ISAPP
International Scientific Association for PROBIOTICS and PREBIOTICS

2025 Annual Meeting Report

ISAPP Annual Scientific Meeting
Banff, Canada July 15-17, 2025

EXECUTIVE SUMMARY

Plenary Session, Banff Centre

The 2025 ISAPP Annual Scientific Meeting provided the setting for 142 scientists and clinicians from 23 countries to connect together in the beautiful Canadian Rocky Mountains, for 2.5 days of engaging exchange on the science of biotics. Attendees shared research of the highest calibre in presentations, short talks, discussion groups and poster sessions, with robust discussions and engagement from the community.

2025 ISAPP Annual Meeting

… at a glance

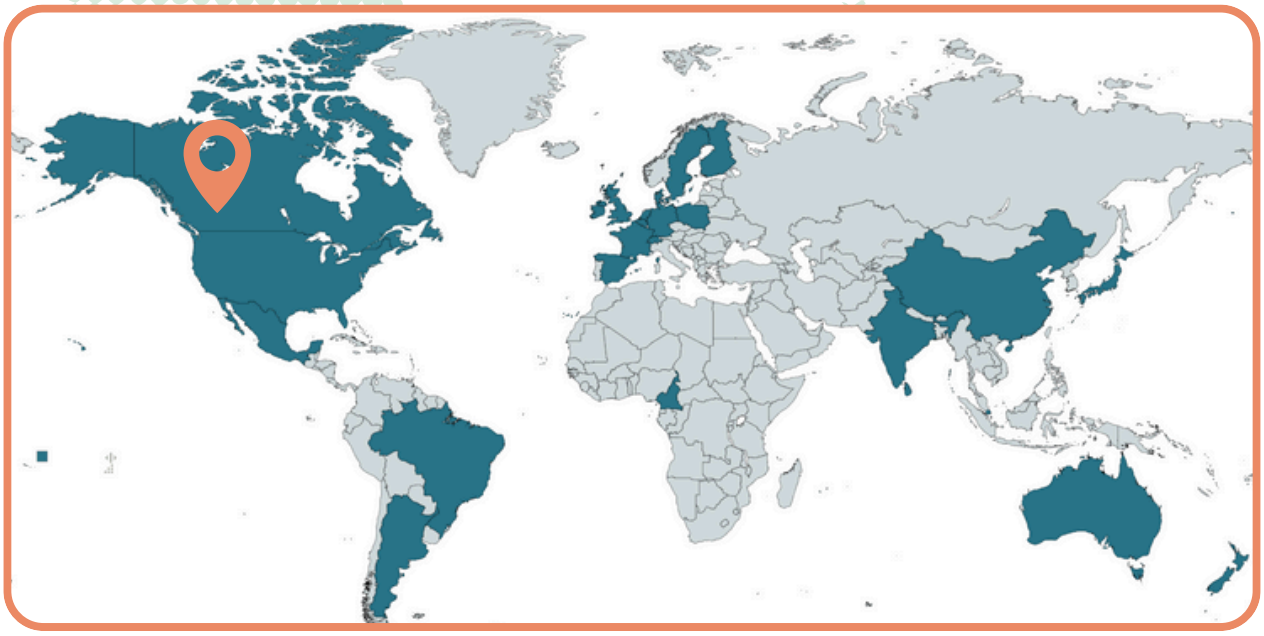
142 attendees

- **53** Industry members
- **45** Speakers and invited experts
- **28** Students and Fellows
- **16** Board members and staff

Representing

- 51 academic institutions
- 34 industry member companies

Delegates travelled from 23 countries and 6 continents to Banff, Canada



2025 ISAPP Annual Meeting

… at a glance

Feedback highlights

From an expert speaker

"This meeting was fantastic as always. ISAPP provides the best discussion of meetings that I attend, and is exceptionally well organized."

From an industry member

"Other meetings do not compare to how ISAPP fosters discussion, networking, and collaboration."

From a SFA member

"This conference was unparalleled in its ability to foster meaningful connections with fellow students, including exceptionally talented individuals from around the world."

EXECUTIVE SUMMARY, CONT.

The plenary program showcased impressive bodies of work from leading scientists on topics spanning prebiotic immune interactions, sensing gut microenvironments, differentiation of probiotic and postbiotic mechanisms, metabolomic responses to fermented foods, and the most promising probiotic research targets for glucose management and obesity. In the interactive discussion groups, academic and industry scientists explored six important research questions in small group settings, sharing the latest data, implementation challenges and opportunities for the field. Our expert panel session addressed the topic of clinical translation of biotic science, bringing together insights and perspectives from clinical, academic and industry researchers on how to advance the implementation of science in this field by healthcare professionals. Further opportunities for scientific exchange included a lively poster session, thought-provoking short talks and late breaking news session, showcasing delegate research and perspectives in energy-filled sessions.

Plenary Session, Banff Centre

Welcome reception, Banff Centre

Meanwhile, the industry committee- and student association-organised premeeting programs provided an opportunity for industry member scientists and early career researchers to connect with each other and share knowledge, leading to fertile discussions to fuel research, development and innovation. Amongst these and other scientific portions of the program, attendees enjoyed opportunities for social connection, fun, and exploring the spectacular surrounds of the Banff meeting venue.

On behalf of the ISAPP community, we thank all attendees for joining us at our annual meeting, and helping to advance biotic science together.

Marla Cunningham, ISAPP Executive Director

THE 2025 ISAPP BOARD OF DIRECTORS

ISAPP Board of Directors: (left to right) Hannah Holscher, Kelly Swanson, Anisha Wijeyesekera, Kristin Verbeke, Marla Cunningham, Eamonn Quigley, Dan Merenstein, Dan Tancredi, Sarah Lebeer, Geoffrey Preidis, Maria Marco, Hania Szajewska, Gabriel Vinderola, Seppo Salminen (not present: Karen Scott, Jens Walter)

IAC FEATURED PLENARY SESSION

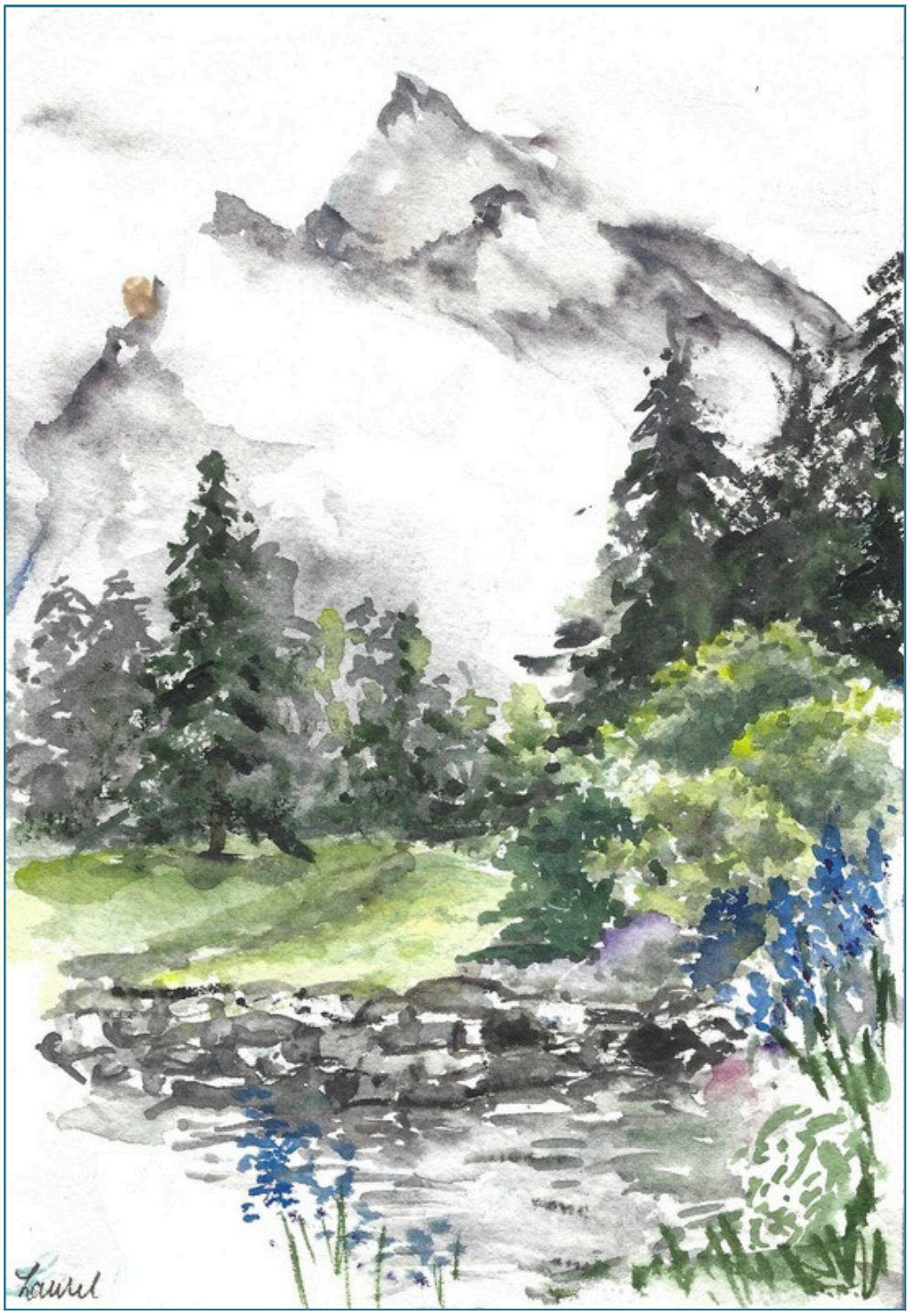
THE ROLE OF MICROBIAL COMMUNITIES IN HEALTHY AGING

This plenary session brought together cutting-edge perspectives on how gut microbial communities influence the ageing process, featuring expert talks by Professors Elaine Holmes and Sean Gibbons.

Elaine presented advanced analytical approaches to explore phenotypic characterization of the aging gut microbiome, emphasizing how microbial metabolites—captured through platforms like NMR and MS—reflect complex host-microbe interactions. Drawing on human, animal, and in vitro studies, she highlighted how the microbiome and metabolome change with age across populations and diets, as well as the impact of interventions including caloric restriction, antimicrobials and gut microbiota transplants. The possibility of microbial biomarkers of aging and the impact of interindividual variability were key themes explored in the discussion.

Sean introduced a systems biology view of healthy ageing, exploring large-scale metagenomic and metabolomic data across diverse cohorts. His talk emphasized that microbiome "uniqueness" increases with age and correlates with reduced abundance of core taxa like Bacteroides, which was paradoxically linked to better survival outcomes in older adults. Using microbial community-scale metabolic models (MCMMs), he demonstrated how butyrate production capacity varies between individuals and can be modulated through personalized dietary and -biotic interventions. Finally, he urged for a nuanced, mechanism-informed strategy for modulating the microbiome to support healthy aging.

Together, the talks showcased complementary technological and modeling approaches to understanding and shaping the aging gut microbiome—laying a foundation for precision nutrition and microbiome-targeted strategies to promote resilience in later life.



Watercolor of Banff Cascade Gardens
by meeting guest, Dr. Laurel Beckett.

IAC/SFA INNOVATION WORKSHOPS

IAC Representatives, SFA Executives

The Industry Advisory Committee (IAC) and Students and Fellows Association (SFA) Innovation Workshops provided a valuable platform for collaboration between SFA and industry scientists. This year four IAC/SFA discussion groups focused on **"Non-gut microbiomes"** chaired by Shalome Bassett (Fonterra), **"Mechanism of action – from microbe to mechanism"** chaired by Jessica Van Harsselaar (Beneo), **"The promise and potential of next-generation probiotics (NGPs)"** chaired by Patricia Sanz (University of Reading) and **"Microbial consortia"** chaired by Dave Hourigan (University College Cork). These workshops enabled both communities to exchange cutting-edge research, explore emerging topics in the field, and identify opportunities for innovation. Both SFA and IAC attendees showcased recent advancements and ongoing projects, while sharing insights into challenges and applications—fostering mutual benefit and strengthening connections between academia and industry.

Group 1: Non-gut microbiomes focused on the challenges and importance of researching microbiomes outside the gut, such as the vaginal, skin, oral, and respiratory microbiomes. Discussions highlighted the limited studies outside Western countries and the difficulties encountered in translating research findings into clinical applications. Regulatory and cost issues were viewed as significant barriers, especially for vaginal live biotherapeutic products, with varying regulatory landscapes across regions. The session emphasized aligning policy with scientific advances and the necessity for clear regulatory frameworks to facilitate product development for different microbiomes. Using phage therapy as an example, engagement with policymakers and regulators was highlighted as critical to addressing these challenges. The need for improved models, interdisciplinary collaboration, and a better understanding of the mechanisms and intellectual property protection for microbiome therapeutics was also acknowledged.

Group 2: Mechanisms of action focused on the distinct and shared MoAs of probiotics, prebiotics, and postbiotics. Discussions centered on key pathways linking microbial activity to host metabolism, immunity, and neurological functions, with a special focus on the gut-brain axis and the role of metabolites such as SCFAs. The group explored how metabolites and bioactive components contribute to these effects, the challenges of addressing non-responders, and the complexities of proving MoA.

There was an emphasis on personalized approaches, with AI and machine learning suggested as tools for improving study designs and understanding individual variability in response to biotics. The group also discussed the importance of refining in vivo and in vitro models to better translate findings from animal studies to human applications.

Workshop group, Banff Centre

Group 3 discussed the potential of next-generation probiotics (NGPs), including novel commensals and engineered strains, to address health needs beyond those met by traditional probiotics. Key themes included defining what qualifies as an NGP, demonstrating efficacy and safety—particularly in healthy populations—and navigating complex regulatory landscapes. The group highlighted the importance of precision medicine, standardisation challenges, and identifying active components beyond viable cells. Advances in microbiome science, diagnostics, and AI were seen as opportunities for personalising NGP use, with collaboration across science, industry, and regulation considered essential for progress.

Group 4: Microbial consortia covered key advances and challenges in designing microbial consortia for health applications, including the importance of host-adapted strains, environmental context, and strain stability over time. Discussions spanned phage dynamics, bacteriocin production, metabolic modelling, and synthetic communities, with emphasis on personalization, functional validation, and regulatory hurdles. Applications ranged from gut-brain interactions to industrial strain optimisation such as individual vs multi-strain culturing, and attention to the risks of genetic drift. Emerging strategies for the rational design include flux-based modelling, co-occurrence networks, and working backwards from successful FMTs to define effective consortia.

EXPERT PANEL

CLINICAL TRANSLATION OF BIOTIC SCIENCE: HOW CAN WE ENHANCE IMPACT FOR CLINICAL PRACTICE?

Aiding the efficient and timely translation of research to practice is a challenge for all health sciences, and the field of biotic science is no exception. Clinical research on probiotics, prebiotics, postbiotics, synbiotics and fermented foods continues to grow year each year, creating a wide range of evidence-backed interventions with significant potential to improve patient health. Clinical practice can be slow to change, and amid growing public and market interest in the concepts of gut health and the microbiome, misconceptions and hype may obscure the scientific data.

With a focus on points of influence for scientists, this panel brought together academic and industry scientists to explore the challenges and paths forward for clinical implementation of biotic science, sharing expert insights on appropriate and clinically relevant research design, conduct and reporting, as well as tailoring communication and outreach efforts to a clinical audience.

Expert panel discussion, Banff Centre

Prof Howard Bauchner MD started the session with a keynote for the panel, drawing on his experience as a scientist, clinician and past chief editor of the Journal of the American Medical Association. He provided his takeaways about the research which changes practice (and that which doesn't) - emphasizing the importance of robust RCTs and clinical guidelines. Exploring the responsibilities of investigators, he highlighted key considerations to ensure accurate dissemination of scientific findings, identifying hype, causal attribution, and balance of evidence as key watchouts in scientific communication.

Following on with short panel presentations, Prof. Dan Merenstein MD shared insights from his experience in clinical studies focused on primary care research questions, with particular emphasis on the importance of choosing study settings and outcomes with strong relevance to clinicians and patients. Prof Hania Szajewska MD PhD followed the path of research into the development of clinical guidelines, exploring the explanations and implications for divergent probiotic recommendations from clinical societies. In the presence of conditional recommendations either for or against use, the implications for informed, shared decision making with patients remain paramount. Adding insights into probiotic research gaps identified during the American Gastroenterology Association's probiotic guideline development in 2020, Prof Geoff Preidis MD PhD also identified key scientific and educational barriers in a clinician's practice to implementation of biotic science, such as inconsistent data, lack of mechanistic understanding of biotic action and knowledge gaps across clinicians and care teams. Kristina Campbell, science writer and ISAPP's communications director, explored strategies to help improve the impact of robust science with communication techniques providing relevance and engagement - such as couching research results within a narrative about a familiar clinical problem. To conclude, ISAPP industry member scientists Kristie Leigh RDN and Kyle Sloan PharmD highlighted recent statistics and trends in clinical recommendations for probiotics and prebiotics, identifying key factors feeding into clinical decision making as well as the most effective outreach methods for clinicians.

A lively Q+A followed, exploring broad topics including the responsible reporting of secondary outcomes, implications of open science, the value of meta-analysis, the influence of patient demand on clinical decision making, reducing investigator and industry bias, and best practice for communicating n=1 patient experiences.

HIGHLIGHTS FROM THE PLENARY SESSIONS

The plenary sessions at the annual meeting covered a broad range of topics related to biotics and the microbiome. Here we share some highlights of the talks given by this international lineup of experts.

Paul de Vos of Maastricht University, the Netherlands spoke on "Dietary fibers and immune health". Starting with a reminder that the gut is the largest immunological organ in the human body, he introduced the question of how dietary components interact with the immune system. He described a series of experiments on dietary fibers, showing that they exert immune effects that depend on their chemical structure. Long-chain inulin is effective for stimulating Th1 cells (which contribute to defense against pathogens) whereas short-chain inulin is less effective; in addition to these divergent immunological effects, they share the property of upregulating bacterial adhesion gene expression. When tested for effects on human Th1-dependent pathogen responses (Hepatitis B vaccination), oral administration of long-chain inulin enhanced antibody responses while short-chain inulin was ineffective. Overall, different dietary fibers appear to support immune function by promoting beneficial bacteria and microbial products, as well as through direct interactions with immune cells.

The talk by **Carolina Tropini** from the University of British Columbia, Canada, was called "Leveraging the gut environment for functional biosensor microbes", and covered the process of creating a bacterial biosensor that can detect changes in the gut microbial environment occurring prior to clinical manifestation of disease. The group looked for a gut commensal with a strong ability to engraft and survive perturbations and identified *Bacteroides thetaiotaomicron*. Based on metatranscriptomic data, they created a library of *Bacteroides* promoters sensitive to specific environmental cues in the gut such as malabsorption and low pH. They developed a toolkit (using a phage promoter) for Bacteroides to induce and measure the expression of fluorescent proteins, and demonstrated in a series of experiments that the biosensor could detect subclinical intestinal malabsorption.

The Sanders Award for Advancing Biotic Science 2025 Lecture was given by this year's award winner, **Remco Kort** of Vrije Universiteit Amsterdam, the Netherlands, and covered two decades of his applied research for the advancement of biotic science.

In an inspiring presentation, Prof. Kort urged researchers to "propel biotic science beyond academic walls", striving to create societal impact from microbiome and probiotic science. He described how he helped create Micropia, the world's first museum dedicated to microorganisms, which fosters public engagement with the microbial world through a series of interactive exhibits. He also talked about a project he co-founded called Yoba for Life, a nonprofit organization providing probiotic starter cultures and other support to local entrepreneurs in several African countries, enabling them to create yogurt-selling businesses. Turning to his current scientific research projects, Prof. Kort described a citizen science approach to engage women in the isolation and application of the vaginal bacteria Lactobacillus crispatus. The project looks at natural variation in the genes of L. crispatus strains to identify probiotics that may be effective for clinical outcomes, guided by the idea that natural variation in real-life environments may be the best way to select effective novel probiotic strains.

Slides and abstracts from the meeting are available to meeting participants and IAC members on the ISAPP website here – meeting attendees and industry members can contact ISAPP for the password via info@isappscience.org.

Haruki Kitazawa from Tohoku University, Japan presented on "Probiotics and postbiotics to regulate the immune system: what can we gain or lose from viability or inactivation?" A brief review of the literature, albeit with few direct comparative studies on the same strain, showed that in most cases (in mouse models) the live microorganism was equally effective to the heat-killed version, although in a few cases the live microorganism was more effective. He notes that the question of whether to use a probiotic or a postbiotic for immunomodulation should take into account the specific strain, the type of inactivation process (such as heat treatment), the immunological context, and the existence of in vitro and in vivo studies.

The next speaker was **Guy Vergères** from Agroscope, Switzerland, speaking about investigating the health benefits of fermented foods using 'nutrimetabolomics' (the application of metabolomic techniques to nutrition science). Analysis of postprandial serum metabolites reveals much about the physiological effects of different foods in the body – for example, milk vs yoghurt intake results in several key differences in serum metabolites and gene expression which may explain some biological effects of fermented foods. He also explored work linking the genomes of yogurt strains to the metabolome of fermented milk products, and ongoing research within the COST Action PIMENTO project exploring the health benefits of fermented foods.

Plenary session, Banff Centre

ISAPP board member **Maria Marco** of UC Davis, USA, presented on the ISAPP consensus definition on "gut health", which is currently in review. The consensus panel of 13 experts was convened in September 2024 to define the term, which is used frequently among the general public as well as in the scientific literature. After extensive discussion, the experts proposed a definition of gut health encompassing key physiological domains of function as well as the subjective patient experience of gut health. Implications for research and clinical practice were highlighted, with the work intended to serve as a starting point for more comprehensive and aligned approaches to understanding what contributes to gut health and ultimately overall health.

The Glenn Gibson Early Career Researcher Award 2025 Lecture was given by **Peijun Tian** of Jiangnan University, P. R. China. In his talk called “Psychobiotics: unveiling the molecular basis of host mood regulation”, Dr. Tian described a bacterial strain (*Bifidobacterium breve* CCFM1025) with mood-regulating potential. This strain prevented depressive-like behaviors in chronically stressed mice, while a closely related strain did not. A comparison of the two strains showed different sets of associated metabolites. Further work showed that the effect of the mood-regulating strain depends on its ability to synthesize ILA Indole-3-lactic acid (ILA). The group is screening other bacterial strains for the presence of key genes for ILA synthesis.

The Gregor Reid Award for Outstanding Scholars in Developing Nations 2025 Lecture was presented by **Josiane Kenfack** from University of Yaounde I in Cameroon. She presented on “The Leke project: Mapping the vaginal microbiome and benefits of vaginal lactobacilli in Cameroon”. The Leke project is a citizen science initiative in Cameroon, a sister project of the Isala project in Belgium, aiming to collect data on the vaginal microbiome and spread awareness about vaginal health. Differences were found in the vaginal microbiomes of healthy women living in urban versus rural settings, while further data showed potentially unique features of the vaginal microbiome in HIV-positive pregnant women, such as greater diversity and less *L. iners*.

Plenary session, Banff Centre

Two Industry Advisory Committee (IAC) highlight talks opened the day on Thursday. **Maria Rodriguez-Palmero** of AB Biotics, Spain described a trial in 210 perimenopausal and postmenopausal women. Compared to placebo, a 3-strain probiotic formulation (with *L. brevis* KABP052, *L. plantarum* KABP051, and *P. acidilactici* KABP021) taken for 3 months significantly decreased menopause symptoms as measured through the validated MRS-II scale. Quality of life, as measured using the Utian scale, also improved. Then **Elaine Vaughan** of Sensus, the Netherlands, gave an overview of the work of an ILSI Europe Prebiotic Task Force, mapping scientific evidence and regulatory pathways to support EU health claims for prebiotics. She explained the key path of building a health claim dossier that uses the term 'prebiotic' in association with a health benefit. Recommendations for a dossier included appropriate characterisation of prebiotic substances and their selective effect on the microbiota, clinical demonstration of physiological benefit of prebiotics with mechanistic support, and documentation of the link between the prebiotic's selective effect on the microbiota and physiological benefit through multiple clinical studies.

Two Students and Fellows Association (SFA) highlight talks followed. The first was by **Valentina Cattero** from Laval University, Canada, covering the prebiotic-like activity of cranberry extract. She described how the extract, which is rich in both polyphenols and oligosaccharides, modulated gut microbiota composition (specifically altering the mucus niche) and enhanced intestinal barrier function in ex vivo and in vivo models. The second was by **Kait Al** from Western University, Canada, and described a pilot study that tested acetate (an apple cider vinegar supplement, equivalent to 30mL per day) in people with anxiety or depression taking a psychotropic medication with medication-associated weight gain. Lipid profiles improved in most participants, and depression/anxiety scores improved in almost all participants, demonstrating positive early results for possible future research.

Finally, **André Marette** from Université Laval, Canada, addressed the timely topic of probiotics for metabolic disease. After exploring current research on the subject, he turned to promising pathways for future probiotic development. Previous research has established that yogurt is protective against type 2 diabetes, but so far the mechanisms are unknown. By looking at microbial metabolites that modulate host metabolism, he found in a mouse model that branched chain hydroxy acids (BCHA) mediated the health benefits of yogurt consumption. He thus hypothesized that bacteria producing BCHA (perhaps various strains of lactic acid bacteria) may be probiotic candidates for metabolic health, and that promising strains may be found by looking at the duodenal microbiota (beyond the colon) and at the translocated bacteria of metabolic tissues outside the gut, such as liver and adipose tissue.

2025 AWARD WINNERS

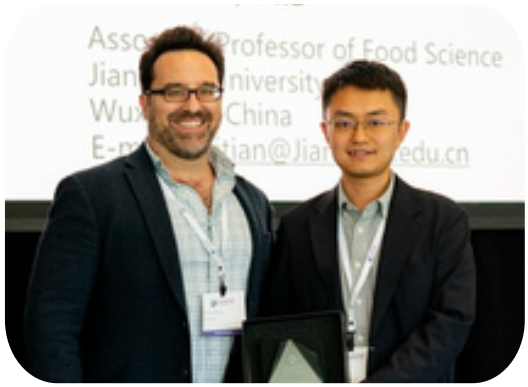
The Sanders Award for Advancing Biotic Science

Remco Kort, Vrije Universiteit Amsterdam, The Netherlands

Mary Ellen Sanders and Remco Kort

The Glenn Gibson Early Career Researcher Award

Peijun Tian, Jiangnan University, P. R. China



Geoffrey Preidis and Peijun Tian

The Gregor Reid Award for Outstanding Scholars in Developing Nations

Josiane Kenfack, University of Yaounde I, Cameroon

David Hourigan and Josiane Kenfack

Gala festivities, Banff Park Ranch

DISCUSSION GROUPS

Group 1: Role of microbially-derived compounds on fermented food and postbiotic health benefits

Maria Marco and Gabriel Vinderola, Co-chairs

Fermented foods and postbiotics contain microbially-derived compounds comprised of thousands of metabolites, proteins, and cell-wall components. Although many of these compounds are known to induce immune, metabolic, epithelial, and neural responses in humans when provided individually or synthesized by members of the gut microbiome, there remain questions on the extent to which those compounds contribute to health benefits observed as a consequence of fermented food and postbiotic intake. This discussion group evaluated what is known about the microbially-derived compounds present in fermented food and postbiotic preparations and what steps are needed to establish the significance of these compounds individually and collectively on human health.

Discussion Group 1

To address this complex subject, fermented foods were discussed for the relative importance of individual compounds (for example, β-galactosidase in yogurt and acetic acid in vinegar) and the complete matrix (for example, sauerkraut) for modulating intestinal and gut microbiome responses. Vinegar (acetic acid) consumption is linked to improved cardiometabolic health and reduced self-reported depression symptoms (Carol Johnston, Arizona State University, USA). The complex mixtures of metabolites in sauerkraut are associated with increased intestinal barrier function in in vitro assays (Maria Marco, UC Davis, USA). However, identification of the specific compounds in fermented foods like sauerkraut responsible for such effects is impeded by limitations in microbial genome annotations and bioinformatic methods used for predicting enzymatic capabilities (such as for β-glucosidases and the metabolism of isoflavones) (Michael Gänzle, University of Alberta, Canada). By comparison, postbiotic preparations are useful for discerning the importance of microbially-derived compounds on human health, relative to the nutritive and other metabolites present in (fermented) food matrices, and separate from assumptions of viable microbial cell colonization or persistence in the gut (Gabriel Vinderola, National University of Litoral and CONICET, Argentina). Moreover, examination of strains deficient in one or more host-modulatory compounds in postbiotic preparations helps to disentangle how these compounds act on immune and other host response pathways (Haruki Kitazawa, Tohoku University, Japan).

Despite the challenges associated with determining the roles of microbially-derived compounds in fermented food and postbiotic health benefits, the ingestion of microbial compounds in fermented foods do change the human metabolome (Guy Vergères, Agriscope, Switzerland). There is also significant overlap between the compounds produced by the human gut microbiome and those found in fermented foods and postbiotics. Thus, these findings underscore the current gaps in knowledge and potential opportunities to support and improve human health via inclusion of fermented foods and postbiotics in habitual diets. These gaps can be partially addressed in studies investigating how the dietary delivery of individual microbially-derived compounds (such as butyrate) to targeted sites in the intestine affects health and disease (for example, treatment of inflammatory bowel disease or autoimmune arthritis) (Shijie Cao, University of Washington, Seattle, USA). Moreover, mechanistic and bioinformatic approaches on single and multiple microbially-derived, health-modulatory compounds may ultimately lead to the production of fermented foods and postbiotics optimized for reproducibly delivering those compounds in appropriate doses to the active site in the digestive tract. The outcomes of this Discussion group will be the object of a paper under production.

DISCUSSION GROUPS

Group 2: Use of biotics in health and disease – towards optimizing the host response

Eamonn Quigley and Geoffrey Preidis, Co-chairs

While a variety of biotics have been the subject of clinical trials in humans and animals, in many cases the selection of product, dose and means of administration seemed to owe more to conjecture or convenience than science. This approach was not unreasonable when little was known of the structure and function of the gut microbiome or of its interactions with the host. The thesis that formed the basis of this discussion group was that, given tremendous progress in our understanding of the host response, a much more rational and informed process can now guide the precise selection of a biotic for a given indication. To achieve this goal, we explored various determinants of the host response including, but not limited to, the commensal microbiome and components of the host immune and neuro-endocrine responses as well as impacts on metabolic functions and the brain-gut axis.

We identified targets that have the potential to be modulated by a biotic intervention and then reviewed the evidence that biotics can actually modify these responses. The basic mechanisms and pathways whereby such modulations occur were explored, the accessibility and reproducibility of potential biotic targets were critically evaluated, and an attempt to prioritize targets in terms of their relevance to individual biotics and potential for translation to human studies was performed. Looking to the future, we discussed emerging approaches for studying host-microbiome interactions (e.g., human-derived organoids, gut on a chip, machine learning approaches). Finally, and mindful of the challenges inherent to translation from bench to bedside in this area, we developed recommendations for the future design of human studies with particular attention to choice of biotic product and human disease targets.

1. Biotic Modulation of Human Commensal Microbes – Vanessa Sperandino
    - Key point: inter-kingdom chemical signaling is integrated with the gut-brain axis.
    - Norepinephrine increases the virulence of *Citrobacter rodentium*, and adenine derived from *Enterococcus faecalis* increases the virulence of enterohemorrhagic *Escherichia coli*.

- Gut colonization by Proteobacteria alters host metabolism and modulates the neurobehavioral response to cocaine. The neuroactive metabolite glycine, a bacterial nitrogen source, is depleted in the gut of mice colonized by Proteobacteria; repletion of glycine reverses the host response.
- Additional studies are needed to identify: 1) How the baseline microbiome influences impacts of interventions; there is data for various diets and check point inhibitors but much less for predicting responses to pre-, pro-, syn-, postbiotics or FMT or consortia. 2) To what extent are the impacts of biotic interventions dependent on changing the host microbiome; there is some data for FMT and prebiotics but not much for other biotics where beneficial effects could be independent of microbiome changes.

2. Microbe-immune interactions – Liam O'Mahony
   - Key point: we must not seek to "boost" the immune system, which could induce inflammation or an uncontrolled immune response but rather modulate/regulate the immune response. Lots of experimental (and some human) data reveal that biotics can mediate anti-inflammatory responses and shift from pro- to anti-inflammatory immunotypes.
   - Specific targets in the immune system must be identified – Toll-like receptors, antigen presenting cells, epithelial cells, lymphocyte populations, gastrointestinal lymphoid tissues.
   - Genetically modified organisms are a potential vehicle for immune-modulating interventions.

Discussion Group 2

3. Microbe-metabolism – Andre Marette
   - Key point: the supremacy of function over composition, e.g., metabolomics over 16S or even metagenomics. The vast majority of microbial metabolites have not been documented, classified, or defined; current metabolite libraries must be more fully developed.
   - Looking beyond SCFAs for important gut microbial fermentation substrates:
     i. Branched-chain hydroxy acids (via microbial metabolism of BCAAs) in yogurt prevent hepatic insulin resistance and steatosis in obese mice.
     ii. Other examples: microbial metabolism of GABA, bile acids, epinephrine and norepinephrine can impact host health.
   - Role of gut barrier and bacterial translocation in obesity.
   - Sampling and therapeutic strategies must consider compartmentalization: longitudinal and transversal gradients along the gut from small bowel to colon, radial axis from lumen to mucosa. New information is emerging from ingestible sampling devices.

4. Microbe-enteric nervous system and gut neuro-endocrine cells – Premysl Bercik
   - Key point: new mechanisms are being identified by which gut bacteria, diet, and biotics regulate concentrations of neuromodulatory molecules that impact human health.
   - Probiotic *Bifidobacterium longum* increases levels of butyric acid, tryptophan, N-acetyl tryptophan, glycine-conjugated bile acids, and free fatty acids, and improves anxiety and depression in adults with IBS.
   - Oral tryptophan activates microbial indole and host kynurenine (via aryl hydrocarbon receptor) pathways in the small intestine while impacting fecal microbiome profiles in healthy adults. These pathways could be targeted in chronic inflammatory conditions affecting the small intestine.
   - Visceral hypersensitivity can be mediated by histamine produced by gut microbiota or by microbial interactions with bone marrow-derived mast cells in the colon.
   - Emerging roles of polyphenols, p-Cresol, free radicals, VIP, CGRP, and other modulators of neural and immune activity are being investigated.

5. Microbe-gut-brain axis – Eamonn Quigley
   - Key point: optimization of the host response requires careful consideration of subject selection (genetics, disease subtype, baseline microbiome), intervention (strain, dose, formulation, delivery, adjunct treatments), and goals: prevention (primary vs secondary) vs cure (how to define) vs alleviation of symptoms (which ones, for how long).
   - Range of potential interventions, from diet to FMT.
   - A lot of animal studies indicate that microbiome and biotic interventions can impact on brain structure and function.

- Some human data of impact of biotics on stress response and anxiety/depression linked to DGBI. Possibly mediated by an anti-inflammatory effect.
- Many confounders
    i. In the host
    ii. Related to the intervention

6. Novel approaches to evaluating host-microbe interactions – Geoffrey Preidis
    - Key point: new funding mandates provide opportunities to enhance preclinical work with new approach methods (NAMs) that prioritize human-based research.
    - Examples of NAMs include ex vivo human-based approaches, including perfused human organs and precision-cut tissue slices; in vitro methods, including microphysiological systems and organoids; computational and artificial intelligence-based approaches; and combinations thereof.
    - Human-derived organoids plated in 2-dimensional monolayers can be used to screen physiologic responses of the epithelium to gut microbe-derived metabolites.
    - Microbial fermentation products of dietary carbohydrates are not the only metabolites that strengthen the gut barrier – new evidence suggests that fermentation products of dietary protein also impact barrier function.

7. Future directions – Geoffrey Preidis and Eamonn Quigley
    - Precisely define/characterize both the intervention and biologically meaningful readouts.
    - Understand that the response to a biotic is context dependent (e.g. interactions with diet, spatial localization, host genetics and environment).
    - Consider biotics as supplements to other interventions, e.g., a wide range of diet- and host-derived substrates for microbial metabolism beyond dietary fibers and SCFAs.
    - Focus on the metabolome, shifting away from composition as a target/readout, while continuing to improve technology to identify new microbial metabolites.
    - Regulation/modulation rather than “boosting” immune responses.

DISCUSSION GROUPS

Group 3: 'Phagebiotics'? Exploring the application of phage and virome interventions in health and disease

Colin Hill and Andrey Shkoporov,, Co-chairs

Our Discussion group explored whether a new term "phagebiotics" should be introduced to describe bacteriophage-based interventions that confer health benefits on the host. It builds on ISAPP's broader definition of "biotics" as interventions involving microbes or microbial material that positively impact health.

Phagebiotics could potentially encompass a range of bacteriophage applications, including:

- Phage therapy
- Microbiome editing
- Phage–bacteria combinations
- Fecal virome transplants (FVT)
- Phage as immunomodulatory agents
- Engineered phages with payloads or genome editing capabilities

These approaches aim to modulate the microbiome to protect health, enhance probiotic functionality, or treat infections or chronic health conditions.

Arguments in favour of a new term included enhancing communication among scientists and consumers; stimulating innovation in academia and industry; and clarifying regulatory pathways. We heard from six speakers, and all of the talks generated lively discussion.

Scientific Highlights

- Phage Ecology (Shkoporov): Phages and bacteria co-evolve; phages don't normally eliminate their hosts.
- Phage–Bacterial Pairs (Hill): Bacteria adapt to phage predation, potentially improving probiotic efficacy.
- Phage Therapy (Pirnay): Phages can be effective when combined with antibiotics; future includes AI-driven personalized phage production.
- FVT (Ritz & Rasmussen): Virome transplants show promise in behavioural and gut health.
- Microbiome Editing (Bellamine): Phage cocktails can potentially reduce harmful bacteria in the gut and promote beneficial ones.

Group 3: 'Phagebiotics'? Exploring the application of phage and virome interventions in health and disease

We all agreed that only phage-based interventions that meet three conditions should be considered as phagebiotics: the intervention should be completely characterized (eliminating virome transplants), they should involve microbes (which is the case for all phage preparations), and they should provide a health benefit.

The general conclusion of the group was that the term would be useful to define, even in advance of any demonstrated examples. There was a preliminary proposed definition:
"Phagebiotics are characterized bacteriophage(s) that confer a health benefit on the host".

On behalf of myself and my co-chair Andrey Shkoporov I would like to thanks all of the members of DG3 for their enthusiastic participation in the group.

Discussion Group 3

DISCUSSION GROUPS

Group 4: Opportunities for biotics in precision nutrition

Anisha Wijeyesekera and Kelly Swanson, Co-chairs

Precision nutrition is growing in recognition as a more data-driven, individualised approach to nutrition counselling. This discussion group examined the latest science on precision nutrition and the opportunities for biotic substances to manipulate the microbiome in a targeted manner. Key themes driving the session included a review of the current status of precision nutrition, the opportunities and potential for the development for targeted, precision biotic products, and the feasibility of the implementation of biotic substances in precision nutrition practice.

These areas were first addressed by the expert panel, who provided an overview of conventional and emerging approaches used in precision nutrition, novel insights that have been uncovered using phenotypic technologies, and how these may be used to personalise nutrition. These included the importance of gut microbiota inter-individual variability, which plays a key role in individualised responses to different foods (e.g., fibres) as well as determining interactions with host processes, such as inflammation and the production of hormones (e.g., GLP-1). The role of diets and different food sources was also highlighted as an important factor in shaping these host-gut microbiota connections, given that they can be a source of both microbes as well as metabolites. A challenge identified in this area was the quality of dietary data in past studies. Whilst efforts are being made to improve information relating to dietary consumption, objective assessments would enable more accurate data to be captured than self-reported approaches. Technological innovation and development in recent years has addressed this challenge to some extent, with some analytical methods and technologies enabling researchers to objectively measure dietary components, as well as capturing the metabolic impact of targeted biotics interventions on the host. Since the complexity of phenotypic responses can lead to paradoxical data, more research is needed to better understand gut microbial function and identify which microbes are involved in high or low metabolite production, which can help explain individualised responses and tailor precision nutrition practice.

Discussion Group 4

The potential to manipulate the microbiome using biotics and targeted dietary approaches was then addressed by the panel, with examples of how a better understanding of the structure and function of substances (e.g., fibres) and enzymes may lead to the identification of potential novel prebiotics. The establishment of open iresources such as the Glycopedia database (The Development of the Davis Food Glycopedia—A Glycan Encyclopedia of Food - PMC) and the Periodic Table of Foods Initiative (Home - Periodic Table of Food Initiative), can support researchers to better understand diversity and structure-function of dietary components such as fibres, and could be used in the future to develop precision biotics using in vitro, in vivo and in silico approaches. The emerging role of artificial intelligence in precision nutrition was also discussed, with synergistic strategies incorporating both top-down approaches (e.g., machine learning, for pattern discovery and identification) as well as bottom-up approaches (e.g., systems mapping, to recreate systems and understand mechanisms) being recommended for holistic insight. Caution was noted with the growing use of AI tools for co-creation and collaboration, and that outputs should always be validated by humans and/or other models.

The group then discussed the feasibility of implementing biotic substances in precision nutrition practice. Opportunities to tailor interventions to overcome inter-individual variation and overall providing a nutritional rather than pharmaceutical approach to improve health were discussed. Challenges with cost, regulations, and healthcare systems were identified as key areas that would determine whether this potential will be realised. Potential stratification into target groups rather than individual personalisation was also considered as a potentially more feasible approach.

DISCUSSION GROUPS

Group 5: Exploring the integration of prebiotics in pharmaceutical applications

Kristin Verbeke and Sarah Lebeer, Co-chairs

Prebiotic compounds are most often commercialized and marketed as food supplements rather than pharmaceutical products. In our discussion group, we explored the potential need, benefits and challenges of exploring the intended use of prebiotic compounds as (registered) pharmaceuticals.
From a regulatory perspective, foods and pharmaceutical products differ primarily in their intended use: foods are meant for the general population while medicinal products are intended for the treatment of patients or for prevention of disease in population at risk. We identified several diseases in which prebiotics might have potential for therapeutic applications. For example, prebiotics could be used as adjunct therapy in patients with mild-to-moderate inflammatory bowel disease (IBD) to help reduce the frequency and severity of flares, improve quality of life and reduce the need for therapy escalation. In irritable bowel syndrome (IBS), prebiotics may be used to target gut motility or to correct dysbiosis when present. Given that prebiotic effectiveness can vary with individual gut microbiota composition, prebiotic interventions should ideally be designed based on host profiles.

Human milk oligosaccharides (HMOs) are one example with potential for pharmaceutical use when intended for the prevention or treatment of necrotizing enterocolitis in preterm newborns or to alleviate allergic disorders, adult IBS or IBD. Nowadays, HMOs are already widely included in infant formulas to support general health and wellbeing. Unfortunately, mechanistic HMO research has been limited by restricted HMO availability. However, recent advances in microbial fermentation or plant-based production methods may overcome this barrier. For these therapeutic applications, registering prebiotics as pharmaceutical compounds could be valuable, as it would ensure consistent high quality and allow products to be labeled for specific medical use, although we also discussed that this comes with additional quality, batch-to batch consistency and robustness criteria that need to be met.

A notable application is combining a prebiotic, or at least a fermentable sugar, with a live biotherapeutic product (LBP) to enhance the survival and efficacy of the microorganism.

An example was provided with adding maltose to increase survival of vaginal lactobacilli in an LBP. The final product, as a drug, must comply with FDA standards including GMP production and certification. However, when the prebiotic only serves as a supportive ingredient for the microorganism rather than as an Active Pharmaceutical Ingredient (API) for the condition targeted by the LBP, registration requirements can be less stringent than for an API.

Finally, we also had a general practitioner in the panel and we discussed whether there would be a need for GPs and patients to have pharmaceutical-grade prebiotics or drug-approved prebiotics. From the perspective of GPs, the availability of such pharmaceutical-grade prebiotics is considered to possibly increase confidence among both doctors and patients, provided that costs remain reasonable.

Discussion Group 5

Despite these opportunities, several challenges remain. First, the lack of specificity of many prebiotics can hinder the identification of clear mechanisms of action and molecular targets and makes them different from classical single molecule drugs. In addition, the absence of qualified microbiome-based biomarkers makes it difficult to demonstrate microbiome modulation as mechanism of action. Furthermore, most existing prebiotic production facilities are not designed for GMP manufacturing. Developing prebiotics as pharmaceuticals would therefore require substantial additional investment - costs that may be prohibitive without the potential for generating intellectual property. Given that prebiotics are generally also complex sugars or macromolecules, validating batch-to batch consistency and reproducibility in line with GMP requirements is also a challenge.

DISCUSSION GROUPS

Group 6: Cesarean section delivery and gut microbiota – early colonization patterns, outcomes, and emerging interventions

Hania Szajewska and Seppo Salminen, Co-chairs

This discussion group, chaired by **Hania Szajewska** (The Medical University of Warsaw, Poland) and **Seppo Salminen** (University of Turku, Finland), was convened to explore the effects of Cesarean delivery (CD) on infant gut microbiota development, consider potential short- and long-term consequences for infant health, and evaluate emerging interventions that aim to support microbial colonization. The group discussed priorities for future research, with input from experts across microbiology, clinical practice, and maternal-child health.

Jose C. Clemente (Icahn School of Medicine at Mount Sinai, USA) reviewed how CD affects the early acquisition of microbes in infants. In contrast to vaginal births, CD is associated with modified exposure to maternal vaginal and fecal microbes. Instead, initial colonization is shaped by microbes from the hospital environment or maternal skin. He presented evidence that microbiota restoration strategies, such as vaginal microbiota transfer ("vaginal seeding") and infant-adapted probiotics, have been studied and appear feasible under controlled conditions. **Summary**: CD is associated with changes to the initial colonization pattern in infants. Some targeted interventions show potential to modulate microbiota development, but there are limited data on associated health outcomes.

Eldin Jašarević (University of Pittsburgh School of Medicine, USA) discussed how the maternal microbiome is shaped by environmental exposures, life history, and diet, particularly during pregnancy. These factors influence the microbes that may be transferred to the infant at birth. His animal model research suggests that dietary factors can influence microbial behavior in the reproductive tract and potentially affect the infant microbiome. **Summary**: Maternal health, particularly diet and environmental exposures, plays a role in shaping the infant's response to postnatal microbial colonization.

Group 6: Cesarean section delivery and gut microbiota – early colonization patterns, outcomes, and emerging interventions

Kjersti Aagaard (HCA Healthcare and Boston Children's Hospital, USA) examined how maternal, neonatal, and infant microbiomes recover or adapt after birth, in both CD and vaginal deliveries. Although taxonomic differences are observed, their microbial metabolic functions do not differ significantly. Early taxonomic shifts in the neonatal microbiome neither translate into meaningful functional changes nor persist beyond 4–6 weeks. A meta-analysis of all newborn microbiome studies to date supports these findings. Large-scale metadata further highlight the influence of maternal diet, comorbidities leading to CD, gestational age, and breastfeeding/mother's own milk in shaping the offspring microbiome. She also raised questions for future study, including why microbiota recovery varies between infants and how maternal diet, breastfeeding, and environmental exposures affect these patterns. **Summary**: Functional recovery of the microbiome typically occurs after both vaginal births and CDs, without the need for interventions such as vaginal seeding. Further research is needed to clarify how maternal and environmental factors shape the composition and function of the neonatal and infant microbiome.

Discussion Group 6

Anne Salonen (University of Helsinki, Finland) presented research showing that maternal fecal bacteria, rather than vaginal microbes, more effectively support restoration of the microbiota in neonates delivered by CD. She highlighted that while these interventions modify microbial composition, there is limited evidence so far on how they influence clinical or immune outcomes. Additional data were presented demonstrating that as much as 2/3 of maternal fecal donation could not be used in transplant due to pathogen risk. **Summary**: Experimental restoration of microbiota is feasible, but the impact on health outcomes requires further investigation.

Katri Korpela (University of Helsinki, Finland) reviewed postnatal strategies aimed at supporting microbiota development, including probiotics, breastfeeding, skin-to-skin contact, co-bathing, and sibling exposure. She noted that breast milk contributes beneficial compounds, including human milk oligosaccharides but may be limited as a source of microbes. Specific probiotic supplementation, particularly with infant-adapted bifidobacteria, has shown positive results in restoring microbial composition. **Summary**: Several practical interventions are under investigation. Evidence supports combined approaches, but more clarity is needed on timing, composition, and outcomes.

Research Gaps and Priorities
The group identified several important areas for future research and discussion:

- **Value of clinician input**

There would be great value in advancing research that incorporates feedback from clinicians on which neonatal, infant, and early childhood health outcomes should be prioritized in future studies of microbiota development and restoration. Identifying these outcomes and their weighted prioritization would help align scientific goals with clinical relevance.

- **Safety requirements**

Safety must be rigorously assessed for all microbiota-targeted interventions, including biotics. Safety measures cannot be mere short-term measures such as detection of pathogens, but should take into account the possibility that, among women with pregnancy-related comorbidities which increase the risk for CD (e.g., diabetes, obesity, large or small for gestational age infants, preeclampsia, etc.), transplantation of their gut or vaginal microbiomes to the neonate at birth may cause more harm than benefit. Complexities in the development of long-term safety data include the time required for conditions such as metabolic disorders and diabetes to manifest in the offspring. Participants noted that the requirements for long-term safety data should not exceed those typically expected for non-biotic interventions used in maternal or infant care.

- **Clinical relevance of microbiome disruption**

While it is widely acknowledged that microbiota composition (but not function) differs between CD and vaginally born neonates, there is ongoing debate about the clinical significance of these differences. Evidence to date suggests they may not persist or translate into functional metabolic alterations, but more research is needed to clarify their short- and long-term implications. The long-term health impact remains uncertain, and the necessity and safety of microbiota restoration approaches are still under discussion, as they may carry both short-term (fecal restoration) and long-term (fecal or vaginal restoration) risks.

- **Unclear link to health outcomes**

At present, there is no convincing evidence that CD, as a stand-alone factor, leads to increased risk of poor health outcomes in neonates, infants, or children. Multiple confounding factors, including antibiotics, feeding practices, and maternal health, make it difficult to draw firm conclusions.

- **Relative value of interventions**

Future studies should explore and compare the potential value of different strategies aimed at improving outcomes in neonates born by CD. These may include: (1) Microbiome restoration approaches (e.g., vaginal seeding, maternal fecal microbiota transfer, microbial consortia, biotics); (2) Improving maternal diet (e.g., encouraging fiber-rich, non-obesogenic diets to support an 'optimal' maternal microbiota); (3) Reducing maternal stress during pregnancy. Breastfeeding and mother's own milk feeding are among the most important factors influencing neonatal and infant microbiome establishment and restoration.

Plenary session, Banff Centre

LATE-BREAKING NEWS

Chaired by Bob Hutkins, this session offered participants 5-minute slots to present late-breaking news in an informal, interactive atmosphere.

William Chen: Fungal Precision Fermentation and Future Foods

Elke Lievens: Binding the Unseen: Probiotics vs. Microplastics

Kjersti Aagaard: Yum yum bubble gum...chewing gum for preterm birth prevention?

Caroline Montelius: L. plantarum 299v reduces side effects of iron therapy in anemia

Colin Hill: The microbiome: An actor or stage for biotic activity?

Gabriel Vinderola: Latest guidance on categorising and quantifying postbiotics

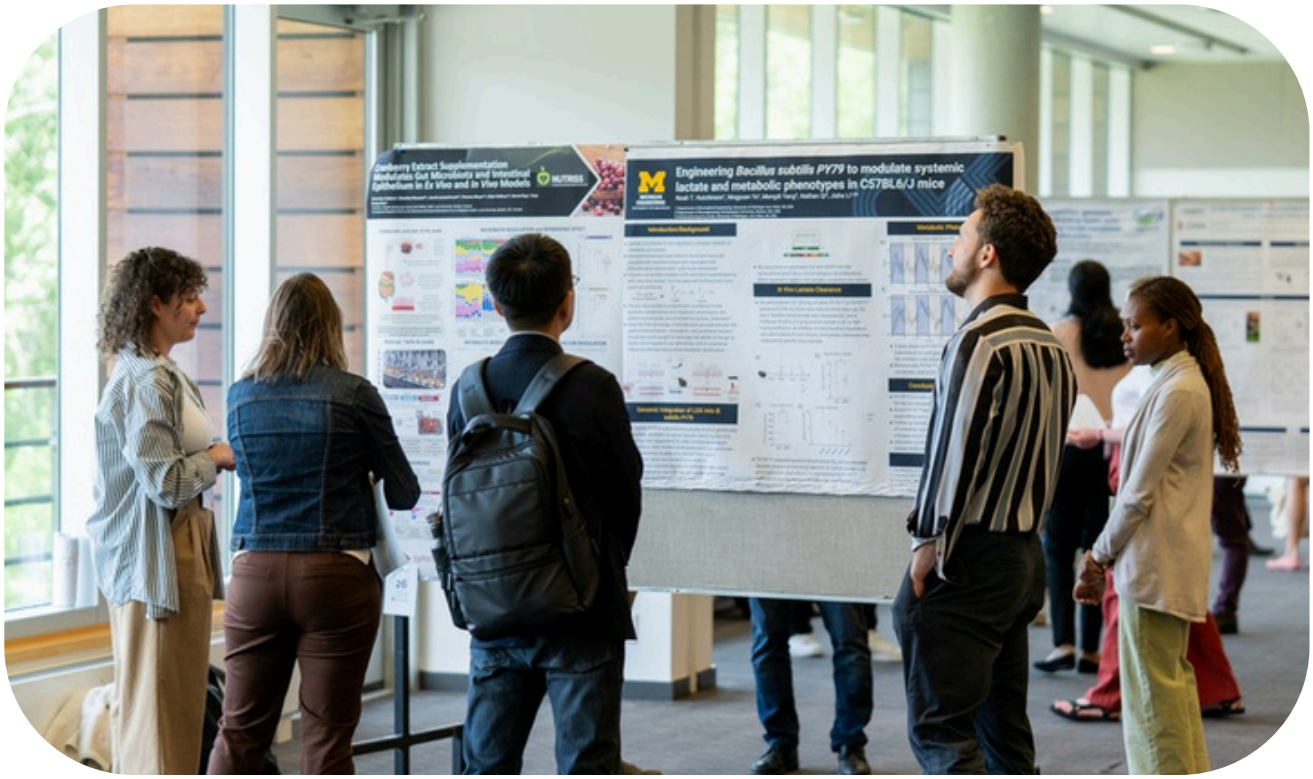
Tommy Auchtung: Improving lactose intolerance with Bifidobacterium adolescentis iVS-1

Siobhan McCormack: Microbiome narratives for behaviour change

Sabrina Green: Phage Support Ukraine, a project to combat multidrug-resistant bacteria

Bruce Y. Lee: How to talk to the media about prebiotics, probiotics, postbiotics, and the microbiome

POSTERS AWARD WINNERS



Poster Session, Banff Centre

SFA Poster Awards

Benjamin Levine, University of Illinois at Urbana-Champaign, USA

Caroline Dricot, University of Antwerp, Belgium

Watercolor of Lake Louise, Banff
by meeting guest, Dr. Laurel Beckett.

POSTERS

All poster abstracts are found in the Meeting Guide.

Poster 1 SFA
Unveiling the vaginal microbiome shift in iatrogenic menopause: Insights from breast cancer therapy-induced changes, Sarah Ahannach, Lab of Applied Microbiology and Biotechnology, Department of Bioscience Engineering, University of Antwerp

Poster 2 SFA
Exploring the prebiotic potential of commercial cellobiose: in vitro and in vivo approaches, Manxi Huang, University of Reading, Reading UK

Poster 3 SFA
Human milk oligosaccharides for irritable bowel syndrome: preliminary findings from a crossover randomised controlled trial, Sanz Morales, P., The University of Reading, Whiteknights, Reading, UK

Poster 4 SFA
Developing a topical probiotic to prevent penile HIV acquisition, Rachel Penney (University of Western Ontario, London, ON

Poster 5 SFA
Isala citizen-science study: navigating the vaginal microbiome's metabolic landscape, Caroline E.M.K. Dricot, University of Antwerp, Antwerp, Belgium

Poster 6 SFA
Colocalization of bacteriocin production with DNA uptake systems across prokaryote genomes, David Hourigan, APC Microbiome Ireland and School of Microbiology, University College, Cork, Ireland

Poster 7 SFA
Cassava (Manihot esculenta) cultivars: chemical composition, prebiotic activity scores, and impact on the colonic microbiota of celiac individuals, Tatiana Colombo Pimentel, Federal Institute of Paraná, Paranavaí, Paraná, Brazil

Poster session, Banff Centre

Poster 8 SFA
Endolysins for microbiome editing – LysH1 is a novel Enterococcus faecium phage endolysin with activity against Ruminococcus gnavus in a simplified human gut consortium. Ellen Murray, APC Microbiome Ireland and School of Microbiology, University College, Cork, Ireland

Poster 9 SFA
Ancestral Allies: Ultra-deep sequencing of Amazonian hunter-gathers yields insights into beneficial functions and novel probiotic candidates, Brendan A. Daisley, Department of Molecular and Cellular Biology, University of Guelph, Guelph, Canada

Poster 10 SFA
Inulin-MCT microcapsules: a novel approach to treat metabolic and inflammatory diseases, Amin Ariaee, University of South Australia

Poster 11 SFA
Antiplasmodial activity of probiotic Limosilactobacillus fermentum YZ01 in Plasmodium berghei ANKA infected BALB/c mice, Timothy Bamgbose, ICMR-National Institute of Malaria Research, Sector 8, Dwarka, New Delhi, India

Poster 12 SFA
The Leke project: Mapping the vaginal microbiome and benefits of vaginal lactobacilli in Cameroon, Marie Josiane Kenfack Zanguim, University of Yaounde I, Yaounde, Cameroon

Poster 13 SFA
Assessing the microbial accuracy of commercially fermented beverages in the United States, Breanna Metras

Poster 14 SFA
Boosting the respiratory tract microbiome: Lacticaseibacillus casei LAMBR2 as promising live biotherapeutic product for respiratory health. Ilke De Boeck, University of Antwerp, Antwerp, Belgium

Poster 15 SFA
Impact of colon-delivered riboflavin versus riboflavin-overproducing Limosilactobacillus reuteri on the female intestinal and vaginal microbiota, Eline Cauwenberghs, Laboratory of Applied Microbiology and Biotechnology, Department of Bioscience Engineering, University of Antwerp, Antwerp, Belgium

Poster 16 SFA
The effect of a probiotic yoghurt on gut microbiome, low-grade inflammation and weight status of obese South African women, James Elegbeleye, Department of Consumer and Food Sciences, University of Pretoria, Pretoria, South Africa

Poster 17 SFA
Maternal mediterranean diet benefits offspring gut microbiome and neurodevelopment features via the gut–brain–immune axis, Gwoncheol Park, Florida State University, Florida, USA

Poster 18 SFA
In vitro fermentation insights into infant gut microbiota responses to 2'-fucosyllactose and/or galacto-oligosaccharides, Cathy Lordan, Teagasc Food Research Centre, Moorepark, Fermoy, Co. Cork, Ireland and APC Microbiome Ireland, Cork, Ireland

Poster 19 SFA
Dietary intake, gut microbiome and anxiety: multilevel insights from a cross-sectional study on highly anxious females aged 18-25. Melissa Basso, University of Surrey, Guildford, Surrey, United Kingdom

Poster 20 SFA
The milk-enriched infant gut microbiome drives functional capacity for both breast feeding and weaning, You-Tae Kim, University of California, Davis, CA

Poster 21 SFA
Effects of soluble corn fiber consumption on cognitive function and gastrointestinal microbiota, David Alvarado, University of Illinois at Urbana-Champaign, Illinois, USA

Poster 22 SFA
Exploring the host-gut microbiota-related polyamine metabolism in MASLD development and treatment, Ambrin Farizah Babu, University of Eastern Finland, Kuopio, Finland; Afekta Technologies Ltd., Kuopio, Finland

Poster 23 SFA
Synergistic interaction of Akkermansia muciniphila and mucin-degrading Bacteroides in Inflammatory bowel diseases, Qinnan Yang, Department of Microbiology and Immunology, University of Michigan, Ann Arbor, MI, USA

Poster 24 SFA
Individual intestinal motility responses to acute whole-grain prebiotic ingestion mediates post-prandial nutrient metabolism: a single-blind randomized controlled clinical trial, Benjamin A. Levine, University of Illinois at Urbana-Champaign, IL, USA

Poster 25 SFA
Acetate and gut-brain axis modulation: a pilot study on mental health and metabolic outcomes, Kait F. Al, Department of Microbiology and Immunology, Western University

Poster session, Banff Centre

Poster 26 SFA
Cranberry extract supplementation modulates gut microbiota and intestinal epithelium in ex vivo and in vivo models, Valentina Cattero, Laval University, Quebec, Canada

Poster 27 SFA
Engineered Bacillus subtilis as lactate converting probiotics to modulate host glucose metabolism, Noah Hutchinson, University of Michigan, Ann Arbor MI, USA

Poster 28 SFA
Targeted microbiome editing using a novel bacteriophage-derived endolysin with lytic activity against C. difficile, Ceylon Simon, School of Microbiology, University College Cork, APC Microbiome Ireland, University College Cork, Cork, Ireland

Poster 29 SFA
Targeted vaginal probiotics with Lactobacillus crispatus based on their unique antimicrobial specialized peptides, Jelle Dillen, Laboratory of Applied Microbiology and Biotechnology, Department of Bioscience Engineering, University of Antwerp

Poster 30 IAC
Exploiting distinctive genomic features in New Zealand lactic acid bacterial isolates for novel candidate probiotic discovery. Shalome A. Bassett, Fonterra Research & Development Centre, Palmerston North, New Zealand

Poster 31 IAC
In vitro fermentation characteristics of acacia fiber (Everwell Fiber ®) using canine and feline fecal inocula. Elena Vinay, Kerry, Beloit, Wisconsin, USA

Poster 32 IAC
Bacillus Coagulans Unique IS2 improves stool characteristics in healthy adults with infrequent bowel movements: a randomized, double-blind, placebo-controlled trial, Leila M. Shinn, PepsiCo, Inc. Chicago, IL USA

Poster 35 IAC
Probiotic Bifidobacterium bifidum strains desialylate MUC13 and increase intestinal epithelial barrier function, Elke Lievens, Winclove Probiotic BV, Amsterdam, The Netherlands

Poster 36
Exploring the gut-lung axis in pigs: effects of intestinal microbiota and postimmunobiotics on the resistance to PRRSV infection, Luciano Arellano-Arriagada, Tohoku University, CERELA-CONICET

Poster session, Banff Centre

Poster 37
Evaluation of enriched brewers' spent grains from fermentation with probiotic bacteria as potential functional food ingredients, Prof. William Chen, Endowed Professor in Food Science & Technology, Nanyang Technological University Singapore

Poster 38
Exploration of the human duodenal microbiome in the development of the metabolic syndrome, Marilou Lavoie, Université Laval, Québec, Canada

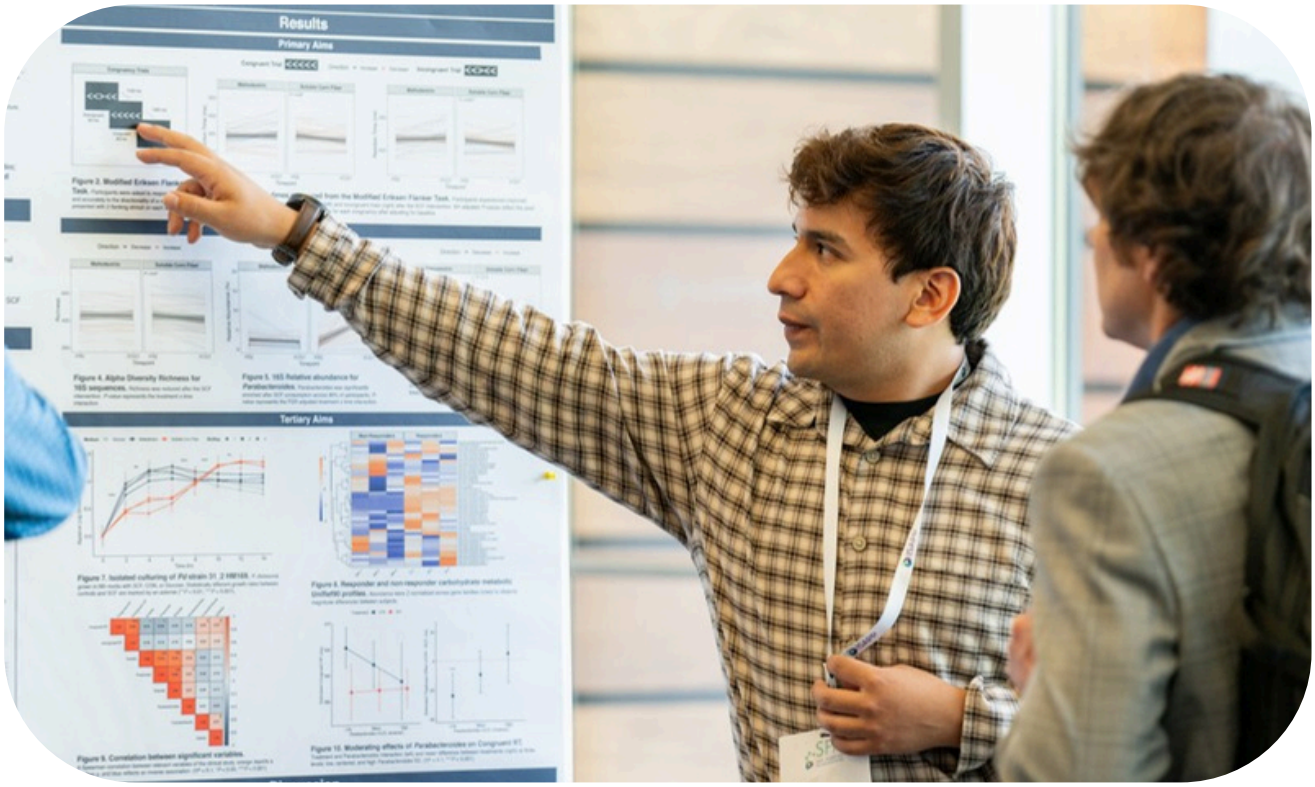
Poster 39
Consumption of fermented foods products by adult Canadians: trends and opportunities, Carla Liria Sánchez-Lafuente, Western University, London, ON, Canada

Poster 40
Bowel preparation reshapes the gut microbiota: consequences for probiotic engraftment and pathobiont invasion, Imogen Porter, Genome Science & Technology, University of British Columbia, Vancouver, Canada

Poster 41
Animal-free milk proteins: bovine casein expression in Pichia Pastoris, A. Thiel, Dairy Science and Technology, Food Quality and Design group, Wageningen University, the Netherlands

Poster 42
Responsiveness to 2'FL and GOS by infant gut microbiota differs by history of individual 2'FL consumption, Alexander W. Thorman, University of Cincinnati College of Medicine, Department of Environmental and Public Health Sciences, Cincinnati, OH, USA

Poster 43
Capacity of fermented cabbage to protect against cytokine-induced damage to intestinal barrier integrity, Lei Wei, University of California - Davis



Poster session, Banff Centre

STUDENTS & FELLOWS ASSOCIATION

David Hourigan

The Student and Fellows Association's (SFA) goal is to create an interactive network of graduate students and postdoctoral fellows across the globe working on probiotics, prebiotics, or related fields. The SFA is a growing organisation year-on-year and has grown from 342 members in 2024 to 404 active members, a growth attributed to its consistent monthly blog posts and active outreach across communication channels. This year, the SFA has expanded its communications infrastructure to LinkedIn, BlueSky, and Instagram. SFA following on LinkedIn has risen sharply this year, rising from 200 to over 750 followers, which is driving the increase in applications to attend the annual meeting, active members, and overall community outreach.

ISAPP 2025 Students and Fellows Association members

At the ISAPP meeting in Banff this year, the SFA assembled a diverse group of early career researchers from around the world including Belgium, Canada, Finland, Nigeria, Ireland, Australia, Cameroon, UK, Brazil and USA. This year 95 eligible abstracts were received from 21 countries, an increase from 72 in 2025.

A total of 29 early career researchers participated in the program this year, together creating an informative and memorable meeting. In the pre-meeting SFA program, students and fellows each shared the focus of their research in rapid, one-minute introduction talks and also presented their research with posters throughout the main ISAPP meeting. Four early career researchers were selected to present their work as an oral presentation during the SFA program, and another two shared featured oral presentations during the plenary session. These were Melissa Basso (University of Surrey, UK), Timothy Bamgbose (Kings University, Nigeria), Rachel Penney (Western University, Canada), Hina Maniya (RK University, India), Valentina Cattero (Laval University, Canada) and Kait Al (Western University, Canada), respectively. The SFA also welcomed contributions from Dr. Howard Bauchner (Boston University School of Medicine, USA), Kristina Campbell (Consulting Communications Director at ISAPP), and Dr. Sean Gibbons (Institute for Systems Biology, Seattle, Washington, USA) as invited speakers for the SFA program. These speakers were selected for their leadership in medical science, science communication, and microbiome research, aligning with the SFA's commitment to outreach. Their talks provided valuable perspectives spanning publishing insight, public engagement, and career development.

The Industry Advisory Committee (IAC) and SFA Innovation Workshops provided a valuable platform for collaboration between SFA and industry scientists. See more on page 9. The SFA also participated in the majority of other meeting activities, resulting in an overall enhanced potential for networking and knowledge exchange with the main meeting participants.

This year, the SFA was pleased to facilitate the 2nd year of the Gregor Reid award for Outstanding Scholars in Developing Nations. This award was established to recognise excellence in scientific and translational contributions from an early career researcher in a low- or middle income country (LMIC), in a manner that reflects Dr. Reid's commitment to scientific achievements, innovation, and community development in LMICs. We received a total of 20 applicants from 10 different countries. Josiane Kenfack, a Cameroonian PhD student at the University of Yaoundé I, won the 2025 Gregor Reid Award for her leadership in research on the vaginal microbiome and potential for probiotic interventions aimed at improving women's health across Cameroon and Africa. Her strong community engagement has advanced awareness and research participation among diverse groups of Cameroonian women, amplifying her impact beyond academia. Josiane was an invited guest at the meeting and shared her research in a plenary presentation titled "The Leke project: Mapping the vaginal microbiome and benefits of vaginal lactobacilli in Cameroon". Josiane also received mentorship on the oral presentation from award namesake Dr. Reid and received an award plaque and cash prize.

SFA Executive Team in 2024-2025: (left to right)
Ellen Murray (APC Microbiome, Ireland), Communications
Cathy Lordan (Teagasc Research Centre, Ireland), Past President
Breanna Metras (University of Illinois, USA), Treasurer
Sarah Ahannach (University of Antwerp, Belgium), Engagement
Patricia Sanz-Morales (University of Reading, UK), Vice President
Brendan Daisley (University of Guelph, Canada), Local Organiser
Dave Hourigan (APC Microbiome, Ireland), President

Rounak Chourasia (National Agri-food Biotechnology Institute, India), Secretary (not present)

2025 ANNUAL MEETING PROGRAM

All program events will be held in the Kinnear Centre building at Banff Centre for Arts and Creativity unless otherwise noted below.

Breakfast is served in Vistas Dining Room, Sally Borden Building, 3rd Floor unless otherwise noted below.
Abbreviations: IAC=Industry Advisory Committee (representatives of member companies); SFA=Students and Fellows Association

TUESDAY JULY 15

07:30 - 13:00 *KC100 Galleria*	Registration desk open
Pre-meeting program (Open only to IAC, SFA and Board of Directors)	
07:15 – 08:15 *KC105*	IAC member networking breakfast (Industry members only)
08:30 – 09:30 *KC103*	**IAC Featured plenary session: The role of microbial communities in healthy ageing** Elaine Holmes, Murdoch University, Australia & Imperial College London, UK Sean Gibbons, Institute for Systems Biology, USA
09:30 – 10:00	Break
10:00 - 11:30 *KC203*	**IAC/SFA Innovation workshops (separate sign-up required).** **1: Non-gut microbiomes** Shalome Bassett, Fonterra, New Zealand
KC305	**2: Mechanisms of action – From microbe to mechanism** Jessica Van Harsselaar, Beneo, Germany
KC303	**3: The promise and potential of next-generation probiotics** Patricia Sanz, University of Reading, UK
KC301	**4: Microbial consortia** Dave Hourigan, University College Cork, Ireland
11:30 - 12:15 *KC103*	**IAC and Board of Directors meeting**
12:15 - 12:30	*Move to rooms for working lunch*
12:30	Working lunch during discussion groups *(served in Galleria on 2nd and 3rd floors)*
12:30 - 17:00	**Discussion groups** (concurrent sessions)
KC201	**1: Role of microbially-derived compounds on fermented food and postbiotic health benefits** Maria Marco, University of California, Davis, USA and Gabriel Vinderola, National University of Litoral and CONICET, Argentina
KC203	**2: Use of biotics in health and disease – towards optimizing the host response** Eamonn Quigley, The Methodist Hospital and Weill Cornell School of Medicine, Texas, USA and Geoffrey Preidis, Baylor College of Medicine and Texas Children's Hospital, USA
KC205	**3: 'Phagebiotics'? Exploring the application of phage and virome interventions in health and disease** Colin Hill, University College Cork, Ireland and Andrey Shkoporov, APC Microbiome, University College Cork, Ireland

KC301	**4: Opportunities for biotics in precision nutrition** Anisha Wijeyesekera, University of Reading, United Kingdom and Kelly Swanson, University of Illinois at Urbana-Champaign, Illinois, USA
KC303	**5: Exploring the integration of prebiotics in pharmaceutical applications** Kristin Verbeke, Katholieke Universiteit Leuven, Belgium and Sarah Lebeer, University of Antwerp, Belgium
KC305	**6: Cesarean section delivery and gut microbiota – early colonization patterns, outcomes, and emerging interventions** Hania Szajewska, The Medical University of Warsaw, Poland and Seppo Salminen, University of Turku, Finland
17:00 - 19:00	**Outdoor social activity**
19:00 - 21:00 *KC101 &* *KC Terrace*	**Welcome reception**

WEDNESDAY JULY 16

07:30 - 08:30 *KC100 Galleria*	Registration desk open
08:30 - 08:35 *KC101/103/105*	**Welcome** Maria Marco and Marla Cunningham
08:35 - 09:05	**Dietary fibers and immune health** Paul de Vos, Maastricht University, The Netherlands
09:05 - 09:35	**Leveraging the gut environment for functional biosensor microbes** Carolina Tropini, University of British Columbia, Canada
09:35 - 10:00	**The Sanders Award for Advancing Biotic Science 2025 Lecture:** **Two decades of applied research for the advancement of biotic science** Remco Kort, Vrije Universiteit Amsterdam, The Netherlands
10:00 - 10:30 *KC100 Galleria* *KC201/203*	Break & Poster Preview *Refreshments served in galleria on 1st floor* *Posters available for previewing on 2nd floor*
10:30 - 11:00 *KC101/103/105*	**The scientific communication ecosystem: the responsibility of investigators** Howard Bauchner, Boston University Chobanian & Avedisian School of Medicine, USA
11:00 - 12:30	**Expert Panel: Clinical translation of biotic science: How can we enhance impact for clinical practice?** Howard Bauchner, Boston University Chobanian & Avedisian School of Medicine, USA Dan Merenstein, Georgetown University, USA Hania Szajewska, The Medical University of Warsaw, Poland Geoffrey Preidis, Baylor College of Medicine and Texas Children's Hospital, USA Kristina Campbell, Science writer, Canada Kristie Leigh, Danone North America, USA Kyle Sloan, Procter & Gamble, USA
12:30 - 13:30	Lunch break, *Vistas Dining Room, Sally Borden Building, 3rd Floor*
13:30 - 14:30 *KC201/203*	**Poster session.** Poster presentations and SFA poster judging. Authors will be present for all posters.
14:30 - 15:00 *KC101/103/105*	**Probiotics and postbiotics to regulate the immune system: what can we gain or lose from viability or inactivation?** Haruki Kitazawa, Tohoku University, Japan
15:00 - 15:30	**Health benefits of fermented food: from bacterial genomes to dietary guidelines** Guy Vergeres, Agroscope, Switzerland

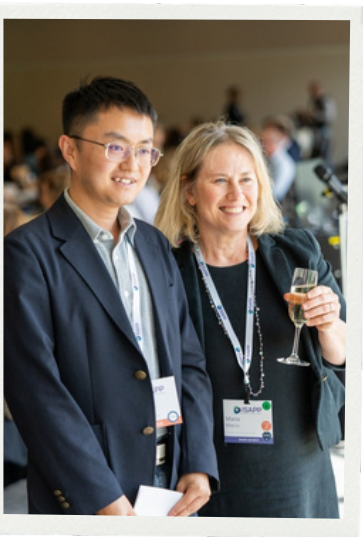
15:30 - 16:00	**Gut health: An ISAPP consensus definition effort** Maria Marco, University of California, Davis, USA
16:00 - 16:15	**The Glenn Gibson Early Career Researcher Award 2025 Lecture:** **Psychobiotics: unveiling the molecular basis of host mood regulation** Peijun Tian, Jiangnan University, P. R. China
16:15 - 16:30	**The Gregor Reid Award for Outstanding Scholars in Developing Nations 2025 Lecture:** **The Leke project: Mapping the vaginal microbiome and benefits of vaginal lactobacilli in Cameroon.** Josiane Kenfack, University of Yaounde I, Cameroon
16:30 - 17:30	**Late Breaking News** Chair: Bob Hutkins, University of Nebraska – Lincoln, USA
17:30 - 18:00	Break
18:00 - 18:30	*Buses to gala social event. Pick up outside PDC building.* *Departure times: 17:50, 18:00, 18:25, 18:35*
18:30 - 23:00	**Gala social event,** *Banff Park Ranch*

THURSDAY JULY 17

09:00 - 09:15 *KC101/103/105*	**IAC highlight** **Effects of a probiotic formula containing *Levilactobacillus brevis* KABP 052, *Lactiplantibacillus plantarum* KABP 051, and *Pediococcus acidilactici* KABP 021 on symptoms and quality of life in peri- and postmenopausal women (GynMeno trial).** Maria Rodriguez-Palmero, AB Biotics, Spain
09:15 - 09:30	**IAC highlight** **Towards EU health claims for prebiotics: A focus on scientific evidence and regulatory pathways** Elaine Vaughan, Sensus/ILSI, The Netherlands
09:30 - 09:45	**SFA highlight** **Prebiotic-like activity of cranberry extract: Modulating gut microbiota composition and enhancing intestinal barrier function in ex vivo and in vivo models** Valentina Cattero, Laval University, Canada
09:45 - 10:00	**SFA highlight** **Acetate and the gut-brain axis: A pilot study on mental health and metabolic outcomes** Kait Al, Western University, Canada
10:00 - 10:05	**Announcement of poster award winners**
10:05 - 10:35	**Next generation probiotics for metabolic and liver health** André Marette, Université Laval, Canada
10:35 - 11:00	Break
11:00 - 12:30	**Summary reports from Discussion groups** SFA: **Students and Fellows Association report** DG1: **Role of microbially-derived compounds on fermented food and postbiotic health benefits** DG2: **Use of biotics in health and disease – towards optimizing the host response** DG3: **'Phagebiotics'? Exploring the application of phage and virome interventions in health and disease** DG4: **Opportunities for biotics in precision nutrition** DG5: **Exploring the integration of prebiotics in pharmaceutical applications** DG6: **Cesarean section delivery and gut microbiota – early colonization patterns, outcomes, and emerging interventions**
12:30	**Close**

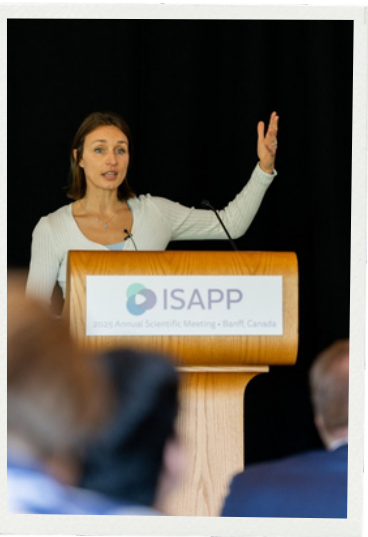
Washrooms are located on each level in the Kinnear Center building. Lactation room is in KC304.

Thank you to our industry members for your support of ISAPP in 2025.

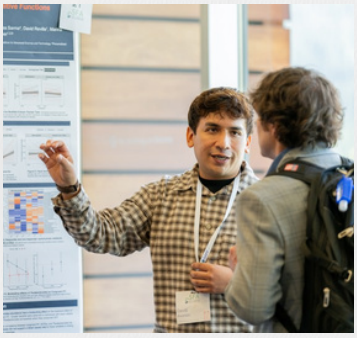











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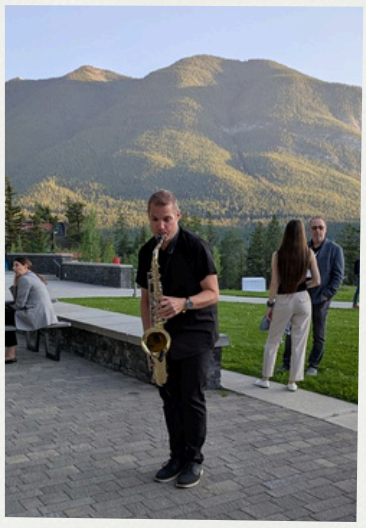

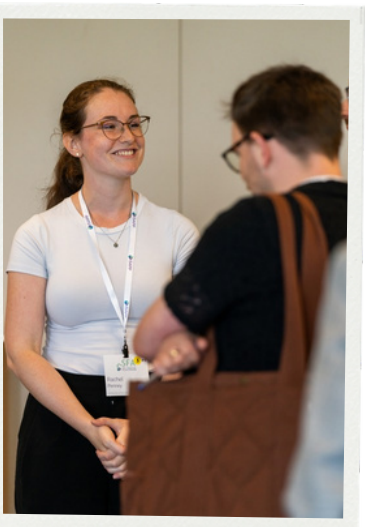

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