45 | Holly Mackay, Queen's University |
| 1:45-1:55 | Roham Gorgani, McGill University |
| 1:55-2:05 | Question Period |

2:05-2:30 Break

2:30-4:00 **Poster Session**
Oak/Pine Meeting Room

4:00-5:00 **Trainee-Networking Session -**

**Concurrent STC Annual Business Meeting – All STC Members**
**Chesnut Meeting Room**

## Zoom Meeting link for those attending remotely:

https://ccrsolutions.zoom.us/j/87460116197?pwd=nSd3A3PJnadAESirQ89j5soxaJm72v.1
Passcode: 423776
Webinar ID: 874 6011 6197

**Reception & Awards**
6:30 pm All attendees are welcome – *upcoming…*
(*finger food & refreshments provided and cash bar*)

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## DAY 3 – December 9

8:25-8:30 **Opening remarks**

**Session III. Environmental and health impact of post-consumer and pharmaceutical waste**
*Chairs* – Clotilde Maurice *Co-chair* – Mercedes Rose

8:30-8:55 **PFAS are everywhere in our water, food, soils, sewage sludge and air – what's next?**
Sébastien Sauvé (Université de Montréal)

8:55-9:20 **Micro-/nanoplastics and human health: what we've learned so far from mouse models and humans**
Lindsay Cahill (Memorial University of Newfoundland)

9:20-9:45 **Development of an in vitro neurovascular unit model for the screening of permeability-linked neurotoxicity**
Gregory Knipp (Purdue University)

9:45-10:10 **Pharmaceuticals and Personal Care Products (PPCPS) and hormones in Canadian municipal wastewater 2010 to 2022**
Sarah Gewurtz (Environment and Climate Change Canada)

10:10-10:30 Break

10:30-11:15 **Poster session**
Oak/Pine Meeting Room

11:15-12:00 **Barbara Hales Award – Dr. Carole Yauk (University of Ottawa)**
*Introduction – Marc-André Verner and Clotilde Maurice*

12:00-1:00 Lunch

1 :00-1:10 **Angela Hofstra – ICT 2028**

**Session IV. Impact of the word "Natural"on risk perception and risk assessment**
*Chairs* – Ria Falvo *Co-chair* – Rina Massarelli

1:10-1:35 **Fungi or fungicide – where's the risk? What does toxicology tell us?**
Angela Hofstra (Syngenta)

1:35-2:00 **Does "Natural" mean safe? What do we know about essential oils and how to assess the risk for human health.**
Clotilde Maurice (Health Canada)

2:00-2:30 Break

**Session V. May the future be greener**
*Chairs* – Arno Siraki *Co-chair* – Natasha Laboni

2:30-2:55 **Non-invasive aptamer-based monitoring of xenobiotics in live cells and animals**
Maureen McKeague (McGill University)

2:55-3:20 **Reducing laboratory resource use to reduce environmental impact**
Scott Grant (My Green Lab)

3:20-3:45 **Green strategies toward the development of antimicrobial surface coatings**
Lee Wilson (University of Saskatchewan))

## December 8nd, 2025

### Session I. Toxicological perspective on climate change.

8:30-8:55

**The future is smoky: Wildfire smoke and human health in a changing climate**

Stephanie Cleland, Assistant Professor, Simon Fraser University

**Bio:** Dr. Stephanie Cleland is an Assistant Professor and the Legacy for Airway Health Chair in Promotion of Lung Health in the Faculty of Health Sciences at Simon Fraser University and a Research Scientist at the Vancouver Coastal Health Research Institute. She holds a PhD and MSPH in Environmental Sciences and Engineering from UNC-Chapel Hill. Dr. Cleland's research explores how climate change-related exposures, such as wildfire smoke and extreme heat, adversely affect human health and well-being.

**Abstract:** Climate change poses a considerable threat to human health. Increases in temperatures and changes in weather patterns are expected to increase population exposure to multiple environmental hazards. One pressing example is climate change-driven increases in wildfires, which is changing when, how often and how much people are exposed to wildfire smoke. The particulate matter, gases, and chemicals that make up wildfire smoke can travel thousands of miles and remain in the air for weeks at a time. Exposure to these pollutants can lead to a wide range of adverse health outcomes, but the full extent of wildfire smoke's detrimental effects remains unknown. Which frequencies, intensities, and durations of wildfire smoke exposure pose the greatest health risk? What are the longer-term health implications of multiyear exposure, and who is most susceptible? This presentation will cover what we currently know about the health effects of wildfire smoke and the ways ongoing research is addressing key knowledge gaps. It will also highlight strategies to mitigate exposure and build smoke resilient communities in the face of the ongoing climate crisis.

8:55-9:20

**Impacts of climate change on infectious disease risks in Canada**

Nick Ogden, Director of Modelling Hub division, Science-Policy Integration Branch, Public Health Agency of Canada

**Bio:** Dr. Nick Ogden is a UK-trained veterinarian with a doctorate in vector-borne disease ecology and post-doctoral training in disease modelling. He is a senior research scientist and Director of Modelling Hub division within the Science-Policy Integration Branch of the Public Health Agency of Canada (PHAC), focusing on assessing disease risk by study of the ecology, epidemiology and genetic diversity of vectors and zoonotic and vector-borne micro-organisms. A key component of his work is assessing impacts of climate change on zoonoses and vector-borne diseases, and developing tools for public health adaptation. His team conducts PHAC's infectious disease modelling encompassing COVID-19, MPOX, vector-borne diseases, and measles in recent years.

**Abstract:**

In this presentation, the possible impact of climate change on emerging and re-emerging infectious disease risks in Canada will be presented. Our understanding of how climate and climate change impact infectious disease risks will be described, and what this is expected to mean for infectious disease emergence and re-emergence in Canada, according to our most recent national assessment. How we predict and adapt to these emerging risks will be described and evidence for recent impacts of climate change on disease emergence presented.

9:20-9:45

**Climate change influence on the environmental fate of organic chemicals in the Arctic**

Hayley Hung, Senior Research Scientist
Air Quality Processes Research Section, Environment and Climate Change Canada

**Bio:** Dr. Hayley Hung is a Senior Research Scientist of the Air Quality Processes Research Section of Environment and Climate Change Canada. She studies the temporal and spatial trends, sources and transport pathways of atmospheric organic contaminants to the Arctic, the Great Lakes and other ecologically sensitive environments, such as endangered whale habitat regions. She graduated from the University of Toronto with a Ph.D. in Chemical Engineering/ Environmental Collaborative Program under the supervision of Professor Don Mackay in 2000. Hayley is an adjunct professor at the University of Toronto Scarborough. She is Canada's Key National Expert of the Arctic Council's Arctic Monitoring and Assessment Programme (AMAP) on POPs. In 2022, she received the Nancy Cutler Citation of Excellence for Women in Science and Technology.

**Abstract:** The Arctic environment has changed significantly as a result of climate change and such changes, e.g. increasing temperatures, sea ice retreat, slumping permafrost, changing sea ice regimes, glacial loss and changes in precipitation, can impact contaminant distribution and subsequently affect the Arctic ecosystems. Observations of the influence of climate change on contaminant circulation and transport among various Arctic environmental media, including air, ice, snow, permafrost, fresh water and marine environment, are discussed in this presentation. Indirect effects of climate change on contaminants in the Arctic, including those of extreme weather events, increase in wild fires, and increased human activities leading to new local contaminant sources, have been identified as significant knowledge gaps. Emerging issues, including potential enhanced impacts of higher molecular weight halogenated natural products (hHNPs) and microplastics under a changing climate will be explored and their implications discussed.

## Gabriel Plaa Award

10:15-11:00

**Growing together: A life in developmental toxicology shaped by bright minds and kind hearts**

Louise Winn, Acting Director School of environmental Studies, Queen's University

**Bio:**. Dr. Winn received her PhD in toxicology from the University of Toronto in 1999. After a postdoctoral fellowship at the University of New Mexico in Albuquerque, New Mexico she was appointed Assistant Professor joint in the Department of Pharmacology and Toxicology and the School of Environmental Studies in 2001. She received tenure with promotion to Associate Professor in 2007 and promotion to Full Professor in 2011.

Dr. Winn's research interests are in understanding the mechanisms of toxicant induced developmental toxicity, including that of benzene toxicity. Recognition of the novelty and quality of Dr. Winn's research by the scientific community are reflected by her receipt of several awards including: the 2009 F. Clarke Fraser New Investigator Award from the Teratology Society and the 2011 Mentoring Award presented by the Women in Toxicology Special Interest Group of the Society of Toxicology.

Dr. Winn has contributed to educational programs in both of her units and has supervised many graduate students. Additionally, she serves on many Departmental and University committees. Outside the University, she serves on the Board of Directors of Canadians for Health Research, serves as a peer review panel member for the Canadian Institutes of Health Research and is the Past-President of the Society of Toxicology of Canada.

**Abstract:** My career in toxicology began by chance in the laboratory of Peter Wells at the University of Toronto, where an initial opportunity led to lasting relationships and a research journey focused on mechanisms underlying developmental toxicity caused by exposure to xenobiotics. While the path was not without challenges, my achievements have been shaped by the kindness of many colleagues and the innovative contributions of trainees. Their intellectual curiosity, persistence, and ability to generate novel ideas are the reason for this presentation.

## Plenary Speaker

11:00-12:00

**Exposome and toxicology : the happy couple**

Robert Barouki, Professor at Université Paris Cité Medical School and
Head of the Inserm institute of public health

**Bio:** Robert Barouki, MD, PhD, is Professor of Biochemistry at Université Paris Cité Medical School and head of the Inserm institute of public health. His research is focused on the impact of environmental contaminants on human health, in particular POPs and EDCs and more generally on the links between the exposome and health. He is involved in several EU projects: PARC (linking exposure to health), Heals and Neurosome (exposome), HERA (setting the research agenda in environment climate and health) Oberon (EDC testing), IHEN (setting the agenda for human exposome research) and EIRENE (european exposome infrastructure). He has also been involved in the networking of French and European research in the field of environment and health as well as in communicating scientific data to citizens. He is a corresponding member of the French Academy of Medicine and of several scientific councils at the European and French levels.

**Abstract:** The development of the exposome concept has been one of the hallmarks of environmental and health research for the last decade. It has inspired many research programs and is expected to influence environmental and health practices and policies. Since health outcomes are critical components of the exposome, it is expected that this concept should influence toxicological studies and practices which aim to understand the biological effects of environmental exposures. Yet, the links bridging toxicology and the exposome concept have not been fully developed. The exposome concept provides a framework for combining toxicological approaches with those of other disciplines, including exposure sciences and epidemiology, and for taking into account the impact of different types of stressors and their interactions. Computational approaches, such as Adverse Outcome Pathways, are equally valuable and can be combined with Aggregated Exposure Pathways. To better understand the interconnectedness of exposures and responses, toxicological studies are expected to further investigate long-term effects, particularly when there is an extended time gap between exposure and outcome; take into consideration vulnerabilities; develop closer coordination between human and ecosystems approaches and observations; and adopt ideas and tools put forward by the Planetary health and the One Health concepts. To illustrate the impact of exposure complexity on a traditional toxicological pathway, the new properties of the aryl hydrocarbon receptor (AhR) will be described in a dedicated case study. We expect these approaches to have an impact on regulatory risk assessment taking into account a wider and more holistic vision of toxicology.

## December 9th, 2025

## Session III. Environmental and health impact of post-consumer and pharmaceutical waste

8:30-8:55

**PFAS are everywhere in our water, food, soils, sewage sludge and air – what's next?**

Sébastien Sauvé, Associate Professor, Université de Montréal

**Bio:** Sébastien Sauvé is Professor of Environmental Chemistry at the Université de Montréal. He has more than 300 scientific articles to his credit on a variety of subjects ranging from the study of contaminated soils, the circular economy, blue-green algae, ultra-trace analysis by mass spectrometry and the impact of emerging contaminants on human health and the environment. He is particularly active in popularizing his research, with hundreds of appearances in the media. He is a member of the Royal Society of Canada, a correspondent of the Académie d'agriculture de France and was awarded the Prix Michel-Jurdant en Environnement by ACFAS in 2020.

**Abstract:** PFAS are ubiquitous and regulatory thresholds are continuously being updated for an ever larger number of PFAS compounds. This can quickly become a monitoring nightmare for analytical chemists and even worse if trying to evaluate the toxicology of each individual compound. We now have some drinking water quality guidelines but there is definitely some lag in terms of the capacity of regulatory agencies to follow with concomitant and coherent regulations for agrifood systems: limits on food, soils, biosolids, wastewaters and potential environmental toxicology impacts are lagging even further behind. Partly because regulatory thresholds need information on plant uptake, food chain transfer and potential leaching to underground water but also because the diversity of the family of PFAS makes it challenging to evaluate each compound separately and the properties of different PFAS can be very different.

8:55-9:20

**Micro-/nanoplastics and human health: what we've learned so far from mouse models and humans**

Lindsay Cahill, Associate Professor, Memorial University of Newfoundland

**Bio:** Dr. Cahill did her PhD in Chemistry at McMaster University and completed post-doctoral fellowships at the University of Warwick and the Hospital for Sick Children. Dr. Cahill joined the Departments of Chemistry and Radiology at Memorial University of Newfoundland in 2020 and is currently an Associate Professor. Her research group focuses on studying the impact of environmental exposures (e.g., micro-/nanoplastics and perfluoroalkyl substances) on pregnancy and early life.

**Abstract:** Plastics are found everywhere in our modern society. These plastics often end up in the ocean and on land, breaking down into microplastics (diameter < 5 mm) and nanoplastics (diameter < 1 μm). Humans can be exposed to plastics through inhalation of dust and ingestion of food and drinking water. This presentation will discuss the current state of knowledge about micro-/nanoplastics and their impact on human health, with a focus on pregnancy and early life development. We will discuss results from animal studies and an ongoing clinical human project to measure microplastics in blood and placental tissue.

9:20-9:45

**Development of an in vitro neurovascular unit model for the screening of permeability-linked neurotoxicity**

Gregory Knipp, Purdue University

**Bio:** Gregory T. Knipp, Ph.D. is a Professor of Industrial and Molecular Pharmaceutics, College of Pharmacy, Purdue University, where he also serves as the Faculty Director of the Purdue Translational Pharmacology CTSI Core Facility. During his over 35 years of experience in the pharmaceutical field, he has maintained a strong interest in the preclinical discovery and development areas. In particular, he has expertise in the ADME/T area where he worked on the Caco-2 and bovine brain microvessel endothelial cell model in his doctoral work. He has received funding from the NIH, FDA, DTRA, EPA, DOD, and private industry to support his laboratory's research.

**Abstract:** Over 50 million people worldwide suffer from some form of neurodegenerative disorders (e.g., Alzheimer's Disease) which are steadily increasing due to aging populations. The economic impact on society is estimated to be over $600 B. In addition, pathologies of the Blood-Brain-Barrier (BBB) are now critically associated with the progression of neurological diseases. Clinical trial success in treating CNS disorders (5.6%) lag far behind the rates for other disorders (13.2%), in part due to the fact that only 2% of all approved therapies traverse the BBB. A significant unmet medical need exists for advanced approaches to discover and develop new treatments for diseases that involve the brain's interface with the BBB. The high attrition rates associated with development and approval of neurotherapeutics are theorized to be due to issues including the restrictiveness of the BBB, off target toxicity, or a lack of efficacy during late-stage clinical trials. We posit that a reduction in attrition may be realized through enhancing the in vivo relevancy of BBB and NVU screening models used for permeability and neuroactivity in early lead candidate selection and development stages. In vivo the BBB extends beyond the brain microvessel endothelial cell (BMEC) layer and includes the pericytes and astrocytes in direct contact that form the BBB. The NVU also includes cells of the brain parenchyma consisting of neurons, microglia and oligodendrocytes. Taken together, the six major cell types of the NVU barrier synergistically function to: increase the restrictive barrier phenotype; regulate the expression of influx and efflux transporters and metabolizing enzymes; control neuronal extracellular fluid composition; and possess the supporting cells in direct contact comparative to current indirect contact in vitro BBB screening models. I will detail our research into the development and optimization of a physiologically relevant direct contact NVU in vitro model where human astrocytes, pericytes, and brain endothelial cells (HBEC-5i) are layered and cultured on the apical Transwell® surface in direct contact to form the BBB. In addition, neurons (SH-SY5Y), human microglia and oligodendrocytes have been cultured in the basal chamber to provide a complete in vitro model of the human NVU. This optimized direct contact NVU in vitro model has been developed for assessing the permeation and associated exposure effects of new and established chemical entities. Combined, the complete in vitro NVU Transwell® is being positioned to improve compound screening for neurotoxic effects.

9:45-10:10

**Pharmaceuticals and Personal Care Products (PPCPs) and hormones in Canadian municipal wastewater 2010 to 2022**

Sarah Gewurtz, Wastewater Science Unit, Environment and Climate Change Canada

**Bio:** Sarah Gewurtz has been a proud member of Environment and Climate Change Canada (ECCC)'s Wastewater Science Unit since 2019. This unit manages a national monitoring program for trace contaminants in wastewater treatment plants. Sarah conducts wastewater-related research and monitoring and leads communication of the findings. Sarah has spent much of her career conducting monitoring and surveillance studies on trace contaminants in the environment. In addition, she was a risk assessor at GHD for eight years. She received a B.Sc. at the University of Guelph, a M.Sc. at the University of Windsor, and a Ph.D. at the University of Toronto, where she studied the environmental fate and transport of contaminants. She completed a post-doctoral fellowship at the Ontario Ministry of the Environment, Conservation, and Parks.

**Abstract:** Environment and Climate Change Canada's (ECCC) wastewater monitoring program monitors concentrations of chemical substances in wastewater treatment systems in order to evaluate their importance as environmental exposure pathways in support of risk assessment and risk management activities. Samples from over 80 wastewater treatment plants (WWTPs) across Canada have been analyzed for a multitude of substances including pharmaceuticals and personal care products (PPCPs) in 2010-13 and 2022 and hormones in 2015-16. The objectives of this study were to evaluate the fate of 135 PPCPs and 17 hormones through the liquid and solids trains of typical treatment process types used in Canada. We also assessed the time trends of PPCPs in wastewater and biosolids between 2010 and 2022. PPCPs dominant in influent and effluent included the antidiabetic metformin, analgesics/ anti-inflammatories (acetaminophen, ibuprofen, 2-hydroxy-ibuprofen), caffeine and its metabolite (1,7 − dimethylxanthine), theophylline (a bronchodilator and metabolite of caffeine), an insect repellent (N,N-diethyl-m-toluamide, DEET), and iopamidol (a contrast media for X-rays). PPCPs dominant in biosolids included antibiotics (fluoroquinolones and doxycycline), antidepressants (sertraline, citalopram, and amitriptyline), a preservative and antimicrobial agent (triclosan), an antihistamine (diphenhydramine), and an antifungal (clotrimazole). These elevated concentrations in influent/effluent and biosolids reflected their use in Canadian communities. The dominant hormones in wastewater were androstenedione (a natural steroid) and androsterone (a testosterone metabolite) and in biosolids were androstenedione and progesterone (a natural steroid). Higher removals of PPCPs and hormones were observed in WWTPs that use biological treatment compared to primary physical/chemical treatment. PPCP concentration changes in wastewater matrices between 2010–2013 and 2022 were influenced by risk management measures, warnings, the development of new pharmaceuticals, the COVID-19 pandemic, and other factors. These time trends reflected the limited information available on PPCP use in Canada.

## Barbara Hales Award

11:15-12:00

**From vision to implementation: Five years of error-corrected sequencing to modernize mutagenicity assessment**

Carole Yauk, Assistant Professor, University of Ottawa

**Bio:** Carole Yauk was the lead scientist of the Genomics Laboratory in the Environmental Health Science and Research Bureau at Health Canada for 18 years. She joined the University of Ottawa's Department of Biology as a professor in September 2020, where she holds the Tier 1 Canada Research Chair in Genomics and the Environment. Her research broadly focuses on the development and implementation of genomic tools for human health risk assessment of environmental chemicals. Carole currently chairs the Board of Trustees for Health and Environmental Sciences Institute (HESI) and is involved in its Emerging Systems Toxicology in the Assessment of Risk (eSTAR) and Genetic Toxicology Technical (GTTC) Committees. She is a Canadian delegate and plays leadership roles within the Organisation for Economic Co-operation and Development (OECD) Advisory Group on Emerging Science in Chemicals Assessment. She is Past-President of the Environmental Mutagenesis and Genomics Society (EMGS) and a recent inductee into the Canadian Academy of Health Sciences. She is the 2025 recipient of the EMGS's Alexander Hollaender Award for her outstanding contributions advancing the use of genomic technologies in regulatory toxicology and risk assessment.

**Abstract:** Traditional mutation assays are foundational to toxicological assessment. However, conventional endpoint-specific methods targeting individual reporter loci are limited in sensitivity, scope, and potential for integration with other model systems and regulatory tests. Over the past five years, our group has helped transform the promise of error-corrected next-generation sequencing (ECS) into a practical, validated, and regulatory-ready approach for measuring mutagenicity. ECS enables highly accurate quantification of rare mutations across any genomic region, in any species or tissue, providing in-depth mechanistic insight and opportunities for integration with other regulatory tests.

This presentation will highlight our journey implementing ECS for mutagenicity testing, from early feasibility studies through inter-laboratory validation and application across animal and human systems. I will showcase key studies demonstrating the concordance of ECS with established assays, its power to define quantitative dose–response relationships across tissues and time, and its ability to reveal mutation spectra, clonal expansion, and early carcinogenic signatures.

Together, these efforts have laid the groundwork for a new generation of mutagenicity testing that is more mechanistic, quantitative, and human-relevant. Through focused innovation and strong collaboration, we have taken tremendous steps to bridge discovery and regulatory science in just five short years.

## Session IV. Impact of the word "natural" on risk perception and risk assessment

1:10-1:35

**Fungi or fungicide – where's the risk? What does toxicology tell us?**

Angela Hofstra, Syngenta

**Bio:** Angela Hofstra is a senior principal scientist and team lead at Syngenta where she and her team are responsible for the mammalian toxicity assessment of new and existing pesticide active ingredients and products. Angela received a BScPhm and a PhD from the University of Toronto, and an MBA from Wilfrid Laurier University. She worked in pre-clinical toxicology in the pharmaceutical industry prior to joining Syngenta. As a regulatory toxicologist Angela is a strong proponent of using the most predictive and applicable toxicity studies to assess potential human health risk. A member of STC since she was a graduate student, Angela has had various volunteer roles within the society and is currently engaged in planning the International Congress of Toxicology which STC will host in Vancouver, June 11 to 14, 2028.

**Abstract:** Fungal toxins in the food chain potentially pose significant health risks, causing both acute and chronic illness in humans and other mammals. Crop protection products and sound agricultural practices are essential for maintaining fungal toxin levels below thresholds of concern.

The fungal toxin deoxynivalenol (DON) is a ribosome inhibitor, decreasing protein synthesis, and causing severe vomiting, gastroenteritis and gastrointestinal hemorrhage in exposed mammals. The toxicity profile necessitates strict regulatory limits on DON levels in crops and food products.

Succinate dehydrogenase inhibitors (SDHIs), a relatively new class of fungicides, effectively control the fungi the produce DON toxin. These compounds have been designed to minimize mammalian toxicity while maintaining fungicidal efficacy. Comprehensive evaluation through guideline toxicity studies mandated for regulatory approval demonstrates low mammalian toxicity across the SDHI class. Advanced mechanistic investigations employing novel approach methodologies—including transcriptomics and metabolomics—provide deeper insights into the toxicity mechanisms in rodent models and their relevance to human health risk assessment.

Contrary to the widespread belief that natural means safe, DON toxin is more toxic than the synthetic fungicides used to control it. The WHO tolerable intake of DON toxin is more than 100x less than typical exposure limits to SDHIs. Furthermore, risk assessments of SDHIs indicate larger margins between tolerable limits and anticipated human exposure.

1:35-2:30

**Does "Natural" mean safe? What do we know about essential oils and how to assess the risk for human health.**

Clotilde Maurice, Senior scientific evaluator

Existing Substances Risk Assessment Bureau, Health Canada

**Bio:** Clotilde Maurice did her PhD in Animal science with a major in reproductive and developmental toxicology from Université Laval in Quebec city and completed a post-doctoral fellowships at Health Canada. She joined the Existing Substances Risk Assessment Bureau at Health Canada in 2018. The Bureau helps to protect the health of Canadians by assessing and providing expert advice on the health risks and impacts posed by chemical substances in commerce. Dr Maurice was the co-chair of the Health Canada Modernized Approaches to Risk Sciences (MARS) working group for the past 3 years and has been involved in two OECD expert groups: the Academic data in risk assessment and Refining TG489 comet Assay to included germ cells. In 2022, she received the Assistant Deputy Minister Award for Excellent in the "Young Professional" category. In 2023, she is also received the Health Canada Award of Excellence in the Official Languages category for her strong commitment in the use of both official languages at Health Canada.

**Abstract:**

Under the Chemicals Management Plan (CMP), Health Canada is evaluating the risks for human health on botanical extract such as essential oils or terpenes and terpenoids substances. These substances can be found in personal care products (e.g., body lotion, shampoos, drugs and natural health products), cleaning products, air fresheners and in food. Those products are regulated by the Food and Drugs Act, Canada Consumer Product Safety Act, or the Natural Health Products Regulations. Essential oils are naturally occurring complex mixtures that are produced by plants and often believed to be safe due to their long history of use and their natural source. Unlike conventional consumer products which are evaluated and are regulated, the use of essential oils in their pure form to make their own products, known as Do-It-Yourself (DIY), is growing with an unknown risk for human health. The use of essential oils in DIY present three main challenges to characterize the risk for human health: 1) the composition of the oil and its variability, 2) the lack toxicological data, and 3) the complexity and uncertainties of developing sentinel scenarios for DIY. Due to problematic components of some essential oils such as methyl eugenol, and for certain whole essential oils such as jasmine, the potential to pose risks to human health for those "natural " substances may be underestimated steering people to use them in a potential unsafe-manner. As essential oils become more and more popular in Canada, more hazard and exposure data should be conducted to guarantee their safe use.

## Session V. May the future be greener

2:30-2:55

**Non-invasive aptamer-based monitoring of xenobiotics in live cells and animals**

Maureen McKeague, Associate Professor, McGill University

**Bio:** Prof. Maureen McKeague is an emerging leader of the chemical biology of therapeutic and diagnostic nucleic acids. She received her PhD in Chemistry from Carleton University, then conducted postdoctoral research at Stanford University and ETH Zurich. She is currently an Assistant Professor at McGill with a dual appointment in the Departments of Chemistry and Pharmacology & Therapeutics. Prof. McKeague's interdisciplinary research group is pioneering nucleic acid tools to treat and characterize disease. Notable achievements include the development of encodable gene switches for non-invasive drug monitoring and cell fate control in cells and live animals (Nat Commun 2019, Chemical Science 2023), innovating clinically-robust diagnostics for detecting viruses and malaria, and discovering oligonucleotide therapeutics for undruggable leukemia targets (Cell Reports Medicine 2023, Leukemia 2024). Her group also applied synthetic strategies to decorate "aptamers" with new chemistry, permitting the first high-throughput analysis of thousands of highly functional DNA aptamer molecules (in revisions Nature Chem). Furthermore, her team made important contributions ton the emerging field of DNA damage sequencing, development new methods to detect DNA damage at single-nucleotide resolution enabling improved toxicity predictions (JACS 2018, ACS Central Science 2023, Chem Soc Rev 2020). Prof. McKeague's leadership in nucleic acid research has been recognized with numerous awards, including a Canada Research Chair, Kavli Foundation Emerging Researcher Award, and Cole Foundation Transition Award. She is a recognized aptamer world expert, as evidenced by her selection as the Vice-President of the International Society on Aptamers and Associate Editor for the Molecular Therapy Nucleic Acids and Aptamers journals.

**Abstract:** Reliable and accessible biosensing platforms are essential for detecting environmental toxins, contaminants, and biomarkers of exposure. To address the growing demand for fit-for-purpose tools, our group is developing nucleic acid-based biosensors known as aptamers, which offer advantages such as chemical stability, in vitro selection, and batch-to-batch consistency. As one example, we have developed a genetically encoded aptamer biosensor platform for non-invasive detection of xenobiotics in cells and animals. By coupling the high specificity of aptamer recognition with the convenient readout of fluorescent proteins, our biosensors exhibit high sensitivity, strong specificity, and dose-dependent responses. Importantly, we have incorporated these aptamer biosensors into zebrafish, a key model vertebrate, enabling real-time, non-invasive imaging of biodistribution across timepoints in whole animals. To our knowledge, this represents the first transgenic vertebrate line that stably expresses an aptamer biosensor across generations. This genetically encoded platform addresses a critical need for whole-animal, non-invasive biosensing and offers significant utility for drug and toxicant analysis. We envision these tools being used to monitor xenobiotic exposure in real time and to uncover causal links between molecular responses and adverse toxicological outcomes.

2:55-3:20

**Title: Reducing laboratory resource use to reduce environmental impact**

Scott Grant, My Green Lab

**Bio:** Scott Grant is the Vice President of Certifications at Impact Laboratories, where he spearheads the My Green Lab Certification program. In this capacity, he collaborates with laboratories worldwide to enhance their sustainability practices and drive impactful change. With 25 years of diverse experience across environmental testing, polymer characterization, and food safety, Scott brings a wealth of knowledge to the table. His career includes leadership roles in laboratories in the United States and Australia, reflecting his commitment to excellence and innovation in laboratory operations and sustainability.

**Abstract:** Laboratories are inherently resource intensive environments using a great deal more energy and water than typical office environments while generating multiple complex waste streams. How do we ensure scientists can still perform their important testing and research while reducing the environmental impact from this work? This presentation will explore the impacts of this increased resource consumption and practical, evidence-based strategies to decrease these impacts while not impacting the integrity of the science.

3:20-3:45

**Green strategies toward the development of antimicrobial surface coatings**

Lee Wilson, Professor, University of Saskatchewan

**Bio:** Lee Wilson is an Indigenous scholar and chemistry professor at the University of Saskatchewan. His research is internationally recognized and focused on the chemistry of biopolymers and sustainable biomaterials that covers diverse fields: Materials Chemistry, Environmental Chemistry, and Supramolecular Chemistry. Current research aims to understand the structure-function relationships related to adsorption science and technology. Wilson's research has led to peer-reviewed research publications (>350) in the chemical literature with an H-index of 63 and an i10-index ~232 with more than 14,000 citations. His research group at USask is actively involved in studies focused on the modification of biomaterials via green chemistry, along with characterization of their structure and physicochemical properties. This research address a range of fundamental scientific questions to practical problems that stem from the development of sustainable materials and their sorption phenomena that relate to water, food, and energy security. Wilson's group has contributed to the development of sustainable adsorbent science and technology, which serve to address the UN Sustainable Development Goals (UN SDGs), such as SDG-6 (clean water and sanitation) and SDG-9 (industry, innovation, & infrastructure). He has served as a role model and ambassador for STEM education for Indigenous youth and communities in Canada and internationally for several decades through science outreach and academic programs.

**Abstract:** Biomass fiber composite (BFMC) can be prepared as hierarchical materials via a dip-coating method. This facile noncovalent strategy can yield diversiform structures that range from duplex to triplex systems with unique sorption and antipathogen properties. BFMCs were developed by physisorption of chitosan onto modified flax fibers and characterized by complementary methods (Raman, NMR, and IR, SEM, XRD, TGA and BET analysis), which reveal variable composite morphology with incremental biopolymer doping onto a fiber substrate via supramolecular interactions. Dye adsorption profiles of BFMCs with Rose Bengal corroborated the role of physisorption with an adsorption capacity that rises to 17.9 mg/g, whereas the water sorption capacity reaches an impressive value ca. 11 g/g, which indicated the role of synergism upon biopolymer immobilization. Anti-microbial/-fungal properties were supported by antipathogen tests. The BFMCs have high antimicrobial potency toward gram negative (E. coli), gram positive (S. aureus) and a fungal strain (C. albicans) based on the low FFMC dosages required to achieve 100 % microbial elimination. This versatile class of unique biocomposites display unique structure-function relationships related to synergistic water sorption and antipathogenic effects, as compared to available literature reports. This work reports on several  first examples of unique hierarchal biomaterial via a facile supramolecular design strategy to yield responsive adsorbents for environmental remediation to biomedical applications (e.g., controlled release, topical administration, or antimicrobial surface coatings).

# Poster abstracts

**Poster #1 (CReSP Student Research Award)**

**Title**

Characterizing airborne chemical exposures in Quebec elementary schools using wearable passive samplers

**AUTHORS LIST**

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**ABSTRACT**

Children are particularly vulnerable to airborne contaminants due to their developing respiratory systems and higher inhalation rates relative to body size. Despite growing concern, few studies have examined multiple contaminant families in school environments. This study investigates indoor air quality (IAQ) in elementary schools using wearable passive samplers to assess children's exposure to airborne contaminants. Four classrooms located in two schools from underserved communities were selected. Sampling occurred over one week using wearable passive samplers worn by 20 children (5 per classroom), along with fixed indoor and outdoor samplers. After collection, sorbent bars were analyzed at Yale University. 28 contaminants with concentrations exceeding the limits of quantification were detected . Sixteen compounds, including flame retardants, PAHs, pesticides, UV stabilizers, and fragrances, were found in 100% of children samplers. Some compounds, such as musk ketone (fragrance), were found only indoor. Only three compounds had reference toxicological thresholds (benzothiazole, diphenylamine, methoxychlor), and none exceeded these values. Methoxychlor is banned without exemption under the 2023 Stockholm convention. Twelve compounds were classified by IARC, with six in Group 2B (possibly carcinogenic) and six in Group 3 (not classifiable). The lack of toxicological benchmarks limits risk assessment. This is the first study in Quebec to use wearable passive samplers for multi-contaminant IAQ profiling in schools. It reveals consistent exposure to a complex mixture of chemicals, many without established safety thresholds. While this assessment provides broad coverage of airborne exposures, this panel of contaminants represents only a fraction of environmental factors to which children may be exposed through inhalation, ingestion, and dermal pathways. These findings highlight the need for expanded monitoring and toxicological research to better investigate the IAQ.

**Poster #2 (Intertek Cantox Student Research Award)**

**Title**

Chlorinated Phenanthrene Promotes Aberrant Angiogenesis in Human Placental Trophoblasts

**AUTHORS LIST**

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**ABSTRACT**

Introduction: Phenanthrene (Phe) is a ubiquitous environmental contaminant. Recently, chlorinated Phe (ClPhe), such as 9-chlorophenanthrene (9ClPhe) and 9,10-dichlorophenanthrene (9,10Cl2Phe), have been detected in the environment, wildlife and human samples, including maternal serum. However, the effects of these compounds on pregnancy outcomes or placental function are largely unknown. Placental trophoblasts play a key role in establishing the maternal-fetal vascular network, which requires angiogenesis. In this study, we investigate the impact of ClPhe on placental trophoblast angiogenesis.

Methods: Trophoblast HTR-8/SVneo cells were treated with Phe, 9ClPhe and 9,10Cl2Phe (0.001-10 μM) for 24h. We assessed the mRNA expression of angiogenic (VEGF), anti-angiogenic (TSP1 and CD36) and cellular stress (EGR1)-related genes by qPCR. Subsequently, we measured VEGF and ROS production and conducted tube formation assays to evaluate angiogenesis.

Results: While there were no changes in the steady-state mRNA expression of VEGF under any experimental condition, treatment with all 3 compounds significantly increased VEGF output. Anti-angiogenic TSP1 and CD36 mRNA levels showed an upregulation across the 3 compounds. Tube formation markers were reduced at high concentrations (1 and 10 μM) of all 3 compounds; these changes were negatively correlated with the increased EGR1 mRNA expression and ROS production.

Conclusion: Despite the increased VEGF output induced by Phe and its chlorinated congeners, increased cellular stress (indicated by elevated EGR1 and ROS levels) may contribute to the reduced placental vascularization. Aberrant angiogenesis has been linked to placental dysfunction; thus, exposure to Phe, 9ClPhe and 9,10Cl2Phe has the potential to disrupt placental function. Moreover, since insufficient vascularization has been associated with altered trophoblast invasion, this warrants future studies to investigate how ClPhe can impact trophoblast invasion

**Poster #3**

**Title**

Apoptosis gene expression in the fetal liver following in utero benzene exposure in CD-1 mice

**AUTHORS LIST**

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**ABSTRACT**

Benzene is a widespread environmental carcinogen that crosses the placental barrier, leading to in utero exposure. Epidemiological and animal studies link in utero benzene exposure to increased childhood leukemia risk, emphasizing the need to understand its mechanisms of developmental toxicity. During fetal development, the liver is a key site of hematopoiesis and xenobiotic metabolism, making it a critical target for benzene-induced effects.

Benzene metabolism produces reactive oxygen species that can induce oxidative stress, DNA damage, and altered gene expression. These effects are particularly concerning during fetal development, when rapid proliferation and differentiation make tissues highly vulnerable to redox imbalance, disrupting normal cell growth and survival. Aberrant apoptosis, a tightly regulated cell death pathway, can result from oxidative stress and DNA damage. Disrupted apoptotic signaling in the fetal liver may impair hematopoietic development or allow the survival of genomically unstable cells, contributing to later -life carcinogenic risk.

Previous work from the Winn Lab showed that in utero benzene exposure in CD-1 mice induces oxidative stress and DNA damage in fetal liver, with sex-specific tumour development in offspring. Building on these findings, it was hypothesized that in utero benzene-initiated oxidative stress triggers apoptosis-related gene responses in the murine fetal liver in a sex-dependent manner. Pregnant CD-1 mice received 200mg/kg benzene or vehicle (corn oil) by intraperitoneal injection on gestational days 8, 10, 12, and 14. Fetuses were collected at 2, 6, and 24 hours after the final exposure. Relative expression of key apoptosis genes (Bax, Caspase9, p53, and Caspase3) was assessed by RTqPCR.

This research will provide information on how oxidative stress and apoptosis interact to shape developmental responses to in utero benzene exposure, advancing the understanding of fetal susceptibility to environmental carcinogens.

**Poster #4**

**Title**

Incorporating the One Health Framework into Human Health Risk Assessment: A Dynamic Approach to Environmental Management

**AUTHORS LIST**

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**ABSTRACT**

Introduction: Conventional human health risk assessment often fails to address wicked environmental problems, overlooking site-specific contexts and Indigenous knowledge, leading to inequitable outcomes. To address this gap, we developed a novel framework for assessing human health risks tailored to Indigenous perspectives. Our objective was to synthesize components from existing risk assessment and One Health approaches via a scoping review to propose a new, integrated HHRA framework.

Methodology: We conducted a systematic scoping review of publications from three major scientific databases (Scopus, Web of Science, PubMed) with no date restrictions. Using a comprehensive search strategy, we screened primary research, reviews, and grey literature. Articles were excluded if they were non-English, opinion-based, or did not present a relevant risk assessment or One Health framework. Key elements were then extracted from the relevant publications to inform the development of the new framework.

Results: The review identified 75 relevant publications across various domains, including cumulative, integrated, and One Health risk assessments. Synthesizing these findings, we developed an HHRA framework that integrates systems thinking into the risk assessment paradigm. This framework is stakeholder-driven, considers the interconnectedness of human, environmental, and ecological health, and places Indigenous knowledge on equal footing with toxicological data. It facilitates a transparent, co-creative process that can be tailored to local contexts, ensuring endpoint measurements reflect community-specific health and cultural values.

Conclusion: Our framework offers a dynamic, holistic alternative to siloed, reductionist approaches, centering on sitespecific and Indigenous perspectives. Its application will enhance the quality, relevance, and equity of public health decision-making for wicked problems, as well as respect for indigenous sovereignty and ways of knowing.

**Poster #5**

**Title**

Evaluation of Concatenated Original Duplex for Error Correction (CODEC) for in vitro genotoxicity testing

**AUTHORS LIST**

Josie Jabbour (1), Julie Buick (2), Lauren Bradford (2), Annette Dodge (1,2), Andrew Williams (2) , Azeet Narayan (3), Ning Li (3), Ruolin Liu (3), Carrie Cibulskis (3), Leslie Recio (4), Jamie Scaglione (4), Nimisha Bhattarai (4), Eunnara Cho (2), Francesco Marchetti (2,5), Carole Yauk (1), Matthew Meier (2)

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**ABSTRACT**

Accurate detection of rare mutations is required to quantify and characterize the mutagenic effects of chemicals. Errorcorrected sequencing (ECS) is an emerging tool that enables the detection of rare mutations and their clonal expansion, which drive cancer development. Duplex sequencing (DS), the most extensively used ECS method, independently tags and sequences both DNA strands to achieve low error rates. However, its high cost and limited genomic coverage restrict widespread application. A novel ECS method, Concatenated Original Duplex for ErrorCorrection (CODEC), offers a cost-effective alternative by physically linking both DNA strands and sequencing them as a single molecule. CODEC requires approximately 100-fold fewer reads than DS and enables genome-scale mutation detection. We evaluated the inter-laboratory transferability of the Broad Institute's published CODEC protocol and compared CODEC results to those obtained using DS. CODEC libraries were generated using DNA from TK6 cells previously treated with 0, 0.006, 0.008, or 0.016 μg/μL of 4-nitroquinoline-1-oxide (4NQO), which showed a concentration-dependent increase in mutation frequency (MF) by DS. We successfully implemented the CODEC protocol, producing high-quality libraries that passed sequencing QC metrics, demonstrating assay transferability. CODEC quantified concentration-dependent increases in MF following exposure to 4NQO, concordant with DS results. We are currently refining the analytical pipeline for MF and mutation spectra analysis. Overall, this work will evaluate CODEC's viability as an alternative for detecting low-frequency mutations. Broader adoption of CODEC could enhance the accessibility of ECS for routine genetic toxicology assessment.

**Poster #6**

**Title**

Modelling Intra-Litter Variability in Response to Developmental Toxicant Exposure: A Mixed Effects Approach Compared to Litter-Averaging Methods

**AUTHORS LIST**

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**ABSTRACT**

Developmental toxicology studies use litter-bearing species and summarize fetal outcomes by averaging litter data to assess toxicant effects, treating each litter as one unit. This approach overlooks variables like litter size, uterine position, and fetal sex which can influence fetal and placental outcomes, thereby obscuring meaningful variability among littermates and lead to misinterpreting treatment effects. This project reanalyses datasets from maternal exposures to benzene and valproic acid to quantify how intralitter factors influence developmental outcomes and assess how toxicant exposure modifies these relationships relative to controls. In both studies, pregnant CD-1 mice received chemical or control treatment on set gestational days (GD): benzene was administered intraperitoneally on GD8, 10, 12, and 14 with fetal and placental collection on GD14–19, and valproic acid was administered subcutaneously on GD9 with collection on GD18. These data provided fetal and placental outcomes (fetal weight, placental weight, and efficiency) along with litter-level information for litter ID, treatment, and intralitter variables. Linear mixed-effects models (LMM), a statistical approach, will be used for each outcome to quantify these relationships. This approach treats pups within a litter as non-independent observations reflecting their shared maternal environment. By denoting litter as a random effect, the model adjusts for these shared influences, separating differences between litters from variation among pups within litters. Ultimately, this project will establish a reproducible analytical workflow for developmental toxicology data, providing a framework for litter-based studies. This approach aligns statistical models with biological structure, promoting methodological consistency and interpretability across studies.

**Poster #7 (Intertek Cantox Student Research Award)**

**Title**

Cellular sensitivity to particulate matter standards in air-liquid interface vs. conventional submerged exposures

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## ABSTRACT

Screening the toxicity of inhaled pollutants may enable identification of sources that pose the greatest hazard. Historically, particulate matter toxicity was studied using animal models or conventional submerged in vitro models. Air-liquid interface (ALI) exposures - where human lung cells are exposed directly to airborne pollutants – offer an alternative. However, little is known about the relative sensitivity of such approaches. Here, we compared the sensitivity of ALI and submerged exposure models using particulate matter standards. Human pulmonary alveolar epithelial cells (A549, H441) were cultured under submerged conditions. For ALI exposures, apical media was removed immediately prior to aerosolized particle exposure; for submerged exposures, resuspended particles were pipetted into the media. Cells were exposed to two particulate matter standards (micron- or nano-sized SiO2) for 4 or 24 h (n=5 experimental repeats). Dose delivered via ALI exposure was quantified using a quartz crystal microbalance. We examined particle effects on cell viability (LDH) and on the expression of key genes involved in inhaled particle response (e.g. inflammatory, antioxidant). Statistical significance was assessed by multiway ANOVA. ALI exposure to nano-sized, but not micron-sized, SiO2 caused a modest decrease in cell viability in H441 cells 24 h post-exposure; A549 viability was not impacted. Nano-SiO2 increased expression of inflammatory mediators interleukin (IL)-6, IL-8, and cyclooxygenase-2 (PTGS2) in ALI exposure models only. In contrast, we did not observe any effects in submerged cells, even when exposing cells at levels exceeding 20-times the ALI quantified dose. ALI-exposed cells were more sensitive to nanosized particles than those same cells exposed under conventional submerged conditions. The greater sensitivity of ALI-exposed cells provides a basis for comparing the relative toxicity of test materials of varying composition, in support of hazard identification.

**Poster #8 (oral presentation)**

**Title**

Triphenyl Phosphate Modulates Metabolic and Endocrine Pathways in Aquatic Embryonic Cells

**AUTHORS LIST**

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**ABSTRACT**

Triphenyl phosphate (TPhP) is an organophosphate flame retardant widely used in consumer products such as plastics, electronics, and furniture foams. Due to its extensive use and environmental persistence, human exposure is common, and growing evidence suggests TPhP may disrupt endocrine and metabolic function. To investigate potential effects, RNA sequencing was performed on STE-137 cells exposed to 80 μM TPhP. This immortalized, embryonic cells line derived from rainbow trout was chosen for its ecological relevance and sensitivity to environmental toxicants, and its use contributes to the growing use of aquatic species in biochemical and toxicological research. Transcriptomic analysis revealed differential expression of several glycolytic pathway genes, including upregulation of hk1 (log2 foldchange = +2.54) and aldocb (log2 fold-change = +2.79), and downregulation of pfkla (log2 fold-change = -1.26). Genes involved in steroid biosynthesis were also differentially expressed, including hsd17b12a (log2 fold-change = +1.69) and soat2 (log2 fold-change = +8.20). This, combined with our lab's previous findings that TPhP significantly upregulates the gapdh gene and downregulates the expression of estrogen receptor α and aromatase genes, suggests potential modulation of metabolic and endocrine function. Functional validation was performed via ELISA quantification of extracellular L-lactate, an end-product of glycolysis, and 17β-estradiol following 0 or 80 μM TPhP exposure for 24, 48, and 72 hours. A significant elevation in L-lactate levels was observed at 48 hours ($p < 0.05$), whereas no significant differences in 17β-estradiol were observed between groups at any time point. Taken alongside the transcriptomic alterations, these findings provide evidence that TPHP disrupts glycolysis through altered expression of key genes, perhaps indicating an epigenetic mechanism.

*Poster #9 is withdrawn

**Poster #10**

**Title**

Sex-specific Effects of Maternal Smoking During Pregnancy on Cell-Free Placental DNA Methylation

**AUTHORS LIST**

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**ABSTRACT**

Background: Maternal smoking during pregnancy (MSDP) is associated with numerous adverse pregnancy outcomes including growth restriction and preterm birth (PTB). In the placenta, MSDP impacts DNA methylation (DNAm) and expression of genes involved in inflammation, lipid metabolism, and energy expenditure. However, studies linking MSDP to altered placental DNAm are often limited to samples at the time of delivery and rarely consider sex-specific responses. Cell-free methylated DNA immunoprecipitation sequencing (cfMeDIP) offers a non-invasive glimpse at placental DNAm before delivery by enriching for hypermethylated cell-free placental DNA in maternal blood. Methods: To assess the effect of MSDP on cell-free DNAm, we applied a linear model to a previously obtained cfMeDIPseq dataset from nonsmoker (N = 82) and smoker (N = 15) second trimester pregnancies stratified by fetal sex. Following our analysis, we selected 13 differentially methylated genes (DMGs) of interest and examined their expression in HTR8/SVneo cells exposed to cigarette smoke conditioned media (CSM; 0.01, 0.1, & 1%).

Results: In pregnancies with a male fetus, there were no changes in DNAm between smoking and non-smoking pregnancies. In pregnancies with a female fetus, smoking resulted in 1195 differentially methylated cfMeDIP genomic regions mapping to 731 unique genes. Of the DMGs examined, exposure to 1% CSM reduced the expression of DDIT4, FN1, and ACRV1; these genes are involved in cell proliferation, cell adhesion, and fertility, respectively and are important for normal placental function.

Conclusions: This work identified differential methylation of cell-free DNA in fetal female pregnancies in response to MSDP. Altered expression of candidate DMGs in CSM-exposed trophoblast cells of unspecified sex provides evidence of placental gene dysregulation due to MSDP. These findings support cfMeDIP as a method for non-invasively assessing molecular perturbations in the placenta during pregnancy.

**Poster #11**

**Title**

Low-dose methylmercury (MeHg) induces abnormal neuronal differentiation of human iPSC-derived neural stem cells

**AUTHORS LIST**

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**ABSTRACT**

Methylmercury (MeHg) is an environmental pollutant most prominent in fish and marine animals higher in the food chain. Prenatal exposure to this compound via fish consumption during pregnancy has been associated with increased incidence of neurodevelopmental disorders (NDDs) such as autism spectrum disorder (ASD). First Nations and Inuit communities are at a higher risk of MeHg exposure due to their traditional diets and more limited access to grocery stores. Past work in our lab has identified a correlation between ASD-like behaviors in mice and low-dose prenatal exposure to MeHg. The specific effects of this prenatal low-dose exposure on human neural development remain unexplored. The aim of this work is to examine the impact of non-apoptotic low-dose MeHg exposure on human cerebral cortical development using a monolayer culture model. Expression of Homeodomain protein X (Hopx), a protein characteristic of outer radial glial precursors (oRGPs), is of particular interest, as it is human-specific. Human cerebral cortical radial glial precursors (hRGPs) were generated from human induced pluripotent stem cells (hiPSCs). The cultured hRGPs were subjected to differentiation in the absence and presence of MeHg at various concentrations (0, 2.5nM, 25nM, 250nM) for 28 days. Immunocytochemical analysis were done at 7, 14, 21 and 28 days in culture to measure the hRGP development to produce mature neurons at all groups receiving various concentrations of MeHg. We showed that MeHg induced premature neuronal differentiation in a dose-depednent manner without causing cell death. Specifically, 25 nM MeHg exposure significantly increased the genesis of Beta-III tubulin+ newborn neurons, associated with a significant reduction of Pax6+ inner RGP (iRGPs) population. Interestingly, we also identified the increased population of Hopx+ outer RGPs (oRGPs), a human-specific neural precursors upon 25 nM MeHg exposure.

**Poster #12**

**Title**

Di-2-ethylhexyl phthalate substitutes DEHA and DEHTP differentially regulate adipogenesis in 3T3-L1 cells

**AUTHORS LIST**

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**ABSTRACT**

Objective: Phthalates are plasticizers that are ubiquitously present in consumer products. Di-2-ethylhexyl phthalate (DEHP) was widely used but deemed toxic due to the effects of its bioactive metabolite, mono-(2-ethylhexyl) phthalate (MEHP), which has been linked to many negative health outcomes including increased adipogenesis. DEHP has been increasingly replaced with alternative plasticizers such as Di-2-ethylhexyl terephthalate (DEHTP) and Di-(2-ethylhexyl) adipate (DEHA). The health effects of these substitutes in general and on adipocyte development remain less understood. The objective of this study was to asses the effects DEHTP, DEHA and their metabolites MEHTP and MEHA. Design/Methods: The adipogenic effects of alternative plasticizers and their metabolites were evaluated using the murine 3T3-L1 preadipocyte which can be induced to differentiate into mature adipocytes using appropriate inducers. Cells were treated with 0.01 μM to 100 μM of test compounds throughout differentiation, in the presence of insulin and 3-isobutyl-1-methylxanthine (IBMX). Lipid accumulation, mRNA expression and protein expression of various adipogenic markers was evaluated.

Results: Our results show that MEHA exposure significantly increased lipid accumulation and upregulated both mRNA and protein expression of adipogenic markers. MEHTP increased mRNA expression of similar markers but did not induce the corresponding increases in protein level or lipid accumulation. Both MEHA and MEHTP moderately activated the mouse peroxisome proliferator-activated receptor γ (PPARγ), suggesting the receptor's involvement. Conclusion: Overall, these results illustrate that DEHP alternatives may pose health risks by promoting or disrupting adipocyte differentiation through distinct mechanisms, underscoring the need to evaluate their unintended metabolic effects.

**Poster #13**

**Title**

Disruption of Pulmonary Epithelial Integrity and Secretome Remodeling by Cannabis Vaping

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**ABSTRACT**

Cannabis vaping is rapidly emerging as a dominant mode of consumption, particularly among youth, with Canada reporting the highest rates globally. Yet its biological impact on the respiratory epithelium—the body's first line of defense against inhaled agents—remains unknown. The airway epithelium maintains homeostasis, restricts pathogens, and releases soluble and vesicular mediators that coordinate local and systemic signaling. This study investigates how repeated cannabis vapor exposure alters epithelial barrier function and the secretome using differentiated human bronchial epithelial cells cultured at the air–liquid interface.

Multi-omic profiling revealed a coordinated metabolic and secretory stress response. Upregulated retinoid and lipid metabolism, protein secretion, and acute-phase pathways reflect ER–Golgi activation and elevated protein-folding demand. Metabolomics showed accumulation of UDP-sugars and altered nucleotide intermediates, indicating increased glycosylation and energy turnover, while elevated hypotaurine and glyceric acid signaled oxidative stress. Downregulation of translation, nuclear division, and mitochondrial fusion suggest energy conservation. Functionally, cannabis vapor increased paracellular permeability, measured by FITC-dextran assay, indicating barrier compromise. Extracellular vesicle profiling showed pronounced secretome remodeling, with increased 100–150 nm size particles, consistent with enhanced small EV release. EV proteomics identified enrichment of ribosomal, tRNA, and glycosylation machinery, suggesting that stressed epithelial cells offload components of their protein-processing and nucleotidehandling systems through vesicular export.

Together, these findings reveal that cannabis vapor weakens epithelial integrity and reprograms cellular communication, providing mechanistic evidence that vaping can disrupt epithelial homeostasis and exert systemic effects—challenging its perception as a safer alternative to smoking.

**Poster #14**

**Title**

The Challenges of Confounding Variables In Vitro: How Particle Size, Dispersion, and Matrix Influence $TiO_2$ Properties and Toxicity


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**ABSTRACT**

Titanium dioxide (TiO2) is widely used as a white pigment in foods, but the reported health effects of TiO2 remain inconsistent. We investigated how particle size, dispersion methods, and matrices affect TiO2 properties and in vitro toxicity outcomes. Particle size distributions of four food-grade TiO2 (TiO2-FG) samples and one nanoscale TiO2 (TiO2- NP) were determined by transmission electron microscopy. Cytotoxicity was assessed in human large intestinal epithelial cells exposed for five days to two TiO2-FG samples or TiO2-NP using the trypan blue assay. Hydrogen peroxide (H2O2) generation during dispersion by probe sonication versus bead-milling was compared in TiO2-FG and TiO2-NP suspended in water, phosphate-buffered saline (PBS), cell culture medium, bovine serum albumin solutions, simulated human intestinal fluid, or skimmed milk. Hydrodynamic size and zeta potential were measured by dynamic light scattering. TiO2-FG had broad particle size distributions (38–864 nm; 2–48% nanoparticle content), while TiO2-NP was more uniform (19 nm ± 6 nm). TiO2-FG did not significantly affect cell proliferation or viability, while TiO2-NP reduced total and live cell counts. Sonication generated more H2O2 than bead-milling, with milk and simulated intestinal fluid reaching 2 μM, while bead-milling produced negligible H2O2 in most matrices. Hydrodynamic sizes varied with matrix, with TiO2-FG measuring 300 nm in most matrices but rising to 700–1,000 nm in PBS and simulated intestinal fluid. For TiO2-NP, sizes ranged from 300 nm in milk to 5,000 nm in simulated intestinal fluid. Most suspensions had a negative zeta potential (-40 mV to -20 mV), but TiO2-FG and TiO2-NP became positively charged (20–28 mV) when sonicated in water. Our results show that particle size distribution, dispersion method, and matrix influenced TiO2 particle properties and toxicity outcomes. Controlling these factors is essential for resolving conflicting evidence and improving risk assessment of TiO2.

**Poster #15**

**Title**

Does Sex Matter? An Investigation into Sex-Specific Placental Responses to Valproic Acid Exposure

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**ABSTRACT**

Environmental stressors can disrupt placental development, yet their impact on this key pregnancy organ remains unclear. Historically, the placenta and fetal sex have been overlooked as key biological variables, despite growing evidence that male and female placentas exhibit distinct responses to environmental stressors. This study uses valproic acid (VPA), an antiseizure medication and potent teratogen, as a model to investigate whether placental response to toxicant exposure differs by sex. Pregnant CD-1 mice were subcutaneously injected with either saline (vehicle control), 400 or 600 mg/kg VPA on gestational day (GD) 9. Placentas were collected on GD18. Gene expression of nutrient transporters was quantified using RT-qPCR as a surrogate measure of placental function. Three placentas per sex across three litters per exposure group were analyzed for relative mRNA expression of glucose transporters Glut-1 (Slc2a1) and Glut-3 (Slc2a3), amino acid transporter Lat-1 (Slc7a5), and folate transporter FR-alpha (Folr1). Preliminary results showed Slc2a1 expression decreased with 600 mg/kg VPA compared with controls ($P=0.0008$) and 400 mg/kg VPA ($P=0.0005$), while male placentas exposed to 400 mg/kg VPA expressed higher Slc2a1 than females ($P=0.0313$). Folr1 expression increased with 400 mg/kg VPA relative to controls ($P=0.0474$) and was higher in females than males within the 400 mg/kg VPA group ($P=0.0007$). No significant differences were detected in Slc2a3 or Slc7a5. These findings suggest that VPA disrupts placental nutrient transport in a sex-dependent manner. Future work will determine whether structural alterations accompany these transcriptional changes. Planned analyses include quantifying the total fetal-placental area, diameter, and proportions of the labyrinth and junctional zone on H&Estained sections. Altogether, this research provides insight into potential mechanisms of sex-specific placental toxicity and its role in overall health.

**Poster #16**

**Title**

Assessing protective metabolomic pathways in the progression of triple negative breast cancer (TNBC)


**AUTHORS LIST**

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**ABSTRACT**

Triple negative breast cancer (TNBC) is an aggressive form of breast cancer (BC) associated with a poor prognosis, high risk of recurrence and limited treatment options. Genomic/proteomic studies have advanced TNBC understanding, but more work is needed. An emerging approach is to define metabolomic signals of TNBC tumours to shed light on novel prognostic/predictive biomarkers. We previously used a non-destructive mass spectrometry (MS) technique, desorption electrospray ionization-MS imaging (DESI), to metabolically profile human breast and colorectal tumours, revealing metabolic signals that significantly correlate to gold standard pathological and prognostic features, which may help improve clinical decisions. We and others also showed the expression and activation of peroxisome proliferator-activated receptor γ (PPARγ), critical to normal sugar and lipid metabolism, suppresses BC progression, but its role in TNBC is unknown. Thus, I hypothesized metabolomic profiles would reveal protective PPARγ signaling pathways that reduce TNBC growth and spread in vivo. I generated in vivo murine xenografts using human TNBC metastatic MDA-MB-231cells and found the expression and activation of PPARγ significantly decreased primary mammary tumour volumes and lung metastases vs. controls. I then DESI profiled the xenografts and showed PPARγ expression and activation significantly downregulated a group of long- and very long-chain fatty acids (FAs), intermediates of FA elongation and synthesis that promote cancer proliferation. Together, these data provide the first evidence that activating PPARγ protects against TNBC growth and spread in vivo, is detectable by DESI, and elucidates mechanistic targets to explore as novel anti-TNBC biomarkers.

**Poster #17**

**Title**

Pod-Based Vaping as a Source of Metal Particles: From Coil Heating to Pulmonary Deposition


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**ABSTRACT**

Despite claims from physicians and health agencies that vaping is safer than smoking cigarettes, the risks associated with electronic cigarettes remain complex. E-cigarettes expose users to harmful compounds, including high concentrations of nicotine, volatile organic compounds, and toxic metals. Particularly concerning is the release of metals from the heating coils of vaping devices when e-liquids are aerosolized, as inhaled metal exposure is a recognized driver of toxicological and pathological outcomes. We hypothesize that heating vaping products would significantly increase the release and subsequent deposition of metal nanoparticles in the lungs. Analysis of commonly used devices in Canada demonstrated arsenic, cadmium, and lead at ppm levels, underscoring the public health relevance of these exposures. We analyzed three popular pod-based devices used in Canada (JUUL, Vuse, STLTH) to quantify metal nanoparticles in both heated and unheated states using single-particle inductively coupled plasma timeof-flight mass spectrometry (SP-ICP-ToF-MS). Mice were exposed for three days to air, vehicle (propylene glycol/vegetable glycerin), or tobacco-flavoured aerosols from these devices. Metal deposition in lung tissue was assessed by laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS), allowing precise spatial quantification. SP-ICP-ToF-MS detected a wide range of in the number of metal nanoparticles, from 61 to 4,154 per sample, with levels of metals like titanium, zinc, lead, and nickel measured in the ppm range upon heating. Following inhalation exposure, we detected significant deposition of arsenic, cadmium, lead, nickel, and chromium in the lungs of exposed mice. This work highlights the urgent need for a deeper understanding of vaping-associated metal exposure and its consequences on health.

**Poster #18**

**Title**

Benzene-Induced Growth Restriction and Compensatory Rebound in Mouse Fetuses and Placentas

**AUTHORS LIST**

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**ABSTRACT**

Benzene is a ubiquitous environmental toxicant and carcinogen, yet its effects on early placental and fetal development remain poorly defined. In our previous work, repeated mid-gestation benzene exposure increased fetal and placental size at gestational day (GD) 19, indicating compensatory growth responses. Here, we investigated the immediate consequences of the same exposure paradigm to determine how these effects unfold over time. Pregnant CD-1 mice received intraperitoneal injections (200 mg/kg) of either benzene or a vehicle control on GD8, 10, 12, and 14, and fetal and placental outcomes were assessed at 2, 6, and 24 hours after the final exposure. Benzene exposure initially reduced fetal and placental weight, which then increased over time and surpassed control values by 24 hours. These growth dynamics were influenced by both sex and uterine position: males exhibited early growth deficits, while females showed delayed compensatory responses; fetuses in the left uterine horn were disproportionately growthrestricted at 2 hours, though this difference was not evident at later timepoints. Together with our GD19 findings, these results define a growth trajectory in which in utero benzene exposure first restricts fetal and placental development, followed by rebound growth that ultimately exceeds control levels. These findings demonstrate that susceptibility to benzene is modified by intra-litter variables, with sex- and horn-specific factors contributing to variability in outcome. This work underscores the importance of accounting for intra-litter variability when evaluating developmental toxicants and highlights the need for future studies into the mechanisms driving rebound growth responses.

**Poster #19**

**Title**

Monoculture vs co-culture: Inflammatory gene expression in asthmatic lung cells following exposure to bacterial components and a metabolite of volatile organic compounds


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**ABSTRACT**

Asthma, affecting over 4.6 million Canadians, is driven by inflammation via T2-high and T2-low pathways. Air pollutants and microorganisms can modulate asthma exacerbations. This study investigates T2-high and T2-low gene expression in monocultures and co-cultures of asthmatic primary lung fibroblasts and epithelial cells. Gene expression (solute carrier family 26 member 4 (SLC26A4), interleukin 6 (IL-6), thymic stromal lymphopoietin (TSLP)) was assessed using digital PCR following 24-hour exposure to a volatile organic compound metabolite, benzoic acid (0.04μM, 0.4μM), and two components of bacterial cell walls, lipopolysaccharide (LPS, 1μg/mL) and peptidoglycan (PGN, 3.3μg/mL). Each exposure condition was compared to either a dimethylsulfoxide (0.5%) or phosphate-buffered saline (0.5%) control. In fibroblast monocultures, IL-6 expression significantly increased by 584% when exposed to LPS, by 375% when exposed to PGN, while SLC26A4 expression decreased by 33% when exposed to 0.04μM benzoic acid, although this difference was not significant. No significant changes were observed for fibroblasts in co-culture. In epithelial monocultures, IL-6 expression significantly increased by 261%, 322%, and 260% when exposed to LPS, 0.04 and 0.4 μM benzoic acid, respectively. No significant changes were observed for epithelial cells in co-culture. No significant trends were observed in TSLP across all conditions. Results suggest that exposure to bacterial cell components upregulates T2-low inflammation in fibroblast and epithelial monocultures, while benzoic acid also increased T2-low inflammation in epithelial cells. The absence of significant changes in co-culture could indicate reduced inflammatory responses when both cell types are present.

**Poster #20**

**Title**

Life in plastic: Effects of polystyrene nanoplastic exposure on maternal caretaking behaviour, litter sex ratio, and offspring growth in two laboratory mouse strains

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**ABSTRACT**

Humans, particularly in urbanized regions, discard plastic products in landfills and oceans where they break down into smaller microplastics (< 5 mm; MPs) and nanoplastics (< 1 μm; NPs) over time. MP fragments and NPs can pass biological barriers and accumulate in neural and gonadal tissue of organisms, where toxic polymers and their additives can disrupt hormone signalling. Rodent models have shown that MNPs have consistent anti-androgenic effects that reduce testosterone (T) synthesis in adult males. However, the MNP exposure literature is heavily biased towards male subjects and often fails to explore sex differences or effects in sensitive periods (e.g., maternity, puberty, and early life). Our group has shown that prenatal NP exposure can disrupt the fetal neuroendocrine-immune system and postnatal developmental milestones in a sex dependent manner in mice. To determine if this developmental disruption may be mediated by post-natal maternal care, we exposed pregnant CD-1 and C57BL/6 mice to either (i) control drinking water or (ii) drinking water homogenized with 0.1 ng/mL of polystyrene (PS) NPs from gestational day 0.5 (GD0.5) until post-natal day 10 (PND10). Nest quality at PND2 and maternal behaviours (e.g., nursing and grooming) at PNDs 2, 6, and 10 were recorded as measures of maternal care. Dam and pup weights (g) were recorded at PND10, and we used polymerase chain reaction (PCR) to determine pup sex via Sry detection (i.e., the gene on the Y chromosome that encodes testes development). The effects of PS-NPs (and mouse strain) on maternal caretaking behaviours, litter sex ratios, and weights will be presented at the Society of Toxicology of Canada's 57th Annual Symposium in Ottawa. Our preliminary results show that litter weights vary between NP-exposed and control dams irrespective of strain; therefore, we hypothesize that variation in maternal care (particularly nursing) may be mediating this growth restriction.

**Poster #21**

**Title**

Multi-omic analysis reveals coordinated DNA methylation and gene expression changes following triphenyl phosphate exposure in embryonic cells

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## ABSTRACT

Triphenyl phosphate (TPHP) is a high-production-volume flame retardant and plasticizer that is widely detected in the environment and in biomonitoring studies. TPHP exposure has been linked to endocrine disruption, metabolic disruption, genotoxicity, and neurodevelopmental effects in vitro and in vivo. The diverse toxicological outcomes across studies suggest disruption of fundamental regulatory processes, such as epigenetic control of gene expression. Here, we used an immortalized embryonic cell line derived from rainbow trout (STE-137) to investigate coordinated transcriptional and epigenetic responses to TPHP exposure. Cells were exposed to 0 or 80 μM TPHP for 24 h, followed by RNA sequencing (RNA-seq) or whole-genome bisulfite sequencing (WGBS). Differential expression analysis identified 1,622 significant genes (adjusted p-value < 0.05), with enrichment of lipid metabolism, DNA replication and repair, cell cycle regulation, and endocrine signaling pathways. Notably, soat2 showed 328-fold upregulation and cidec increased 50-fold, indicating profound metabolic reprogramming. Weighted Gene Co-expression Network Analysis revealed modules highly correlated with exposure (r=0.96 and r=-0.89), enriched for protein metabolism, ion transport, and genomic stability. WGBS detected 382 significant differentially methylated regions (q-value < 0.05, methylation difference > 10%). The most significant region showed 88.5% hypomethylation in htr2cl1, a serotonin receptor gene, providing an epigenetic mechanism for neurotoxic effects. A hypermethylated region in brca2 suggests disrupted DNA damage repair. Integration identified nine genes with coordinated expression and methylation changes, alongside altered expression of key epigenetic regulators. Our results provide molecular evidence for early initiating events relevant to adverse outcome pathways and highlight the importance of epigenetic endpoints in developmental toxicity assessment.

**Poster #22 (Intertek Cantox Student Research Award)**

**Title**

An environmentally relevant mixture of organophosphate esters induces cholesterol biosynthesis in THP-1 Macrophages

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**ABSTRACT**

Background and Purpose. Organophosphate esters (OPEs), commonly used as flame retardants, are known immunotoxicants. In our previous study, THP-1 macrophages exposed to an OPE mixture, representative of Canadian household dust, dose-dependently accumulated cholesterol and cytoplasmic lipid droplets. However, the mechanism by which OPEs dysregulate intracellular lipids remains unclear. Here, we sought to identify the mechanism(s) driving this lipid dysregulation using tandem mass tag (TMT) quantitative proteomics. Methods. THP-1 macrophages were exposed for 48 h to an OPE mixture (1:100,000 or 1:20,000 dilution) or vehicle control. Proteomic profiling was done via TMT-based mass spectrometry, followed by a STRING clustering analysis. Gene expression of selected targets was verified by qPCR, and cholesterol and lipid droplet accumulation were assessed using biochemical assays and confocal microscopy. Results. OPE exposure altered the expression of 162 proteins, with cholesterol biosynthesis emerging as a top connected pathway. Upstream analysis indicated activation of de novo cholesterol synthesis regulated by SREBP2. These finding complement qPCR validation of hmgcr and sqle, which are known downstream targets of SREBP2 that act as rate-limiting enzymes in this pathway. Both hmgcr and sqle were significantly upregulated by the OPE mixture. Cotreatment with atorvastatin, an HMGCR inhibitor, prevented OPE-induced cholesterol and lipid droplet accumulation. Conclusion. TMT-based proteomics revealed that an environmentally relevant OPE mixture disrupts macrophage lipid homeostasis by activating cholesterol biosynthesis. Pharmacological inhibition with atorvastatin effectively mitigated these effects, identifying a targetable mechanism underlying OPE-induced lipid accumulation. This work is funded by CIHR, the Galina Dorfman Graduate Fellowship Award and the Martin Brooks Fellowship Award.

**Poster #23 (oral presentation)**

**Title**

Vaporized Cannabis Distillates Impair Alveolar Macrophage Function and Host Defense

**AUTHORS LIST**

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**ABSTRACT**

Cannabis vape cartridges aerosolize cannabis distillates containing high concentrations of tetrahydrocannabinol (THC). Despite their popularity, little is known about their impact on pulmonary health. Because the lungs directly encounter inhaled chemicals, we hypothesize that THC-vape exposure impairs alveolar macrophage (AM) function. AMs, the predominant immune cells in the alveoli, are essential for pathogen clearance. Our previous work demonstrated that nicotine e-cigarette exposure induces lipid-laden AMs (LLAMs), which may increase infection susceptibility; however, the impacts of THC vaping have not been characterized.

C57BL/6 mice were subjected to a 4-week exposure of air or THC-vape. Bronchoalveolar lavage fluid was collected for lipidomics. AMs were isolated for confocal imaging of LipidTox, or analysis via shotgun proteomics. To assess host defense, mice were infected with Pseudomonas aeruginosa following exposure and monitored for survival and bacterial burden. In select groups, AMs were depleted via clodronate liposomes prior to infection to evaluate the role of vapeinduced AM dysfunction in host defense.

Lipidomics revealed that THC vaping increased oxidized cholesterols, a driver of LLAM formation. Confocal imaging showed lipid accumulation in AMs after exposure. Proteomics revealed downregulation of proteins in immune effector and lipid metabolism pathways. Following infection, vape-exposed mice showed higher bacterial burden and reduced survival. AM depletion prior to infection in air- and vape-exposed mice similarly reduced survival, supporting a role of vape-induced AMs dysfunction in impaired host defense.

By linking THC vapes to AM dysfunction and infection risk, this work will generate critical evidence to guide policymakers in evaluating the safety of legal cannabis vaping products. The rapid emergence of high-potency cannabis vapes poses real risks, as their widespread use is outpacing the research needed to assess their health impacts.

**Poster #24**

**Title**

Forever Chemicals and Fetal Health: Investigating impacts of PFAS Using Biophysical Techniques

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**ABSTRACT**

Per- and polyfluoroalkyl substances (PFAS) are a class of persistent organic pollutants that are used in a variety of products including cookware, cosmetics and firefighting foams. Legacy PFAS (e.g., perfluorooctanoic acid, PFOA) have been banned due to their connection to numerous health issues. However, these "forever chemicals" remain in the environment and can be found in the blood of all living organisms, potentially causing adverse health effects throughout an organism's lifespan. Our group previously detected fluorotelomer (FTEOs), a novel class of PFAS, in dust samples taken from healthcare facilities and in industrial wastewater. The bioaccumulation potential and developmental toxicity of these novel compounds are unknown. To answer these questions, our group uses pregnant CD-1 mice and biophysical imaging techniques including solid-state magic angle spinning nuclear magnetic resonance (MAS NMR) and high-frequency ultrasound.

I will present the results of (i) a 19F solid-state MAS NMR study to detect and quantify PFOA and FTEOs in pregnant and non-pregnant tissue samples [1], (ii) an ultrasound study of the impact of PFOA and FTEOs on placental blood flow [2], and (iii) an NMR metabolomics study of the impact of PFOA and FTEOs on placental metabolism [3]. These studies demonstrate that 19F solid-state MAS NMR is an alternative analytical strategy for analysis of PFAS in biological samples. It demonstrates that both legacy and novel PFAS have a significant impact on fetal development, with the alterations to placental blood flow and placental metabolism depending on the pollutant. Finally, this work emphasizes that efforts should be made to minimize exposure to PFAS during pregnancy.

1. R. Neita, et al.(2025). Environmental Science: Advances 4.

2. K. Steeves, J. Hanrahan, et al. (2023). Environmental Science: Advances. 3.

3. H. Adams, J. Hanrahan, et al. (2024). Chemosphere. 356.

**Poster #25**

**Title**

Aryl Hydrocarbon Receptor-Dependent Efferocytosis Performed by Macrophages Helps Resolve Pulmonary Neutrophilia

**AUTHORS LIST**

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**ABSTRACT**

Inhaling cigarette smoke causes acute inflammation in which innate immune cells like neutrophils and monocytes are recruited to the lungs. Once in the lungs, the neutrophils attempt to eliminate cigarette smoke and die shortly thereafter; meanwhile, the monocytes differentiate into macrophages and assist tissue-resident alveolar macrophages in clearing apoptotic cells through a process called efferocytosis. This crucial process helps macrophages resolve cigarette smoke-induced inflammation, but it is also impaired by cigarette smoke. One protein that may protect against this effect is the aryl hydrocarbon receptor (AhR), a transcription factor expressed by macrophages. AhR mitigates lung damage from cigarette smoke at least partially by reducing the severity of pulmonary neutrophilia, but the mechanisms underlying this effect are unknown.

To investigate how AhR protects against cigarette smoke-induced neutrophilia, we used mutant AhR mice. These mice were either exposed to cigarette smoke or used to collect bone marrow for the purpose of isolating neutrophils or generating bone marrow-derived macrophages; then, techniques like flow cytometry, western blot, and RT-qPCR, revealed that AhR reduces pulmonary neutrophilia by promoting the ability of macrophages to efferocytose neutrophils, an effect that was further stimulated by the endogenous AhR agonist FICZ. Importantly, AhR enhanced efferocytosis independently of its ability to bind DNA or translocate to the nucleus, demonstrating that this effect was independent of its transcriptional activity. Instead, AhR enhanced efferocytosis through the IL-10/JAK/STAT pathway.

Taken together, our data reveal the importance of non-transcriptional AhR activity in protecting against smoke-induced lung damage by promoting the resolution of inflammation. Future investigation into pro-resolution AhR signaling may help identify therapeutic targets for treatment of chronic inflammatory diseases.

**Poster #26**

**Title**

How Smoking Cessation Changes the Human Lung: A Single Cell RNA-Sequencing Meta-Analysis

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**ABSTRACT**

Smoking increases susceptibility to chronic obstructive pulmonary disease (COPD) and lung cancer by damaging the lungs. While such damage is mitigated with smoking cessation, former smokers remain more susceptible to these diseases than never smokers. This suggests that cessation does not return the lungs to a never smoker state, but how smoking and cessation impact the lungs at the molecular level is not well understood.

To investigate the transcriptomic signatures of smoking and cessation, a meta-analysis was performed using existing lung single cell RNA-sequencing (scRNA-seq) data from three different studies, resulting in cells from 9 never, 5 active, and 7 former smokers. Data were integrated across subjects, clustered, and annotated by cell type. The effects of smoking status were determined by identifying differentially expressed genes and performing gene set enrichment analysis (GSEA).

Active smoking dysregulated genes involved in key cell functions, such as collagen production by alveolar type 1 epithelial cells (AT1s), cytoskeletal organization in endothelial cells, and antigen presentation in lung macrophages. Smoking cessation mitigated the effects of smoking only in some cell types; after cessation, there were no differentially regulated pathways in AT1s and downregulation of antigen presentation genes was lessened in non-alveolar lung macrophages. However, there were also effects specific to cessation; active smoker capillary aerocytes had no differentially regulated pathways, but cessation downregulated angiogenesis and cell junction genes in these cells.

Our findings demonstrate that while cessation helps some cells recover from the effects of smoking, there is also transcriptomic dysregulation that occurs only after cessation. Taken together, these data provide insight into how smoking irreversibly damages the lungs at a molecular level, reshaping our understanding of why former smokers remain at increased risk for lung disease.

**Poster #27**

**Title**

Investigating the metabolic differences between in situ and invasive ductal carcinoma using spatial metabolomics

**AUTHORS LIST**

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**ABSTRACT**

Ductal carcinoma in situ (DCIS) is a breast cancer subtype contained within the ductal system, which may or may not progress to invasive ductal carcinoma (IDC). Women diagnosed with DCIS are often over-treated because of the prognostic challenges of knowing if DCIS will progress to IDC or not. To distinguish aggressive from non-aggressive DCIS tumours, we employ desorption electrospray ionization (DESI), a non-destructive mass spectrometry imaging technique capable of detecting changes in the type and amount of lipids, sugars and small molecules using spectrums of mass to charge (m/z) ratios. We hypothesize DESI profiles of DCIS and IDC will reveal unique prognostic signatures. To test this, we performed a feasibility study using locally accrued human (DCIS/IDC, n=34) breast tumour samples. Sections of formalin fixed paraffin embedded samples were analyzed by DESI using negative ionization (m/z 50-1200), then H&E stained and annotated for tumour and non-tumour zones in a blinded fashion by our collaborating pathologists. Multivariate analyses were performed on n≅200 randomized regions of interest per pathological zone. My data suggest a series of pro-tumourigenic, inflammatory ω-6 fatty acids are significantly upregulated in IDC, while antiinflammatory prostaglandins, including 15d-PGJ2, are significantly upregulated in DCIS. As 15d-PGJ2 is an activator of PPARγ, a regulator of lipid metabolism and involved in breast tumour suppression, using immunohistochemistry, a significant increase in PPARγ expression in DCIS samples compared to IDC was observed. To further understand this relationship, we assessed an enzyme involved in 15d-PGJ2 production, PGD2 synthase, in which there was significantly increased expression in DCIS compared to IDC. This data suggests the expression of 15d-PGJ2 and PPARγ within DCIS samples may help inform the aggressive potential of these tumours and improve treatment decision making for DCIS patients and reduce toxicity from overtreatment.

**Poster #28**

**Title**

Dose-dependent toxicokinetics of permethrin in rats: A comparative analysis of four exposure levels

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**ABSTRACT**

Pyrethroid metabolites are used as biomarkers of human exposure but the impact of exposure levels on the kinetics is not clearly established. Using an experimental framework, this study documented the effect of the administered dose on the toxicokinetics of permethrin metabolites used as biomarkers. Sprague–Dawley rats were administered single oral gavage doses of permethrin at 0.004, 0.04, 0.4 and 4 mg/kg bw

Serial blood samples were taken and excreta (urine and feces) were collected at predetermined intervals up to 72 h post-dosing. Trans- and cis-3-(2,2-dichlorovinyl)-2,2-dimethyl-cyclopropane-1-carboxylic acids (trans- and cis-DCCA), 3- phenoxybenzoic acid (3-PBA), and 4-hydroxy-3-phenoxybenzoic acid (4-OH3PBA) were quantified in all matrices, and their blood concentration–time profiles were used to derive toxicokinetic parameters.

A clear dose-dependent effect was observed on the kinetics of the four metabolites analyzed, based on the combined assessment of temporal profiles of these compounds in blood, urine and feces, alongside calculated toxicokinetic parameters. In blood, increasing doses accelerated metabolite appearance, significantly shortening the appearance half-life for all four metabolites. Likewise, terminal elimination half-lives of trans-DCCA, 3-PBA, and 4-OH3PBA decreased consistently with increasing doses, accompanied by a parallel reduction in the mean residence time. In urine, the predominant elimination route, the fraction of metabolites recovered was significantly reduced at the highest monitored dose (0.4 mg/kg bw) compared to the lower doses (0.04 and 0.004 mg/kg bw). In contrast, fecal excretion, a minor elimination pathway, was unaffected by dose level. Overall, the study demonstrates that permethrin dose governs both the rate and extent of metabolite disposition; recognizing this dose-dependent toxicokinetics is therefore essential when interpreting biomonitoring data and reconstructing pyrethroid exposure in population studies.

**Poster #29 (CReSP Student Research Award)**

**Title**

Integrating temporal exposure trends to predict prenatal and postnatal per- and polyfluoroalkyl substances (PFAS) concentrations using a pharmacokinetic model

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## ABSTRACT

Introduction: PFAS are persistent chemicals transferred from mother to child through the placenta and breast milk. Pharmacokinetic (PK) models have been developed to predict PFAS concentrations in fetuses/infants but included only a few compounds and did not fully account for temporal trends in exposure.

Objectives: This study aimed to 1) expand a maternal–infant PK model for PFAS; 2) evaluate it against data from the ODENSE longitudinal birth cohort; and 3) assess how integrating temporal trends affects its predictive ability. Methods: A two-compartment PK model of maternal PFAS exposure over her lifetime and infant exposure through placental transfer/breastfeeding was expanded to five PFAS compounds (PFOS, PFOA, PFHxS, PFNA, PFDA). The model was evaluated using data from 447 mother-child pairs of the Danish ODENSE cohort (2010-2012), with PFAS measured in maternal serum during early pregnancy and in child serum at 18 months. Model performance, based on predicted versus measured child serum concentrations, was assessed with and without PFAS exposure trends, using $R^2$, slope and intercept, the root mean square error (RMSE), and predicted-to-observed ratios.

Results: Integrating temporal trends in PFAS exposure improved the overall performance of the model. The mean predicted-to-observed ratios decreased for most compounds, showing notable improvements for PFOS (1.48 to 1.11), PFOA (1.16 to 0.92), and PFHxS (1.19 to 0.94), while smaller reductions were observed for PFNA (1.96 to 1.88) and PFDA (2.74 to 2.29). RMSE values decreased by 5%-30% across compounds, with the largest reductions for PFOS (-32%) and PFOA (-25%). $R^2$ values were similar with or without accounting for temporal trends and ranged from 0.27 to 0.71 depending on the compound.

Conclusion: Accounting for temporal trends improved the accuracy of our expanded PFAS PK model. The updated PK model will strengthen the assessment of early-life exposure to PFAS and support ongoing risk assessment efforts.

**Poster #30**

**Title**

Tumorspheres as Novel In Vitro Models to Investigate Environmental Pollutants as Risk Factors for Breast Cancer

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**ABSTRACT**

Flame retardants are non-covalent chemical additives found in consumer goods such as furniture, electronics, building materials, and household products, and their release occurs as they wear out. As a result, these persistent organic pollutants are found at high levels in the environment, particularly for polybrominated diphenyl ethers (PBDEs). The phase-out of PBDEs has led to the introduction of other halogenated flame retardants, which are now detected in biota and in the human body, such as breast milk. These new compounds have also been linked with the induction of toxic effects in humans, which is of concern. To assess the toxicity of these compounds, research is increasingly turning to in vitro approaches to respect the principles of replacement, reduction, and refinement of animal welfare considerations, but also to accelerate and decrease the costs of toxicological risk assessment. The use of 3D models, called tumorspheres, for the study of anticancer treatments is raising increasing interest as they are thought to more closely reflect the tissue environment and cellular interactions. Our project aims to evaluate the effects of polybrominated diphenyl ether (PBDE) exposure on cancer progression, proliferation, and viability. Our results show that exposure to PBDEs in cancer cell tumorspheres did not affect their growth, but led to a decrease in their metabolic activity. To understand the mechanisms potentially related to these effects, we measured their impact on the expression of several cancer-associated markers. Our results showed that PBDEs induce a decrease in the expression of progesterone receptors and an increase in the expression of thyroid receptor a1, two receptors essential for the development and cell proliferation of mammary glands, whose dysregulation could lead to pathologies such as breast cancer. A better understanding of these effects could lead to better legislation, reducing risks to women's health.

**Poster #31**

**Title**

Disruption of Mammary Epithelial Morphogenesis by PFUdA: Evidence from a Mouse Model

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**ABSTRACT**

Perfluoroundecanoic acid (PFUdA) is a long-chain perfluorocarboxylic acid with hydrophobic and lipophobic properties used in industrial applications. Due to its persistence and potential for bioaccumulation, PFUdA raises concerns for human health. It has been detected in maternal serum, breast milk, and crosses the placental barrier. PFUdA has been associated with hormonal disruption in utero. A reproductive/developmental toxicity study in rats reported reduced pup weight following exposure via lactation. Given species differences and the lack of investigation into mammary development, we examined PFUdA's effects in mice.

Female mice were exposed to dietary PFUdA (0–3.0 mg/kg body weight (bw)/day) before and during mating, gestation, and lactation. Pups were weaned to a control diet at postnatal day (PND) 21, and mammary glands were collected at PND4, PND21, and PND42 for developmental assessment. Body and mammary gland weight were measured, and epithelial features—including branching, area, and terminal end buds (TEBs)—were quantified.

Female pups exhibited a dose-dependent developmental response, with the 3.0 mg/kg bw/day group most affected. Mammary gland weight was decreased at PND21 in females exposed to 3.0 mg/kg bw/day, though relative weight was unchanged. Across groups, female pups exhibited reduced TEBs number. At PND21, all parameters except ductal elongation and branching density were reduced. In males, some exhibited no epithelial tissue, while others had a few TEBs.

Our findings suggest PFUdA delays mammary gland epithelial development, particularly in females exposed to 3.0 mg/kg bw/day. Future work will explore mechanisms by which PFUdA affects epithelial development and other mammary gland compartments.

**Poster #32**

**Title**

Deriving acceptable exposure levels from in vitro data: Preliminary analyses on developmental neurotoxicity of polychlorinated biphenyls


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**ABSTRACT**

Background: Chemical risk assessment relies heavily on animal models, which are costly, time-consuming, ethically challenging and not always predictive for humans. Alternative approaches are needed to derive acceptable exposure levels for environmental chemicals that are insufficiently assessed.

Objective: To evaluate an in vitro-in vivo extrapolation (IVIVE) approach translating human in vitro data into acceptable exposure levels through a case study on the developmental neurotoxicity (DNT) of polychlorinated biphenyls (PCBs).

Methods: We reviewed human in vitro studies of PCB-induced DNT. For our preliminary analyses, we selected a point of departure (POD) for PCB-118. We used a dynamic in vitro mass balance model to convert the nominal POD into an intracellular lipid-adjusted concentration. This intracellular concentration was translated into maternal administered equivalent doses and corresponding plasma concentrations using a two-generation toxicokinetic model. Uncertainty factors were then applied to estimate tolerable daily intakes (TDIs) and biomonitoring equivalents (BEs). Estimated BEs were compared with plasma PCB concentrations measured in longitudinal birth-cohort studies observing associations between perinatal PCB exposure and DNT outcomes.

Preliminary results: Mass balance modeling yielded an intracellular concentration at the POD of 14,598 ng/g lipids. Applying toxicokinetic modeling with uncertainty factors we estimated BEs ranging 42.0–153.6 ng/g lipids in plasma and TDIs ranging 3.3–10.2 ng/kg/day. Comparisons with cohort data suggested that maternal plasma ΣPCB distributions are generally within or above the estimated BE range, while plasma PCB-118 distributions tended to fall within or below.

Conclusion: This study further documents the potential of IVIVE-based approaches for chemical risk assessment, while identifying methodological refinements to strengthen scientific confidence in their use and facilitate regulatory adoption.

**Poster #33 (Intertek Cantox Student Research Award)**

**Title**

Polycyclic aromatic compounds and ovarian health of muskrats (Ondatra zibethicus) from the Peace-Athabasca Delta

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**ABSTRACT**

In Alberta, petroleum-derived polycyclic aromatic compounds (PACs) have been increasingly detected near oil sands extraction sites and in downstream ecosystems like the Peace-Athabasca Delta (PAD). Although PACs are considered endocrine disrupting chemicals, their reproductive impacts on free-ranging wildlife in these regions remain poorly understood. This study examined the relationship between PAC tissue burden and ovarian health in muskrats (Ondatra zibethicus), a key indicator species of ecological health across the PAD.

Female muskrats (n=16) were collected from 3 sites across the PAD, receiving waters with differing levels of oil sands influence. Liver samples (5g) were dissected for PAC analyses via GC-MS/MS. Total PACs were grouped by molecular weight and alkylation status: parent or alkylated low molecular weight (ALMW), alkylated high molecular weight (AHMW) and alkylated heterocyclic (AHET) PACs. Ovaries were isolated, weighed, and processed to assess gene expression of markers related to follicle development (Igf1, Igf1r), steroidogenesis (Cyp19a1, Hsd3b1) and apoptosis (Casp3) via qPCR. CYP1A1 protein expression was assessed as a marker of PAC exposure and estrogen metabolism via Western Blot.

Muskrats collected from areas receiving water that flows through the Athabasca Oil Sands Region exhibited the greatest PAC burden, driven primarily by ALMW, suggesting exposure to petroleum-derived PACs. These animals also showed significantly higher CYP1A1 expression. Spearman's correlations revealed a negative correlation between ovarian weight and AHET, while expression of apoptotic marker Casp3 was positively correlated with ALMW and total PAC burden. Additionally, AHMW was positively correlated with steroidogenic marker, Cyp19a1. This study shows that exposure to petrogenic PACs (alkylated and heterocyclic) may alter steroidogenic and apoptotic pathways in the ovary and potentially impact the reproductive health of wildlife living near the oil sands region.

**Poster #34**

**Title**

Octopus ink as a non-lethal biomonitoring tool for assessing mining pollution impacts on coastal ecosystems

## AUTHORS LIST

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## ABSTRACT

Mining releases complex mixtures of toxic elements (TEs) into marine ecosystems, disrupting ecosystems. However, the chronic sublethal effects on wild organisms remain poorly understood, highlighting the need for practical biomonitoring tools. This study evaluates octopus ink as a non-lethal sample for assessing molecular responses to mining pollution. We determined the concentrations of TEs (As, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb, Zn) and characterized the proteomic and metabolomic profiles via Liquid Chromatography-Orbitrap Mass Spectrometry (LC-MS/MS) across five tissues —including octopus ink — of octopuses (Octopus hubbsorum, n=40) and mussels (Modiolus capax, n=80) collected from a mining-polluted and a reference site in the Gulf of California. Results showed that tissue concentrations of Co, Cu, Mn, Pb, and Zn were higher at the polluted site, especially during the cold season (up to 16.9- fold Cu in mussels, 4.5-fold Co in octopuses), likely due to winter sediment resuspension. Proteomic analyses showed tissue- and season-specific responses, with site differentiation only in the cold season and no sex differences. Although no significant protein up- or down-regulation was detected, organisms from the polluted site uniquely expressed oxidative stress and metal detoxification proteins (e.g., HSP70, glutathione peroxidase, cytochrome c oxidase) in both seasons. Notably, ink from exposed octopuses had the highest abundance of these proteins and shared ~25% of metabolite changes with other tissues. Our findings evidence that octopus ink reflects molecular responses to TEs mining pollution. However, proteome profiles showed large inter-individual and seasonal variability; thus, ongoing analyses are being conducted to determine the source of these variations, fully characterize the multi-omics response to TEs exposure and confirm if octopus ink is a reliable non-lethal biomonitoring tool for mining-impacted coastal ecosystems.

**Poster #35**

**Title**

A human ex vivo model of systemic effects of diesel exhaust on the brain

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**ABSTRACT**

Air pollution is associated with increased risk of neurodegenerative conditions such as Alzheimer's disease. Due to a lack of human-relevant models, elucidating underlying mechanisms and susceptibility factors remains challenging. In particular, a challenge to applying human-relevant in vitro models is that effects of pollutants on the brain are due not only to direct effects, but also to signals carried by the systemic circulation. We have shown that exposure of neurons to plasma from pollutant-exposed rats recapitulated pollutant-induced gene expression profiles in the brain. Here, we applied this ex vivo model to the human context to determine whether pollutant effects can be identified following treatment of brain cells with plasma from pollutant-exposed individuals.

Plasma was collected from individuals (n=7 males, 8 females) in a randomized double-blind crossover study involving exposure to diluted diesel exhaust (DE; 300 μg/m3 PM2.5) or filtered air (FA) for 2 h with or without prior treatment with the antioxidant N-acetylcysteine. Plasma collected immediately pre- (0 h) and post- (2 h) exposure was used to treat induced pluripotent stem cell-derived neurons for 4 h. Changes in transcript levels between 0 and 2 h - assessed by RNA-sequencing - were compared for DE vs FA, and evaluated statistically (unadjusted $p < 0.05$, fold change > 1.2 for exploratory purposes).

Gene profiles tended to group according to individual, indicating model responsiveness to plasma factors. Comparison of DE and FA revealed differential expression of 255 genes (202 down, 52 up). Initial analyses suggest that responses differ between males and females. Ongoing analyses are exploring affected biological pathways and interactions with individual attributes.

This work is the first to use a human-relevant laboratory model to explore how pollutant-induced circulating factors affect the brain, providing human-relevant evidence of the effects of air pollution on brain health.

**Poster #36**

**Title**

Impact of excess folic acid, with or without choline, on methyl metabolism in Wistar rat offspring

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**ABSTRACT**

Folic acid is a widely consumed B-vitamin, and its intake during pregnancy has markedly increased in North America due to widespread supplementation and food fortification. In contrast, the essential nutrient choline remains underconsumed by most pregnant women. Using Wistar rats as a model of human obesity, we previously showed that prenatal exposure to excess folic acid without choline induces obesogenic phenotypes in male and female offspring. However, when excess folic acid was provided with recommended choline, female offspring were protected, while male offspring remained susceptible. Given that choline functions both as a methyl donor and a precursor for the gutderived metabolite trimethylamine, which is oxidized to trimethylamine-N-oxide (TMAO), a compound linked to vascular toxicity, the objective of this study was to determine the impact of prenatal exposure to excess folic acid, with or without choline, on levels of methyl metabolites. Pregnant dams were fed an AIN-93G diet containing either recommended 1-fold multivitamins (RV), high 10-fold folic acid with recommended choline (HFolRC), or high 10-fold folic acid with no choline (HFolNC). Offspring were weaned to a high-fat RV diet and maintained for 12 weeks. Female offspring of HFolRC and HFolNC dams had lower TMAO levels ($p < 0.01$) and a negative correlation between TMAO and dimethylglycine ($r = -0.38$, $p = 0.05$), suggesting that higher methyl capacity may be protective. In male offspring, HFolRC had higher plasma TMAO concentrations, and a positive correlation between TMAO and folic acid ($r = 0.43$, $p < 0.05$). HFolNC males had normalized TMAO levels, possibly due to choline removal redirecting toward folate-dependent pathways that utilized folic acid, contributing to attenuated TMAO levels. In conclusion, methyl capacity may modulate TMAO concentrations in a sex-dependent manner, with implications for prenatal nutrient balance and cardiovascular disease risk.

**Poster #37**

**Title**

Snakemake workflow of induced-fit based GROMACS Molecular Dynamics (MD) simulations for Protein-Ligand Binding Affinities

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## ABSTRACT

We present a snakemake based fully automated induced-fit GROMACS Molecular Dynamics (MD) simulation workflow to estimate relative protein–ligand binding affinities. Unlike traditional rigid-receptor docking with single-frame MM/GBSA, or costly alchemical FEP, our approach seeds poses via Autodock Vina near tunnel entrances, then uses distance- and force-aware steered MD to drive ligands plausible access routes into the active site. The resulting complexes undergo unbiased, long-timescale MD that allows side-chain and backbone reorganization, capturing induced fit across an ensemble rather than a static snapshot. Binding free energies are then evaluated with gmx_MMPBSA on the equilibrated trajectories, delivering ensemble-averaged ΔG estimates. This combination yields practical affinity estimates that better respect the coupled ligand–receptor conformational landscape, thereby avoiding reporting of binding affinity that are posturally unattainable or unlikely given active site positioning within proteins and ligand chemical interactions during entry. The use of small steered MD simulations reduces computational overhead, balancing resources and time management with accuracy.

**Poster #38**

**Title**

Molecular and cellular consequences of anti-androgenic in utero exposure on postnatal mammary gland development in rats.

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## ABSTRACT

Mammary gland development after birth is orchestrated by hormonal signals that regulate epithelial proliferation, stromal remodeling, immune cell recruitment, and metabolic processes. While the role of estrogen and androgen signaling is well characterized, the developmental consequences of antiandrogenic exposures remain poorly defined. To address this gap, we investigated the effects of in utero exposure to the androgen receptor antagonist flutamide (10 mg/kg/day) on the development of the female rat mammary gland. An integrative multi-omics and imaging strategy, including histology, transcriptomics, lipidomics, cytokine profiling, and second-harmonic generation microscopy, was applied at postnatal days (PND) 21, 46, and 90. Flutamide exposure elicited subtle but consistent alterations in mammary morphology and molecular signatures. At PND21, exposed glands exhibited increased adipocyte density, characterized by smaller adipocytes, accompanied by transcriptional changes enriched for androgen response and immune pathways. Lipidomic profiling revealed transient disruptions in long-chain fatty acid composition at early stages, while immune analyses indicated a reduction of adaptive immune responses at PND46 and PND90. Structural analyses further demonstrated altered collagen fiber density and orientation across all developmental stages. Together, these findings suggest that prenatal blockade of androgen receptor signaling primarily disrupts stromal maturation and early transcriptional programs during mammary gland development, but with modest long-term effects on epithelial architecture. This study highlights the sensitivity of the mammary stroma to antiandrogenic effects and provides mechanistic insight into how prenatal exposures can shape postnatal mammary gland development.

**Poster #39**

**Title**

Plastic additives differentially affect the transcriptome of breast cancer cells

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## ABSTRACT

Humans are exposed to chemicals leaching from plastics, yet many remain data-poor and lack toxicological evaluation. High-throughput transcriptomics (HTTr) offers a scalable approach to screen chemicals of concern and derive mechanistic insights for human health risk assessment. We applied HTTr in MCF-7 breast cancer cells to evaluate plastic additives and dyes. Transcriptomic points of departure (tPODs) were derived from systemic gene perturbations, pathway-specific, and estrogen receptor α (ERα)–specific measures of gene expression. Transcriptomic biomarkers were also used to assess ERα activity and stress responses. Most plastic additives showed similar toxicological potencies, with the majority producing tPODs within one order of magnitude. Bisphenol K (BPK) was the most potent chemical tested, activating ERα at the lowest concentrations, followed by plastic additive 08 (PA08), and bisphenol A (BPA). Despite similar potencies, transcriptomic biomarkers revealed mechanistic differences: plastic additives that shared similar chemical features as BPA activated the ERα, whereas several others with different functional groups inhibited the biomarker. Pathway and upstream regulator analyses further showed that BPA-like plastic additives perturbed ERα–related pathways, while other plastic additives enriched fewer and often opposing gene sets. At the highest concentrations tested, many plastic additives also activated stress biomarkers and inhibited proliferation. These findings suggest that while many plastic additives display broadly similar in vitro potencies, they diverge in ERα regulation and downstream pathways. This study demonstrates the reproducibility and utility of HTTr for chemical screening, supports grouping of ERα-active plastic additives for read-across, and highlights the need for further screening of plastic additives.

**Poster #40**

**Title**

Polystyrene Nanoplastics Drive Transient Microglial Activation via Endolysosomal Pathway

**AUTHORS LIST**

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**ABSTRACT**

Environmental micro- and nanoplastics (MNPLs) can cross the blood–brain barrier and perturb neuroimmune signaling, but microglial mechanisms remain unclear. We exposed BV2 microglia to pristine and fluorescent polystyrene nanoplastics (PSNPLs) under prolonged (3–72 h) and pulse/washout (3–72 h + 72 h clean medium) paradigms at 10–100 μg/mL. Internalization was quantified by confocal microscopy and flow cytometry; activation (Iba1, CD68) by immunocytochemistry; endolysosomal trafficking by colocalization; and cytotoxicity by MTT. Nearly all BV2 cells internalized PSNPLs within 12 h, with no detectable release after 72 h of washout, indicating persistent intracellular retention. PSNPLs localized to endolysosomal compartments and induced a transient increase in Iba1/CD68 without significant cytotoxicity at any time point or dose tested. These data show that PSNPLs are efficiently taken up and retained by microglia, triggering reversible activation via endolysosomal pathways without overt cell death, and suggest that even single exposures may have lasting effects on neuroimmune homeostasis.

**Poster #41 (oral presentation)**

**Title**

Dibenzothiophene perturbs placental iron metabolism and increases markers of ferroptosis

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**ABSTRACT**

Introduction: The extraction and processing of bitumen in the Alberta oil sands is linked to the release of polycyclic aromatic compounds (PACs) in the environment. Some of these PACs have been shown to negatively impact pregnancy success and placental cell function. The heterocyclic PAC, dibenzothiophene (DBT), an organosulfur compound, has been measured in wildlife living near oil sands industrial activity. Work in our lab demonstrated that DBT can impair placental cell function. Although the cytotoxic mechanisms of DBT have not yet to be fully elucidated, DBT has been shown to increase oxidative stress in other tissues. Importantly, oxidative stress has been linked to ferroptosis—a cell death pathway linked to cellular iron overload. The goal of this study was to determine if DBT can induce ferroptosis in placental cells.

Methods: Human placental trophoblast cells (HTR-8/SVneo) were exposed to DBT (1 and 10 μM) for 48 hours. We assessed mitochondrial dysfunction (ATP), oxidative stress (ROS, MDA) and gene targets related to ferroptosis and iron overload.

Results: DBT exposure resulted in decreased ATP production in association with increased ROS and MDA as well as downregulation of the key antioxidant gene, GPX4 involved in ferroptosis. Moreover, DBT treatment resulted in a significant increase in the expression of the iron importer (ZIP8) and downregulation of the iron exporter (SLC40A1) suggesting that DBT is promoting iron accumulation in the cells.

Conclusion: Iron homeostasis in the placenta is recognized as critical for energy production, and the successful maintenance of pregnancy. Excessive intracellular iron disrupts the redox balance, which can result in cellular damage and ultimately lead to ferroptosis. While this study provides evidence linking DBT cytotoxicity, iron dysregulation, and potential reproductive harm, further investigation is necessary to fully evaluate the impact of DBT exposure on pregnancy outcomes.

**Poster #42 (oral presentation)**

**Title**

Gestational Bisphenol A Exposure Has Permanent Effects on Mice Vasopressin Sex Differentiation

**AUTHORS LIST**

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**ABSTRACT**

Arginine vasopressin (AVP) is a conserved sex dimorphic system regulating social behaviors and physiologies. AVP neurons in the paraventricular nucleus (AVPPVN) are involved in sex-biased social behaviors. Gestational exposure to bisphenol A (BPA) also has been linked to sex-specific behavioral deficits in children; however, the underlying mechanisms remains unclear. Here we investigated the effects of gestational BPA exposure on sex dimorphism of the AVP system in mice using immunohistochemistry, tissue clearing, electrophysiological, birth dating, and in utero manipulation approaches. We found that AVPPVN neuronal number, intra-/extra-hypothalamic AVP projections, and intrinsic properties were sex dimorphic at embryonic, postnatal, juvenile, and adult stages, which were disrupted by gestational BPA exposure and whereby female brains displaying male-like properties across these readouts. Mechanistic studies conducted with embryonic brains revealed that the masculinizing effects of gestational BPA exposure is mediated by promoting AVPPVN neurogenesis via estrogenic signal in female brains. Combined, these data reveal that sex dimorphism of AVPPVN occurs prior to perinatal estrogen surge, and that gestational BPA exposure permanently disrupt AVPPVN sex differentiation at the cellular, circuitry, and functional levels. This study also provides mechanic insights into the epidemiological studies showing associations between prenatal BPA exposure and sexspecific social behavioral deficits.

**Poster #43**

**Title**

Labrador tea alters hepatic glucose metabolism and inflammatory response

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**ABSTRACT**

Introduction: Labrador tea (Rhododendron groenlandicum), found widely in the boreal forest, is used by Indigenous Peoples for its medicinal properties, including anti-diabetic and anti-inflammatory effects. Commercial logging practices of clear-cutting, followed by spraying with glyphosate-based herbicides (GBHs), have the potential to affect the quality of this traditional medicine; a concern that has been raised by members of the Bigstone Cree Nation. The overall goal of this project is to determine if Labrador tea that has been exposed to GBHs retains its medicinal properties. To achieve this goal, we developed a standardized brewing protocol to determine the effects of Labrador tea from an undisturbed site on key molecular pathways important for gluconeogenesis and inflammation. Methods: Based on published recipes, discussions with Bigstone Cree Nation Elders, and the scientific literature, we developed a standardized brewing protocol, which was validated by community members. Once this protocol was validated, rat liver cells (McA-RH7777) were treated with 0, 0.5, 1, and 5% Labrador tea for 24h. We determined cytotoxicity and the expression of key genes related to glucose homeostasis (Foxo1, Pepck, G6pase, and Glut2) and inflammation (Tnfa, Il1b, Nlrp3, and Txnip), the documented medicinal properties of Labrador tea.

Results: Labrador tea (5%) significantly decreased the mRNA expression of markers of glucose uptake (Glut2), gluconeogenesis (Foxo1, Pepck, and G6pase) and inflammation (Tnfa, Il1b, Nlrp3, and Txnip).

Conclusion: Our results suggest that a water-based infusion of Labrador tea may reduce glucose uptake, gluconeogenesis, and inflammation in hepatic cells; these results are consistent with Indigenous knowledge of the medicinal properties of Labrador tea. The next steps of this project are to explore functional outcomes following exposure to allow us to compare Labrador tea from an undisturbed site with the plants that have been exposed to GBHs.

**Poster #44**

**Title**

Biological effects of microplastics are dependant on size, composition and source

**AUTHORS LIST**

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**ABSTRACT**

Potential health effects of microplastics (MPs) are a growing concern, with inhalation being a relatively underexplored route of exposure. Studies conducted to date often use MPs of a specific size, composition, and source, impeding attribution of effects to determinants of toxicity. To define the importance of these factors, we compared the effect of size-matched plastic and non-plastic materials on alveolar epithelial cells and murine monocytes.

Human alveolar epithelial (A549) cells and murine monocyte (J774) cells were exposed (0, 30, 100, 300 μg/cm2) to washed size-matched (0.3, 1, 3 μm) plastics (2-3 independently-sourced polystyrene (PS) per size; polymethyl methacrylate (PMMA)) and metal oxides (SiO2, TiO2, Al2O3) for 24h. Particles were characterized (e.g. dynamic light scattering (DLS), scanning electron microscopy (SEM)) to corroborate size and shape. Toxicity was assessed according to cell viability, metabolic activity, oxidative stress, and cytokine release (n=6 experimental repeats), and tested statistically by 2- or 3-way ANOVA.

SEM and DLS analyses revealed some discrepancy from source-reported characteristics; however, a subset – PS-MPs, PMMA-MPs, and SiO2 – were relatively well-matched. Cell viability and metabolic activity were reduced by MPs exposures (with J774 showing greater sensitivity than A549) in the absence of marked changes in oxidative stress. PMMA-MPs exhibited greater cytotoxic potency at the 0.3 and 1 μm sizes, whereas PS-MPs was more potent at 1 and 3 μm, and SiO2 only at 3 μm. Inflammatory potency (TNF-α, RANTES, IP-10, G-CSF, IL-6) tended to be higher for PS-MPs when compared to size-matched PMMA-MPs, and decreased with increasing particle size.

Composition, size and source may each impact the biological effects of MPs. These findings suggest that assessment of MPs toxicity requires detailed characterisation and comparison to standard reference materials in order to interpret relative toxicity and identify drivers of effects.

**Poster #45**

**Title**

Dynamic changes in biological responses to acute ozone exposure in human epithelial cells exposed at the air-liquid interface (ALI)

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**ABSTRACT**

New approaches that enable direct exposure of human lung cells to airborne pollutants – called air-liquid interface (ALI) exposure systems – allow the study of inhaled materials of unknown toxicity under physiologically-relevant conditions without requiring animal experimentation. However, before evaluating effects of poorly characterised pollutants, we need first to establish that models are sensitive to pollutant levels with known human health effects. Ground-level ozone (O3) is a ubiquitous, gaseous, and highly reactive air pollutant found in smog and linked to increased respiratory morbidity and mortality. Here we assessed effects of acute ALI exposure to a level of O3 comparable to those eliciting effects in controlled human exposure studies.

Two human alveolar epithelial cells lines (A549, H441) were exposed to air or O3 (200 ppb) during 1h at ALI. Multiple endpoints including cell viability, metabolic activity, gene expression (through PCR and targeted RNA sequencing), and inflammatory cytokines were quantified. We examined responses at three post-exposure time points (1 h, 3 h, and 23 h; n=5 experimental repeats).

Exposures to air and O3 were carried out at equivalent conditions for temperature and humidity. O3 reduced cell viability and metabolic activity. Differential gene expression was highest shortly after exposure, decreasing at later time points (H441 > A549). A number of O3-impacted genes (i.e. ID1, DUSP1, CLCF1, PTGS2, and HBEGF) were common to both cell lines. Pathway analysis showed gene enrichment of inflammation pathways (i.e. TNF-α signaling via NF-κB), corroborated by increased release of (IL-6,IL-8).

The results show the air-liquid interface exposure model allows the study of the toxicity of inhaled reactive gases using human cells at exposure levels comparable to current standards. Next steps include extension of this model across other gaseous pollutants and levels to generate dose-response curves aiming to support risk assessment.

**Poster #46**

**Title**

A Decision Tree for Toxicity Assessment of Agrochemical Metabolites using NAMs

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**ABSTRACT**

If human environmental exposure of metabolites of environmental chemicals, including agrochemicals, is likely, a reference value for risk assessment is needed considering both potency and type of toxicity. We have developed an assessment framework that utilizes existing data and tiered integration of fit-for-purpose new approach methods (NAMS) to help refine evaluation of agrochemical metabolites.

Important questions in metabolite assessment were identified including: the amount of environmental exposure based on the OECD guideline for the definition of residue; potential for genotoxicity, toxicological similarity to parent or other known chemicals; additional data needed for risk assessment. The framework was organized based on increasing need for data generation, in a tiered fashion from in silico, to in vitro and, if needed, in vivo studies.

The comprehensive framework for assessing the toxicity of agrochemical metabolites employs a sophisticated and predictable decision tree structure. Through the decision tree, metabolites are divided into five categories based on exposure considerations, available toxicity information, and types of data generation needed: (1) metabolites which have sufficient data to pass risk assessment without further data generation; (2) metabolites which require only a genotoxicity assessment; (3) metabolites which have adequate data for read-across; (4) metabolites requiring additional data which are expected to have similar toxicity to parents; and (5) metabolites requiring data which are expected to have different toxicity than parent.

This framework provides a transparent and reproducible way to assess agrochemical metabolites to derive toxicological reference values for human health risk assessment and optimally address needs for different molecules and exposure patterns.

**Poster #47**

**Title**

Risk Assessment of Manufactured Nanomaterials in Commerce Under the Canadian Environmental Protection Act (CEPA), 1999

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## ABSTRACT

Under the CMP, nanoscale forms of certain substances on the Domestic Substances List (DSL) are being addressed separately from their non-nanoscale forms (that is, bulk forms) due to their unique properties and behaviors. To support this regulatory initiative, Health Canada and Environment and Climate Change Canada conducted a mandatory survey under section 71 of the Canadian Environmental Protection Act, 1999 (CEPA) in 2015, which identified 53 nanomaterials (NMs) in commerce in Canada in quantities over 100 kg during 2014. This survey and the subsequent analysis highlighted there are significant data gaps in hazard and exposure information for some of these. In addition, a draft Framework for the Risk Assessment of Manufactured Nanomaterials (RAF) was developed and published in 2022, which describes the key principles, approaches and considerations for risk assessment and risk management of NMs within the Canadian regulatory context. The RAF was built on the traditional risk assessment approach for chemicals, but adapted to integrate the unique aspects of NMs including particle size, shape, surface modification, aggregation/agglomeration, dissolution and transformation in the environment that may affect the risks they pose to human health or the environment. As per the published Plan of Priorities, risk assessments of three NMs listed on the DSL have been initiated to evaluate their potential risks to human health and the environment. A strategy will be developed for nanoforms of substances that are on the DSL and known to be in commerce in Canada to determine which nanomaterials should be prioritized for assessment under CEPA. The strategy will also identify knowledge gaps and needs for further research or data gathering. Here we will summarize the progress to date and outline the considerations in establishing a strategic approach for evaluating DSL nanomaterials under CEPA towards the protection of human health and the environment.

**Poster #48**

**Title**

Naphthalene Impairs Osteogenic Differentiation through Reactive Oxygen Species–Mediated Degradation of β-Catenin in MG63 Cells and 3D Spheroids


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**ABSTRACT**

Naphthalene is a widespread environmental contaminant known for its respiratory and hepatic toxicities, yet its impact on bone formation remains unclear. This study investigated the inhibitory effects of naphthalene on osteogenic differentiation using human osteoblast-like MG63 cells and a three-dimensional (3D) spheroid model. At concentrations of 5 to 50 micromolar that did not affect cell viability, naphthalene markedly suppressed alkaline phosphatase activity and matrix mineralization. The expression of key osteogenic markers, including runt-related transcription factor 2, osterix, alkaline phosphatase, collagen type 1 alpha 1, and osteopontin, was significantly reduced at both the mRNA and protein levels. Mechanistically, naphthalene increased intracellular reactive oxygen species, leading to enhanced activity of glycogen synthase kinase 3 beta and subsequent proteasomal degradation of beta catenin. The loss of nuclear beta catenin decreased the transcription of target genes such as cyclin D1 and c-Myc, ultimately impairing osteogenic signaling. Treatment with the antioxidant N-acetylcysteine restored beta catenin expression and osteogenic potential, confirming the role of oxidative stress. Moreover, MG63 spheroids exhibited greater osteogenic capacity and sensitivity to naphthalene-induced inhibition than conventional two-dimensional cultures, highlighting the physiological relevance of 3D models. Collectively, these findings reveal that naphthalene disrupts osteoblast differentiation by promoting reactive oxygen species–mediated degradation of beta catenin and suppression of the Wnt–GSK3 beta signaling axis.

**Poster #49**

**Title**

High-Content Proteomic Analysis of Zebrafish Embryos in Toxicity Testing for Nanomaterials

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## ABSTRACT

Tunable properties of manufactured nanomaterials (NMs) are attractive for applications in sectors including electronics, cosmetics, food packaging and biomedicine. Surge in production/use of NMs, notably, inorganic oxide NMs in recent years cause health concerns due to potential for exposure requiring NM toxicity testing for health risk analysis. Meanwhile, alternative chemical toxicity testing platforms are sought to align with the 3R principle. An experimental model that is currently explored (e.g., drug toxicity) is the Zebrafish model due to similarities with human genome notably, developmental aspects. Here, we examined the application of Zebrafish embryos for NM toxicity testing. Wellcharacterized NMs (nanoSiO2, TiO2, ZnO) were used to expose Zebrafish embryos (dose:0-100 μg/mL, 24 wells) in E3 medium (24 h-4 d). Morphology, survival, hatching and locomotion were assessed. NM-exposed embryos were analyzed for high-content protein changes (2, 4 dpf) using a LC-Orbitrap MS/MS method, post-lysis, clarification (filterassisted method), reduction/alkylation and tryptic-digestion. NM-specific effects were noticed in morphology, survival, hatching rates for nanoZnO exposure. Significant decrease in locomotion was observed for nanoZnO, with a trend for nanoSiO2. Proteomic profiles of NM-exposed fish embryos showed NM type-, exposure dose-, developmental stagerelated and particle-specific up- and down-regulated proteins demonstrating sensitivity and specificity of analysis. NM exposure-related proteomic changes identified mitochondrial protein changes (e,g., SOD2, catalase) relevant to oxidative stress. Enriched pathways included protein processing, ribosome biogenesis, mitophagy, metabolism (e.g. amino acid, lipid) and cellular senescence providing insight into toxicity mechanisms. Our findings suggest that the application of zebrafish embryo model in combination with high-content proteomics is promising for NM toxicity testing and warrants further exploration.

**Poster #50**

**Title**

Fluoxetine exposure causes oxidative stress and mitochondrial dysfunction in ovarian granulosa cells: a role for the HIF1a signalling pathway.

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**ABSTRACT**

Introduction: Fluoxetine (Prozac) is one of the most commonly prescribed selective serotonin reuptake inhibitor (SSRI) antidepressants and has been shown to disrupt the estrous cycle in women. This effect may be mediated via the action of fluoxetine on the ovary, as it has been reported to induce mitochondrial dysfunction in other tissues. The mitochondria in the granulosa cells are crucial to energy production, steroidogenesis, and redox balance; all of the above fulfill essential functions such as folliculogenesis and hormone synthesis. Disruption of these mitochondrial processes can cause oxidative stress and activate HIF1a-mediated stress response pathways. Therefore, this study aimed to assess the effects of fluoxetine exposure on mitochondrial function and oxidative stress-related pathways in granulosa cells.

Methods: Spontaneously immortalized rat granulosa cells were exposed to control (0) or 10 uM of fluoxetine for 24h. To assess mitochondrial function and oxidative stress, we measured ATP and ROS production as well as the steady-state mRNA expression of oxidative stress markers [Gpx1, Sod1, Sod2, Txnip] by RT-qPCR. As increased ROS production can induce HIF1a signalling, we also assessed the expression of Hif1a and its downstream targets, Vegfa and Hmox1. To confirm functional activation of HIF1a signalling, we assessed VEGFA protein expression by Western blot.

Results: Fluoxetine exposure significantly reduced ATP production and increased ROS levels. While there were no effects on Sod1 or Sod2, expression of Txnip and Gpx1 increased significantly. Similarly, we observed inductions in Hif1a, Hmox1 and Vegfa expression along with increased VEGFA protein, suggesting activation of HIF1a signalling.

Conclusion: Fluoxetine exposure induced mitochondrial dysfunction and stimulated oxidative stress response pathways in granulosa cells. This study provides mechanistic insight into the potential effects of fluoxetine on ovarian functions and fertility.

**Poster #51**

**Title**

Content is not the Same as Exposure: Considering In Vivo Extraction in the Risk Assessment of Snus and Nicotine Pouches

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**ABSTRACT**

Toxicological risk assessment (TRA) evaluates the potential health risks associated with ingredients and detected constituents in various products and forms part of our assessment of oral nicotine products like snus (SP) and nicotine pouches (NP). A conservative approach for exposure assessment assumes that consumers are exposed to 100% of the constituents in the pouches. However, as some ingredients remain in the discarded pouch, this does not reflect realworld use. One suggested alternative approach was using nicotine extraction as a proxy for the extraction of other ingredients/constituents. This work presents extraction data for various constituents in different types of SP and NP. In three open-labeled, randomized, cross-over clinical studies, legal-age users used SP for 30 minutes or NP (dry and moist) for 60 minutes (an exaggerated scenario). The remaining nicotine, cadmium, lead, and tobacco-specific nitrosamines (TSNA) in the discarded SP were analyzed to determine the extracted fraction (%) by comparison with levels in unused SP. For NP, the same analyses were carried out for nicotine and minty flavor-associated constituents. For SP, average nicotine extraction ranged from 13.3–30.3%, while TSNA extraction ranged from 14.2–41.6%, with similar patterns across products. Cadmium (2.9-10.5%) and lead (<1%) were extracted to lesser extents than nicotine. For NP, the average extracted fraction of nicotine was substantially higher from the dry NP (51.3%) compared to the moist NP (39.9%). Flavor constituents were, on average, extracted much less from the dry NP (12.3–22.4%) compared to nicotine. In contrast, all analyzed flavor constituents from the moist NP were extracted to a greater extent (40.4–64.9%) than nicotine. These findings highlight the variability in ingredient extraction between different types of SP and NP. In addition, ingredient levels in the products do not accurately reflect consumer exposure, meaning that content does not equal extraction.

**Poster #52**

**Title**

Gingival Organotypic Cultures as a Tool to Discriminate Nicotine Pouch Formulation-Related Oral Biological Effects

## AUTHORS LIST

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## ABSTRACT

Nicotine pouches (NPs) are oral smokeless products intended for legal-age users of tobacco or nicotine products. NPs come in various flavors and nicotine levels. The EpiGingival™(EG) organotypic culture model has the potential for assessing the biological effects of nicotine-containing products on oral health. However, its sensitivity to capture characteristic differences in product formulation has not been systematically assessed. This study aimed to demonstrate the EG model's suitability for discriminating biological effects (e.g., modulation of inflammatory mediators, cytotoxicity, histopathological changes) of different nicotine products. EG cultures were exposed to extracts of different NP prototype formulations, Swedish-style snus pouch (CRP1.1), American-style loose moist snuff (CRP2.1), and cigarette smoke (CS) total particulate matter (TPM) for 6 hours daily for 3 days. The basolateral media collected at 24, 48, and 72 hours were tested for inflammatory mediator release by multiplex technology. After 72 hours, tissues were collected for histopathological and cell viability analyses. In this study, we showed that the organotypic EG model was biologically sensitive to various oral smokeless product categories. The most significant effects on cell viability, inflammatory mediator profile, and histopathological endpoints were observed with CS TPM and CRP2.1. While the cellular responses from CRP1.1 and the different NP extracts were less pronounced than CS TPM, the model response was not able to differentiate between the various NP formulations. Although the main objective of the study was not achieved, it is noteworthy that NPs with different formulations exerted a much-reduced biological effect on gingival cells (6 h/day, corresponding to 12 NP use for 30 min each) compared to cigarette smoke fraction and American-style moist snuff.

**Poster #53**

**Title**

Data Landscape of Flame Retardants to be Assessed Under Canada's Chemicals Management Plan

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**ABSTRACT**

Introduction: Canada's Chemicals Management Plan (CMP) is an initiative aimed at reducing the risks posed by chemicals to Canadians and their environment. Under the CMP, the Government of Canada is responsible for prioritizing and assessing substances on the Domestic Substances List under the purview of the Canadian Environmental Protection Act (CEPA), 1999. The Plan of Priorities (PoP) prioritizes substances for review in order to protect human and environmental health. Organic Flame Retardants (OFRs) are a group of substances included on the current PoP. Approximately 50 existing OFRs have been assessed under the CMP; however, ~70 additional OFRs have been identified for assessment in the 2025 PoP. The objective of this poster is to highlight the data landscape of the OFRs included on the current PoP, including identifying trends and data gaps.

Materials and Methods: Multiple data sources and predictive tools were used to identify information for OFRs identified as priorities to categorize them by type of FR, available toxicity data, functional groups, etc. Available data were reviewed to identify trends in toxicity and data gaps for risk assessment.

Results and Discussion: This poster will present observed data trends for ~70 OFR priorities based on currently available toxicity data. Predicted toxic effects for some newly prioritized OFRs are similar to previously assessed OFRs including carcinogenicity and reproductive/developmental toxicity; however, less than half have readily available toxicity data.

Conclusion: The Government of Canada has identified risk assessment and management (where required) of OFRs as a priority in order to protect human and environmental health. Analysis of the available information for newly prioritized OFRs will identify data gaps and trends, which will assist in identifying appropriate OFR groupings and risk assessment strategies, particularly for OFRs with limited or no hazard data.

**Poster #54**

**Title**

Repeat Dose Dermal Toxicity Study Utility in Canadian Agrochemical Risk Assessment

**AUTHORS LIST**

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**ABSTRACT**

In Canada, repeat dose dermal toxicity (RDDT) studies (21/28-day exposure) are part of the standard toxicology package for agrochemical registration; however, a retrospective evaluation of 41 Syngenta active ingredients (AIs) registered with the Pest Management Regulatory Agency (PMRA) demonstrates that these studies are not frequently used to set points of departure (PODs) for dermal risk assessments. Data were extracted from the most recent publicly available PMRA pesticide registration documents, including dermal PODs, study type used for POD derivation, and dermal absorption factors (DAFs). To explore the potential for risk assessment without RDDT, surrogate dermal PODs were selected from oral studies and dermal equivalent doses (DEDs) were calculated by dividing surrogate oral POD by DAF. For fungicides, 13 of 20 (65%) AIs had dermal PODs set from oral studies due to developmental, reproductive, or functional effects not assessed in dermal studies. In the remaining fungicides, the RDDT study was used to set a dermal POD, yet for half of these the value was set at the limit dose. In these cases, when a suitable oral study was selected to derive dermal PODs, derived DEDs were protective of dermal exposure. For 75% of herbicides (9 of 12) and 66% of insecticides (5 of 9), oral studies were used to set dermal PODs rather than the RDDT studies, as critical effects fell outside the scope of RDDT experimental design. Where the RDDT study was used for risk assessment, oral-based DEDs produced equivalent or more protective surrogate dermal PODs, or in some instances the study was cited but a dermal POD was not selected. Overall, RDDT studies were found not to be useful for risk assessment as oral study data would have been sufficient to establish protective PODs. Based on these findings we developed a basic decision tree for determining the need for an RDDT study, supporting a reduction in animal use while maintaining human health protection.

Dear colleagues,

In 2028, for the first time in 20+ years, the International Congress of Toxicology (ICT) will be held in Canada — and, as proud host of this prestigious scientific event, the Society of Toxicology of Canada (STC) is pleased to invite you to experience "*Toxicology in a Changing World*" at ICTXVIII in Vancouver, June 11-14, 2028.

The ICT, held once every three years, is the premier event for the International Union of Toxicology (IUTOX) — the global organization connecting more than 60 national and regional societies worldwide, together representing more than 25,000 toxicologists. The SCT is a founding member of IUTOX, and ICT 2028 marks the third time the STC has been awarded the right to host the congress. Our Society hosted the very first ICT in Toronto in 1977, as well as ICTXI in Montreal in 2007. Other recent editions of the congress have been held in Merida, Seoul, Honolulu, and Maastricht, with ICTXVII scheduled for October 2025 in Beijing.

ICTXVIII in Vancouver is expected to attract some 2000 toxicologists from around the world — from academia, industry, government, and non-governmental organisations — to teach, learn, network, celebrate achievement, and showcase the latest advances in the field.

The International Congress of Toxicology — like toxicology itself — is interdisciplinary, consistently offering delegates a wide range of perspectives and presentations on a host of current and emerging issues such as: advances, and new approaches in toxicity testing including 'omics, modelling, AI, animal-free methods; assessing novel therapeutics, new technology, medical devices; emerging chemicals of concern; toxicology across the lifespan – developmental origins, genetic, epigenetic, clinical and forensic; One Health and toxicology, the interdependence of all living things -climate change, environmental contaminants, food safety, social justice; and toxicology for next generation risk assessment – cumulative, mixtures, multistressor interactions, susceptibility.

The four-day program for the 2028 ICT will provide attendees with a variety of sessions to choose from, including exciting keynotes presented by leading researchers; plenaries; short and long symposia; workshops; and special seminars addressing the state of the art in toxicology, all in one of Canada's premier event venues — the Vancouver Convention Centre — with opportunity for ancillary meetings before and after the conference. A call for proposals will be issued in 2026. Of course, the congress will also offer an array of attractive social activities to allow delegates and their guests to make and renew acquaintances and experience Vancouver's spectacular scenery and rich and diverse cultures and cuisines.

Stay tuned for more details, and we look forward to welcoming you to ICTXVIII in Vancouver!

*About Vancouver:* Vancouver, British Columbia is located on Canada's west coast, directly north of the US state of Washington. Nestled between the Coast Range mountains and the Strait of Georgia, the city is renowned for its natural beauty. The greater Vancouver region has a population of more than 2 million people — the third-largest metropolitan area in Canada — yet remains very much a "city of neighbourhoods," each with a distinct character. Vancouver celebrates its cultural diversity, with many residents tracing their backgrounds to Greece, Italy, China, Japan, India, and other nations. The SCT acknowledges that the City of Vancouver is situated on the traditional and unceded territory of the Musqueam, Squamish, and Tsleil-Waututh First Nations.


***www.ICT2028.com***

## Meet and Greet Location

**Sunday, December 7, 7-10 pm / Dimanche 7 Décembre 7-9h pm**

**JOEY Rideau, 50 Rideau St E160, Ottawa**

Go straight to Dalhousie then turn right on Rideau St (350 m South-West of the Hotel)/ tout droit sur Dalhousie St puis à droite sur Rideau St (350 mètres au sud-ouest de l'hôtel)