ISAPP
International Scientific Association for PROBIOTICS and PREBIOTICS

2024 Annual Meeting Report

ISAPP Annual Scientific Meeting
Cork, Ireland July 9-11, 2024

EXECUTIVE SUMMARY

Plenary Session, Western Gateway Building, UCC

This year for ISAPP's annual meeting we welcomed 275 scientists from across the world working in the probiotic, prebiotic, postbiotic, synbiotic, microbiome and fermented food fields. As a unique feature for this meeting, we provided an open registration opportunity for scientists both new and familiar to ISAPP to participate in proceedings on days two and three of the meeting. The mixed meeting format this year provided delegates with enhanced opportunities to connect and learn from an expanded network of scientists and clinicians from academic, student, government and industry backgrounds, including many local attendees from the onsite University College Cork and APC Microbiome Ireland.

2024 ISAPP Annual Meeting

… at a glance

275 attendees

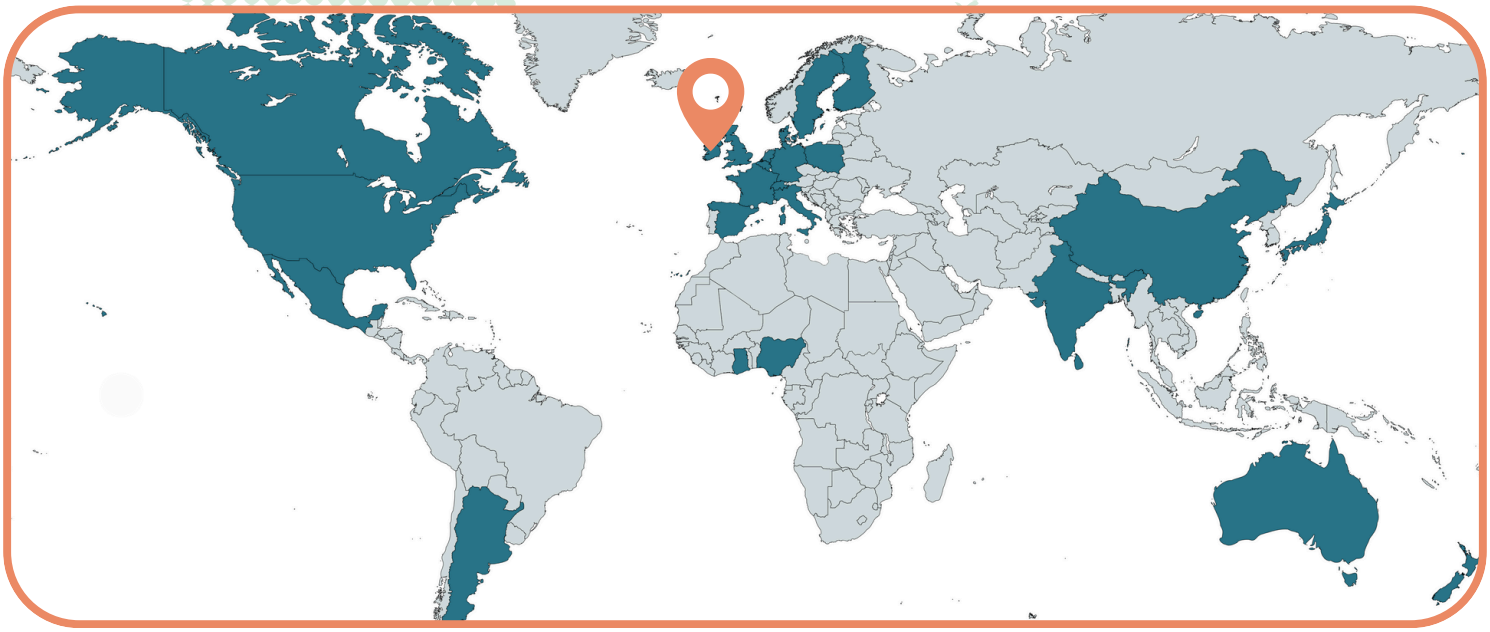
- **82** Industry members
- **50** Speakers and invited experts
- **98** Open meeting delegates
- **28** Students and Fellows Association members
- **17** Board members and staff

Representing

65 academic institutions

48 industry member companies

Delegates travelled from 25 countries and 6 continents to Cork, Ireland



2024 ISAPP Annual Meeting

... at a glance

Feedback highlights

From an industry member

"I always enjoy the discussion groups, as you can choose a topic that suits you and it gives you room to speak and discuss with other experts in this specific field."

From a poster presenter

"The sessions were highly informative, and I appreciated the opportunity to connect with other researchers and professionals in the field."

From an attendee

"This is definitely the best biotic event to attend for anyone with interest in biotic/microbiome."

Day one of the meeting commenced with a pre-meeting program organised by our industry member representatives. The pre-meeting activities provided an opportunity for members to engage with ISAPP board, brought together industry and student/fellow member scientists for interactive innovation-focused workshops, and addressed the issue of scientific requirements for new biotic substances with a regulatory-focused panel. The afternoon session welcomed invited academic and industry member experts to lead discussions and share perspectives at our concurrent discussion groups, advancing key questions in important and timely topics in the field. The evening welcome reception provided an opportunity for all delegates to gather and connect in the historic university Aula Maxima. Delegates enjoyed refreshments and optional campus tours, as well as the opportunity to hear from Prof. Paul Ross about the ongoing research at APC Microbiome.

Plenary Session, Western Gateway Building, UCC

On day two, open meeting delegates joined us for the meeting sessions, with a full day of stimulating and thought-provoking content. Scientists from across the globe shared their insights across a broad range of topics including mapping of microbiome transmission in early life, results from soil-based biotic interventions, sustainability implications of biotics in agriculture, as well as detailed insights into elusive areas of intestinal functionality such as the mucosal interface and small intestine. Through an expert panel of stakeholder perspectives, we explored current challenges for the use of probiotics in preterm infants and highlighted priorities for scientific and clinical progress. Throughout the day, 2024 ISAPP award recipients shared their respective work on isolating bioactive fermented food components, exploring microbial mediators of gut-brain axis modulation, and lessons from implementation of a large-scale community probiotic program for disadvantaged children.

Our poster session showcased almost 80 contributions from across our assembled community of academic, student and industry scientists, providing delegates with a unique opportunity to gain insights into the work of leading labs across the globe. The day concluded with our popular and thought-provoking late breaking news session, showcasing new data and perspectives in an energy-filled session. Our evening social event at the local Cork City Gaol was an opportunity for delegates to enjoy fine Irish hospitality, entertainment and dancing.

On our concluding morning, we heard featured talks from our industry and student members as well as highlights from top experts in gut-skin and gut-brain axis. The meeting closed with the much anticipated sharing of perspectives and learnings from day one discussion groups.

ISAPP sincerely thanks all attendees for joining our community in Cork this year to share, learn and collaborate in advancing biotic science with us, and contributing to an inspiring and rewarding meeting for all.

Gala Event, Cork City Gaol

For more information visit **ISAPPscience.org** or follow us on X **@ISAPPscience**

Updates from the 2024 meeting can be found on X by following **#ISAPP2024**

THE 2024 ISAPP BOARD OF DIRECTORS

ISAPP Board of Directors in 2023-2024: (left to right) Karen Scott, Kristin Verbeke, Anisha Wijeyesekera, Seppo Salminen, Dan Tancredi, Sarah Lebeer, Colin Hill, Dan Merenstein, Eamonn Quigley, Maria Marco, Hania Szajewska, Kelly Swanson, Geoffrey Preidis, Gabriel Vinderola, Marla Cunningham

SUMMARY OF THE INDUSTRY FORUM

FROM LAB TO MARKET: SCIENTIFIC REQUIREMENTS FOR NEW BIOTIC SUBSTANCES IN THE CHANGING REGULATORY LANDSCAPE

Shalome Bassett and Mariya Petrova

The annual industry forum, organized by the IAC representatives, provides an opportunity to explore an important topic of interest to industry scientists. The topic of this year's Industry Forum "From Lab to Market: Scientific requirements for new biotic substances in the changing regulatory landscape" was chosen based on the predominant feedback from industry scientists following the 2023 ISAPP meeting. The session included an excellent scene-setting introduction by Prof Bruno Pot (Yakult) followed by an invited expert panel discussion which included Bruno, Dr Alison Winger (Novonesis), Prof Diane Hoffmann (University of Maryland) and Prof Sarah Lebeer (University of Antwerp). The panel were asked a range of questions by the moderator (Dr. Shalome Bassett) covering topics such as science aspects, regulation, production, quality, and communication, with time provided for questions from the floor during each topic.

The panel session began with a focus on the type of pre-clinical and clinical studies that should be undertaken for novel ingredients and novel strains approval, as well as next generation probiotics (NGPs) in terms of their safety, quality and efficacy requirements. Intended use for the end product, and in particular the intended body site, were identified as important targets to understand even in early development, influencing the types of preclinical studies which may need to be undertaken. The panel were then asked how any changes in regulations were dictating scientific requirements with particular reference given to the substances of human origin (SoHO) regulations in Europe. Bruno and Sarah were able to shed light on how these will impact our science and how we need to position ourselves now to meet these changes, while Diane shared several insights from a US regulatory perspective. The panel agreed that it would be great to harmonize global regulatory requirements, but that this was still far from a reality. Quality of new strains, including whether shelf-life data could be used to support other areas such as safety, product identity and efficacy was also explored by the panel. Lastly, the panel were asked how our science can influence regulation when it comes to new substances approval. Diane gave examples of this in a North American context and the other panel members discussed this in light of EFSA, where government regulatory bodies consider the latest science and where the work of ISAPP has played a critical role and can continue to do so.

SUMMARY OF THE SPECIAL SESSION

PROBIOTICS AND PREMATURE INFANTS - PERSPECTIVES AND PATHS FORWARD

Expert Panel

The use of probiotics in premature infants has been highly topical in recent months. Probiotic use for the prevention of necrotising enterocolitis (NEC) in preterm infants has been studied in over 85 randomised clinical trials, with systematic reviews showing significant reductions in NEC as well as all cause mortality. However, the application of probiotics is not without risk - in vulnerable populations such as preterm infants, the translocation of probiotic bacteria into the bloodstream is a rare but documented occurrence. While probiotic bacteraemia is usually highly treatable with antibiotics, some isolated case reports of fatalities over the years have created significant concern. While a recent US case report and subsequent regulatory action brought this issue to the forefront, evidence gaps and disparate clinical implementation rates are challenges that exist across the globe. To further explore this issue, ISAPP held a panel discussion at the 2024 annual meeting featuring seven experts sharing their unique perspectives on this complex issue, covering scientific, clinical, regulatory, industry, and patient family viewpoints.

- Explore an overview of key perspectives and takeaways from the panel discussion in our blog post.
- Read ISAPPs scientific statement on probiotic use in preterm infants

Special Session panel discussion, Western Gateway Building, UCC

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.

- **Dr. Aki Sinkkonen PhD** investigates the idea that environmental microorganisms could positively modulate the human immune system for better health. He noted that typical urban daycare yards provide a diminished microbiota, with less than 100K bacteria per gram of soil compared to 1 billion per gram in forest soil. He has led interventions to "rewild" soil / sand in daycare yards to create higher bacterial diversity. In one double-blinded, randomized trial, children at a daycare center played in a sandbox filled with peat or microbially diverse soil mixture, 20 minutes per day for 2 weeks. The children showed changes in their skin and gut microbiota, as well as enhanced immune regulation. Furthermore, a 4-week trial of an indoor gardening intervention in adults resulted in increased richness and diversity of their skin microbiota. These preliminary studies show the potential for environmental microbial interventions to enhance human health.

- **Dr. Ana Luis PhD** covered microbiota-human mucin interactions and a novel method for preventing gut mucus barrier dysfunction. She noted that a unique microbiota (distinct from the lumenal community) is present in the human gut mucus layer, and made the case for investigating microbiota enzymes as targets for interventions that strengthen the mucus layer of the gut barrier, potentially improving disease status. Using a model of mucin O-glycan depolymerization, she found sequential degradation of mucus requires multiple enzymes, and furthermore, is initiated by multiple key enzymes. Thus, blocking key enzymes in mucin O-glycan utilization by the microbiota has potential for restoring mucus barrier function in various diseases.

- **Dr. María Pía Taranto PhD** was the recipient of the inaugural Sanders Award for Advancing Biotic Science. Her presentation at the meeting was titled "Challenges and achievements of a probiotic social assistance program" and described the YOGURITO initiative in Tucumán, Argentina. Dr. Taranto and team selected the probiotic strain *Lacticaseibacillus rhamnosus* CRL1505 (PB1505) for its immunomodulatory capacity, then developed prototype products and worked to develop them for production at industrial scale.

Children in underprivileged areas received the probiotic products, with wide distribution initiated in 2010. At present, 200K children receive the probiotic products, with an initial study showing benefits for their health as well as education – in particular, a lower prevalence of respiratory and intestinal infectious diseases.

- **Prof. Douwe van Sinderen PhD** tracks bifidobacterial strains shared between mother and child, using a dual approach of both culturing and metagenomic analysis. In 132 mother-infant pairs, the team found that the isolated *Bifidobacterium* strains could not all be found within the metagenomics compositional dataset, with around 10% of isolates being undetectable via metagenomic methods. The combined approach provided a more complete view of bifidobacterial strains present in mothers and children, and it increased the researchers' ability to detect strain sharing between the pairs. Transmission of strains was observed in 34% of the pairs, with vaginal delivery and several other factors associated with a greater tendency to share strains.

Watercolor of UCC by meeting guest, Dr. Laurel Beckett.

- The lab of **Prof. KC Huang PhD** is concerned with how bacterial cell shapes are determined and maintained, and some of their recent work focuses on how to profile the human intestinal environment. In particular, Prof. Huang aimed to find a good method for studying the small intestinal environment, given that samples are notoriously hard to obtain. He described CapScan, a cost-conscious and easy to administer method of sampling the small intestinal microbiota non-invasively by suctioning a small sample of material into the capsule. Investigations using this sampling method provided insights on the microbiota and metabolism within the small intestine.

In healthy humans with normal digestion, a study confirmed that microbial communities are spatially distinct along the human gastrointestinal tract. Further, the proteome has been found to differ between stool and the small intestine, and correlates with the microbiota. Strain isolation enabled the creation of a synthetic community of phylogenetically diverse isolates from throughout the intestinal tract, which in the mouse intestinal tract was preferentially established in the expected regions.

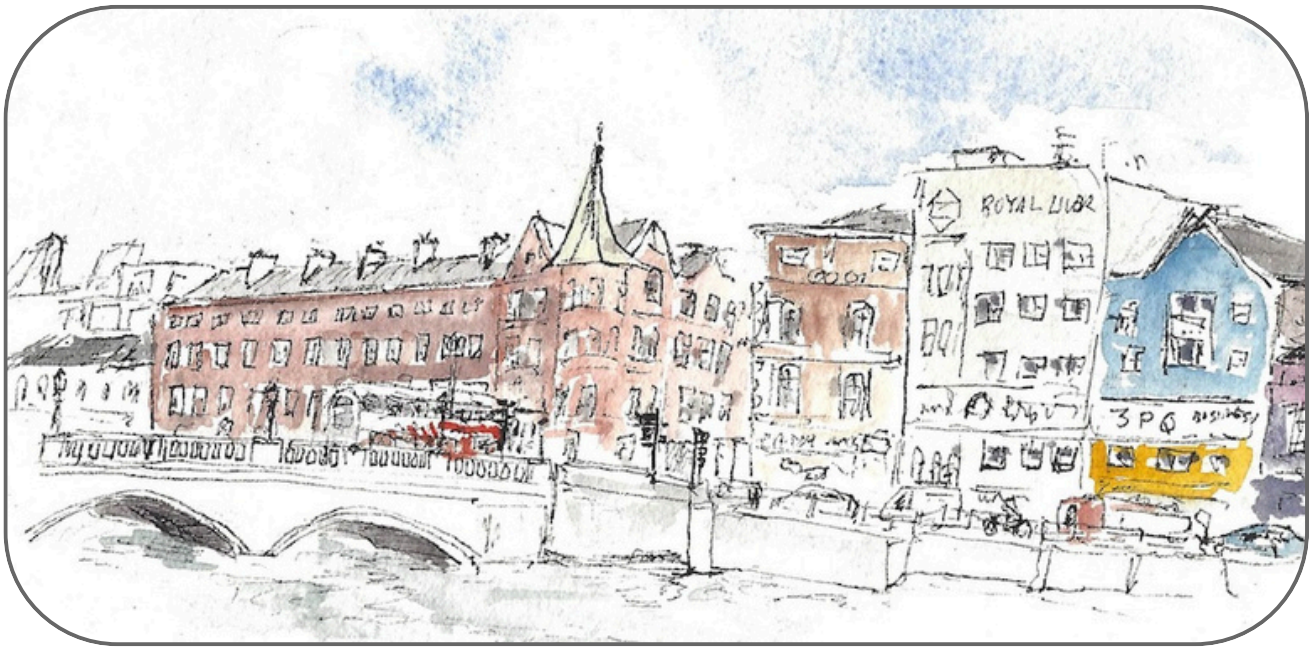
- **Prof. Steven Ricke PhD** gave a high-level overview of biotics for agricultural animal applications. Currently, he noted, applications for poultry and fish are most well studied, with swine applications increasing. Ruminant applications are not as frequent as for other farm animals. Prof. Ricke suggested expanding the criteria for optimizing biotics: not just focusing on pathogen reduction/prevention in the animals, but looking at immune status, inflammation, feed microbial quality, as well as the environmental consequences of use. He gave an example from chicken cecal incubations: administering a rice bran cultivar increased cecal microbiome diversity and decreased *Salmonella*, but a potential increase in nitrogen excretion products could have negative environmental consequences, so alternatives should be considered.

- **Dr. Boushra Dalile PhD**, the 2024 winner of the Glenn Gibson Early Career Researcher Award, gave a talk related to the gut-brain axis, entitled *"Eat your (fiber-rich, fermentable) veg? A translational take on short-chain fatty acids as microbiota-gut-brain axis mediators in humans."* She described a trial showing the potential of colonically-delivered short-chain fatty acids (SCFAs) to lower the cortisol stress response in a 7-day human intervention. Across studies, changes in circulating SCFAs modulate the magnitude of change in psychobiological processes, and individual SCFAs may have unique effects. Only a minimal increase in circulating SCFAs may be necessary to influence HPA-axis response to stress.

- **Dr. Rounak Chourasia PhD**, the inaugural recipient of the Gregor Reid Award for Outstanding Scholars in Developing Nations, spoke about mining bioactive peptides in fermented dairy and non-dairy products in the Indian Himalayan Region. He described the production, sale, and consumption of Chhurpi cheese by local populations of Sikkim, which was affected by microbial contamination as well as the presence of antibiotic resistant bacteria. Dr. Chourasia developed a controlled fermentation method for the production of safe and functional Chhurpi cheese, using selected lactic acid bacterial strains. He also created a novel soybean version of the cheese, appropriate for people with lactose malabsorption. The novel products had a longer shelf life and were free from antibiotic resistant enterococci. A peptidome analysis of undigested and simulated digested Chhurpi and whey, led to the identification of 5 novel bioactive peptides.

- **Prof. Catherine O'Neill PhD** gave ISAPP meeting participants an overview of the role of lactic acid bacteria (LAB) in skin health and disease. LAB, when taken orally, may have applications for addressing both atopic dermatitis and psoriasis, as well as wrinkle formation, as some LAB strains regulate inflammatory immune responses in the skin. Topical administration of LAB and postbiotics is promising for both cosmetic and disease-related applications. However, standardisation is an issue across disease studies, and careful screening is required for appropriate species and strain selection.

- **Prof. John Cryan PhD** concluded the featured plenary talks with a lively tour of the field of microbiota-gut-brain research, exploring landmark findings and their contribution to establishing a causal role of the gut microbiota in brain-related health and disease. He explained that the brains of germ-free mice are altered in multiple ways, with different myelination, neurotransmitters and synaptic plasticity, microglia, neurogenesis, dendritic growth, and blood-brain barrier. Not only is brain development altered in animals without gut microbes, but they also develop social deficits. Prof. Cryan described research on several new applications: targeting the gut microbiome with a prebiotic to reverse neuroinflammation in middle age, and using SCFAs to improve psychosocial stress and the consequent long-lasting increase in stress-responsiveness and intestinal permeability.



Watercolor of Cork by meeting guest, Dr. Laurel Beckett.

2024 AWARD WINNERS

The Sanders Award for Advancing Biotic Science

María Pía Taranto, National Scientific and Technical Research Council (CERELA-CONICET), Argentina

María Pía Taranto and Mary Ellen Sanders

The Glenn Gibson Early Career Researcher Award

Boushra Dalile, KU Leuven, Belgium

Boushra Dalile and Glenn Gibson

The Gregor Reid Award for Outstanding Scholars in Developing Nations

Rounak Chourasia, National Agri-food Biotechnology Institute, Mohali, Punjab, India

Rounak Chourasia and Gregor Reid

DISCUSSION GROUPS

Group 1: Characterization and quantification of postbiotics

Gabriel Vinderola and Seppo Salminen, Co-chairs

The aim of this discussion group was to convene industry and academic experts to discuss specific key issues about characterization and quantification of postbiotics, with practical exploration of how postbiotic products are produced, characterized and quantified commercially. We aimed to discuss postbiotics ranging from “simple products" (a single inanimate strain) to more complex formulations (a mixture of inanimate strains or cell fragments, plus metabolites) and to propose methodologic tools to characterize and quantify such postbiotic products.

An important lens brought into discussion was that the level of characterization and quantification depends on the purpose and recipient of the information - which may include internal process control, to know the mechanisms of action and elucidate potential applications, or to inform customers, regulators or the consumer. Considerations for regulation were a feature of the discussion, with attendance of a regulatory scientist from the Therapeutic Goods Administration in Australia.

Discussion Group 1

Work is ongoing in Australia to produce guidance for the characterization and quantification of products that deliver live and dead (intact) cells. Interestingly, for Australia, leaked cellular content (cell fragments, cell lysates) undergo a different regulatory approach.

Experts addressed the possibilities that flow cytometry brings to quantify intact or fragmented bacteria, yeasts and even filamentous microorganisms. Current state of commercial practice for postbiotics was explored, with industry scientists discussing the production and quantification of the products produced by their companies. Topics identified for further exploration included the potential interference of dead microbes present in a food matrix, as well as how to properly assess the stability of postbiotics throughout storage and shelf life - as ingredients, supplements or included in a food matrix. These topics could be further discussed in a follow up of this discussion group.

Some group conclusions included the following: a complete characterization and quantification of all components of a postbiotic product is not expected; the level of characterization and quantification will depend on who is the recipient of the information; flow cytometry is moving from niche to mainstream as instruments become cheaper and more sophisticated; and that there would not likely be a single gold standard for quantification of postbiotics. On this last point, the group concluded the field would be open to multiple approaches when it comes to quantification, depending on the complexity of the product, the type of microbe (bacteria, yeasts, filamentous fungi) and the integrity of the cell (intact vs. fragmented). The group is now working to produce a Perspective paper describing the discussion held, and proposing a decision tree comprising type of microbe, number of strains and cell integrity as features to guide product developers to consider the different quantification possibilities according to the type of product.

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

DISCUSSION GROUPS

Group 2: How can we establish causal mediation in microbiome intervention studies?

Dan Tancredi and Kristin Verbeke, Co-chairs

The goal of our discussion group was to understand how to improve the quality of the evidence for a claimed mechanistic linkage involving the microbiome as a mediator of health effects caused by a biotic intervention. Despite inherent difficulties in establishing causal mediation, it is important to do so in order advance the fields of biotics and microbiome health and, potentially, to support health claims when mechanism of action evidence is required. We brought together 22 experts, including 11 from industry, with presentations from 6 academic scientists.

Daniel Tancredi presented some of the challenges and potential solutions in establishing the necessary causal linkages for characterizing microbiome-mediated mechanism of action for a prebiotic. He introduced the classical single-mediator model from statistical mediation analysis, which is widely used in the social sciences, along with a set of assumed "no-confounding" conditions that are necessary to confidently establish causal mediation. He pointed out the key difficulty that arises when only the intervention is randomized: the possibility of uncontrolled confounding for the mediator—health outcome linkage. He then described some possible experimental designs that would help address the key challenge, by adding randomization not just of the intervention, but also of a manipulation of the microbiome mechanism.

Kaitlin Wade described the potential utility of Mendelian Randomization, a technique from genetic epidemiology that is based on instrumental variables estimation, a strategy from econometrics. She outlined the necessary assumptions for Mendelian Randomization to work and how uncontrolled confounding, reverse causation and horizontal pleiotropy are potential validity threats. She noted that this technique can be useful for hypothesis generation, particularly when it builds on the accumulating knowledge we have from genetics studies, and is combined with investigator teams who are interdisciplinary and thoughtful about how to employ this method and how to accumulate triangulating evidence to help promote confidence in a particular mechanism.

Michael Sohn presented some of the innovative statistical methods he has developed to adapt the classical single-mediator statistical mediation model to microbiome data, where instead of a single mediator, there are numerous potential mediators, and where the hypothesized mediators are measured as compositional data (such as with relative abundance measures for various operational taxonomic units that add up to 100 percent) with a large number of zero measurements. He demonstrated how his compositional mediation model can be applied to yield insights into mechanism and emphasized that to address concerns about confounding, it is important to measure and control statistically for known confounders and to use sensitivity analysis to understand how robust (or not) results are to uncontrolled confounding.

Our presentations also included three talks that demonstrated how experimental evidence can be developed for specific interventions to provide convincing evidence of mechanism in certain contexts.

Amandine Everard presented on the strategy of combining bioinformatics tools with direct demonstration to establish causality, drawing on the series of *in vitro*, animal, and human studies over nearly two decades that demonstrate causal linkages involving *Akkermansia muciniphila* as both something that responds to a prebiotic and that provides health benefits counteracting obesity. She notes that to navigate the path from correlation to causality involving a specific candidate microorganism, one can take advantage of correlations observed in available studies and methodologies, but that demonstrating causal linkages via well-designed experiments is necessary. She also advises that the selection of candidates and the experimental procedures to use should account for context-specific challenges in microbiome studies, including cross-feeding.

Anissa Armet presented on the use of rodent models for establishing causal mediation. She started by noting conceptual limitations of human microbiome-associated murine models in establishing causation and then presented some striking results from a systematic review that found 38 studies using HMA-murine models across a range of disease states, finding that only one-third replicated “dysbiosis” in the rodent and a similarly low percentage were able to elucidate mechanisms.84% of the studies used statistical techniques that suffered from “pseudoreplication” or the failure to account for nonindependence among observations, as would arise from the microbiome from the same donor being transplanted to multiple mice and the statistical analysis failing to account for such “cluster effects”. The incorrect analysis is likely to lead to artificially low p-values and false positive findings (type-1 errors). She recommends that when using HMA-models, one should aim to confirm that dysbiosis patterns are transferred from human donors to recipient animals, that correct statistical analysis to account for the clustered data are used, and that potential mechanisms be investigated.

Group 2: How can we establish causal mediation in microbiome intervention studies?

She then presented three interesting examples where gnotobiotic rodent models were used to complement human clinical studies to investigate mechanisms linking an intervention to health outcomes and speculated on the potential value of following up such “reverse translation” studies with “reverse-reverse translation” studies that would use human studies to confirm results from the rodent studies.

Kristin Verbeke then presented an experimental program that can convincingly demonstrate the role of short-chain fatty acids (SCFA) in mediating health benefits of prebiotics/dietary fiber via the use of colon-delivery capsules. The capsules help overcome validity threats that arise from the fact that the dietary intervention changes more than just the production of SCFA and the fact that there is between-individual variation in SCFA production when receiving the intervention. Her experimental strategy involves a series of steps, including the quantification and comparison of bioavailability of SCFA produced by the microbiome from fiber fractions and bioavailability from colonic delivery capsules, taking advantage of carbon-labeling. From these results, one can then perform an experimental assessment of physiological effects from SCFA that would arise from physiologically relevant dosages of the intervention. These methods have been used in collaborative research, including investigations for whether SCFA affect our response to stress.

Our group plans to develop a peer-reviewed paper that describes the challenges in establishing causal mediation in microbiome intervention studies and the potential advantages and disadvantages of various strategies, including the ones presented here.

Discussion Group 2

DISCUSSION GROUPS

Group 3: The microbiome and neurodegenerative and neurodevelopmental disorders

Eamonn Quigley and Hania Szajewska, Co-chairs

There has been extensive recent literature on how the microbiome might influence the development and function of the central nervous system and, as a consequence, several studies have evaluated the status of the gut microbiome in both neurodevelopmental and neurodegenerative disorders.

In the course of this discussion group changes (in comparison to normal controls) in the gut microbiome were described in autism spectrum disorder (ASD), attention deficit disorder (ADHD), Parkinson's disease, drug-resistant epilepsy, major depressive disorders, anxiety, stress, multiple sclerosis and hypotheses developed to explain how the microbiome could play a role in the pathogenesis of these disorders.

Key Points from the Discussion

1. Microbiome-CNS Communication
    - Current studies often describe associations rather than causation.
    - Interpretation is limited by the lack of longitudinal data, the heterogeneity of phenotypes, a focus on stool sampling, and failure to account for confounding variables.
    - The microbiome-gut-brain axis is bidirectional, meaning changes in the microbiome could be a consequence rather than a cause of CNS disorders.
    - Despite these limitations, evidence suggests the microbiome is disordered in many of the populations discussed. We anticipate large, longitudinal studies in well-phenotyped patient populations that incorporate metagenomics and metabolomics.
    - The source of microbial metabolites in the brain is unclear. Identifying whether they originate from the gut or nasopharynx is crucial.
    - Brain tissue samples from neurosurgical procedures could help, but such patients often have disturbed neurotransmitter release.
    - Imaging technologies, especially MR spectroscopy, should be utilized more as few brain imaging studies exist on this subject.
    - Defining 'depression-type' behavior in animals and its translation to humans remains challenging.
    - Revisiting hepatic encephalopathy with modern methods could provide insights into microbiome-gut-brain axis disturbances.

2. Mechanisms of Microbiome Impact
   - Animal studies, though not always translatable to humans, suggest mechanisms such as vagal transmission, inflammatory mediators, neuroendocrine factors, and neurotransmitter production by the microbiome.
   - Human studies, including those on experimentally induced stress, offer insights into microbiome involvement.
   - Studies involving animal models have provided several clues about how the microbiome might impact the brain, including the transmission of signals via the vagus nerve, the effects of inflammatory mediators, locally released neuroendocrine factors, and the elaboration of neurotransmitters by the microbiome.

3. Microbiome-Diet Interaction and CNS Function
   - Diet significantly modifies the gut microbiome.
   - Studies suggest dietary interventions could impact neurological disorders via the microbiome.
   - For instance, replacing the ketogenic diet with microbiome-targeted interventions could be based on similar molecular mechanisms of seizure reduction.
   - Monitoring beta-hydroxybutyrate levels could help track trends in ketone concentrations during ketogenic or other ketogenesis-based interventions.
   - Questions remain about whether specific metabolites/neurotransmitters accumulate in disease-specific brain regions or if it relates to higher receptor density.

4. Microbiome and Mood
   - Differentiating between direct microbiome-mood interactions and mood-induced dietary changes leading to microbiome shifts is challenging.
   - Defining a psychobiotic and understanding whether its effects are diet-dependent or independent are key areas of interest.
   - The subjective nature of stress complicates selecting which kind of stress to target in interventions. Most studies have focused on acute stress in healthy participants; there is a need for research on chronic, clinically relevant stress.

5. Microbiome and Neurodegenerative Disorders
   - Key research directions include searching for primary prevention of Parkinson's disease in at-risk patients (e.g., those with a family history) and identifying microbiome patterns predicting Parkinson's disease development.

6. Microbiome and ADHD
    - Issues with the accessibility and quality of raw data limit meta-analyses of microbiome studies.

7. Microbiome and ASD
    - Autism development depends on both genetics and environmental exposure. Manipulating the microbiome could potentially reduce risk and severity.
    - Primary prevention of ASD through microbiome manipulation is more desirable than treatment post-development. Identifying predictive microbiome patterns as early as during pregnancy is needed.
    - Families with children with ASD are often hopeful for effective interventions, which some probiotic manufacturers exploit in advertisements. Claims about probiotic use in ASD must be made cautiously.

Conclusion

This lively and very interactive discussion group nicely summarized the current state of play; intriguing animal data, provocative human studies but many gaps to be filled. We look forward to future studies that will address these limitations and provide clearer insights into the role of the microbiome in neurodevelopmental and neurodegenerative disorders.

Discussion Group 3

DISCUSSION GROUPS

Group 4: Evidence for candidate prebiotics, including polyphenols, resistant starch, and animal-derived substances

Karen Scott, Kelly Swanson and Bob Hutkins, Co-chairs

The number of well-characterised and recognised prebiotics has not changed greatly since they were first described in 1995, namely FOS, inulin, and GOS. This is despite many publications describing the impact of a variety of different substances on the gut microbiota and subsequently on health, hence potentially acting as prebiotics. This discussion group explored what is required for such 'putative prebiotics' to be accepted as prebiotics, within the guidelines of the current definition. This includes selective utilisation, modification of the composition or function of the microbiota and proven beneficial effects on health mediated via the microbiota. The targeted output was a usable infographic or checklist outlining this descriptive process with the aim of assisting conversion of putative to accepted prebiotics.

The 2017 ISAPP consensus statement defined prebiotics as "a substrate that is selectively utilised by host microorganisms conferring a health benefit". This definition was deliberately broad to enable the development of new compounds as prebiotics that may target an expanded range of resident gut bacteria beyond lactic acid bacteria.

In order to manage this potentially huge topic the group focused on three categories: resistant starch (RS), (poly)phenols and human milk oligosaccharides (HMOs). Each of these has one thing in common, they consist of many different specific compounds, characterised by distinct modular units with different covalent bonds linking them together. For instance, more than 200 distinct HMOs have been identified while there are in excess of 10,000 different (poly)phenols. Even the four categories of RS (RS1-RS4) vary depending on the source and means of manufacture. The group agreed that there was no intention to enable any generic group of compounds to be classed as prebiotics. Rather, any specific compound thought to act as a prebiotic needs to be fully investigated and demonstrated to meet all criteria within the prebiotic definition (at a defined dose), before that well-characterised specific compound can be deemed a prebiotic.

Within the RS category, there is sufficient convincing evidence that some specific RS2, RS3 and RS4 starches are selectively utilized by the host microbiota and provide a health benefit.

Various HMOs, including 2'FL and LNnT, have been shown to enrich for Bifidobacterium species and provide health benefits in infants. The differing abilities of distinct Bifidobacterium species to degrade HMOs was discussed revealing important inter-species differences. Thus, the effects on infants may depend on the presence of specific Bifidobacterium species within the gut microbiota.

Of the thousands of different (poly)phenols found in plants, the tannins represent 20-80% of dietary (poly)phenols. Most of these are not absorbed in the upper gastrointestinal tract and many have been investigated to identify prebiotic properties. They can act as carbon sources or electron acceptors for gut microbes which metabolise or transform them into metabolites that can alter the gut environment and improve host health.

Discussion Group 4

Missing from photo: Kelly Swanson

Given the complexity of compounds, even within the above three groups, we finished off the afternoon's discussion debating a possible checklist that could be used to assist in the development and transition of 'putative' prebiotics to prebiotics. This checklist is designed to demonstrate how a product fits the key points within the ISAPP prebiotic classification, illustrating the attributes of each on an individual basis. Presenters who introduced specific HMO, RS and (poly)phenols within the discussion were asked to see if the checklist would allow any of the compounds they mentioned to be classified as prebiotics. Specific types of RS and individual HMOs (such as 2'FL) would tick all the boxes, and could be classed as prebiotics. In the case of specific (poly)phenols it is likely that more research will be required, particularly to allow full characterisation of these compounds which are often tightly bound to other plant components and are difficult to extract, and to correlate microbiome modulation with any health outcomes.

The checklist will be a main output from the group, and will be widely disseminated following further comment and development from discussion group participants.

Lunch and networking, Western Gateway Building, UCC

DISCUSSION GROUPS

Group 5: How does digestion affect prebiotic and probiotic function?

Anisha Wijeyesekera and Maria Marco, Co-chairs

Although digestive processes in the human gastrointestinal tract are generally known, the specific, complex physicochemical mechanisms through which foods and dietary substrates are broken down and absorbed are only just starting to be understood. Even the definition of digestion itself has expanded in recent years to include the enzymatic activities of the resident gut microbiome. This discussion group examined the latest science on digestion and how digestion affects prebiotic and probiotic function. Key questions driving the discussion included: What is the current understanding of human digestion? What are the effects of digestion on biotic substances? What novel information has been uncovered by the development of recent innovative analytical technologies? What should be the next targets/priorities?

These questions were addressed by the expert panel first, by focusing on the physiological factors during digestion that affect probiotics and prebiotics differently. Whereas probiotics need to tolerate acidic pH, antimicrobial compounds, and enzymatic activities in the stomach and small intestine in order to remain viable, prebiotics such as certain dietary fibers may directly influence digestive processes such as gastric motor function and emptying. In addition to variations between and within biotics, other factors including timing of consumption (for example, eaten before or after a meal) and background diet can affect exposures to biotics in the gastrointestinal tract. Digestion is also highly variable from person to person due to physical (e.g. chewing and transit times) and biological (e.g. gene-diet interactions, gut microbiota composition) differences which can have significant effects on absorption.

To measure and monitor the effects of digestion on probiotics and prebiotics, the panel discussed a full range of *in silico*, cell culture, animal modes, intestinal bioreactor, and human studies. While in vitro approaches (e.g. such as artificial gut models) are useful for comparing between biotics and their effects on the gut microbiomes, translation to humans is still needed. The latter is increasingly feasible because of the development of ingestible capsules and innovative endoscopic methods to measure (small) intestinal contents.

Group 5: How does digestion affect prebiotic and probiotic function?

There is also significant opportunity to apply pharmacokinetics and *in silico* modelling originally developed for drugs to probiotics and prebiotics. These approaches can be used to develop a much-needed understanding of probiotic responses (e.g. viability and expression of functionally relevant genes) and prebiotic breakdown (e.g. via specific microbial enzymes) in the human gastrointestinal tract. Such advances may lead to improving the efficacy of biotic interventions by taking digestion processes into account.

Discussion Group 5

DISCUSSION GROUPS

Group 6: Next-generation probiotics by implementation of genetic engineering and other tools

Sarah Lebeer and Colin Hill, Co-chairs

Advancements in genetic tools have enabled precise genome engineering, enhancing the functionality of specific microbial strains and communities. Despite these advancements, the introduction of next-generation probiotics faces significant regulatory challenges, whether for food, supplement or drug applications.

Our group first discussed the term "next-generation probiotics", which has been commonly used to describe both genetically modified (GM) probiotics and probiotic strains and species of more exotic taxonomic origin such as *Akkermansia* and *Faecalibacterium*. We mainly focused on GM probiotics in this discussion group. The term 'next-generation probiotics' was deemed to be a useful shorthand descriptor for these types of novel probiotics (and a useful term for grant applications) but is not a term that needs a formal definition. The term 'probiotic' is sufficient for any strain of any species that has clinical documentation of a health benefit, and this can be augmented by the term GMO (GM organism) or GMM (GM microbe) for any strain that has been modified in a manner that could not occur naturally. Most GMOs have only been tested in mice. Therefore, the term 'next-generation probiotics' mainly signifies an exploratory phase of research activity and excitement for grant applications rather than having any regulatory or scientific validity.

The group also explored the potential benefits of genetically engineered strains with the promise to become probiotics. These benefits could include enhanced therapeutic capabilities, while also acknowledging the risks, including the possibility of losing probiotic functions due to genetic modifications. The discussion identified key functions to optimize through genetic modifications. The field has experienced some excitement in the past decade with many start-ups but also some failures, such as recently from Synlogic in phase 3. Applications outside the gut such as Aurealis for chronic wounds, Ilya and Actobio seem to have promise. The panel identified oncology as a promising application area where genetic engineering could lead to effective probiotics and LBPs (live biotherapeutic products), particularly where no alternatives exist, and where the timing and continuous production of therapeutic molecules are crucial.

The panel also discussed safety. One possibility is that GMO postbiotics could represent a potentially safer and more effective alternative. It may well be that regulators will require evidence that novel species and GMMs must be alive to demonstrate safety, otherwise inanimate versions would be preferred. To enhance safety of live strains, biocontainment strategies like auxotrophies, kill switches and material encapsulation were discussed, though the use of postbiotics would remove this requirement. Postbiotics (non-living/inanimate preparations) could offer significant health benefits while reducing safety concerns associated with GMOs. This has also been nicely showcased with the non-GMM *Akkermansia muciniphila*, which showed (increased) efficacy after pasteurization. Nevertheless, the panel also discussed other inactivation strategies that could help to preserve the protein and cell wall structure such as UV inactivation, gamma and acetone treatment.

In summary, while genetically engineered strains and strains from novel taxa hold significant promise for development as probiotics (once a suitable health benefit has been identified), regulatory challenges and safety concerns necessitate cautious and targeted application, particularly within the medical field. The discussion underscored the potential of postbiotics as a safer alternative and highlighted the importance of regulatory frameworks in shaping the future of microbial therapeutics.

Discussion Group 6

LATE-BREAKING NEWS

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

Yogurt and reduction of type 2 diabetes: New FDA authorized qualified health claim, Miguel Freitas, Danone North America, USA

Unlocking the gut-brain connection: Exploring the potential of probiotics in autism management, Maria Stolaki, Winclove, Netherlands

From predictive modelling to functional analysis focusing on appetite regulation, Cristina Cuesti Marti, APC Microbiome, Ireland

Spatially and temporally precise capsule-based sampling of the small intestine, Joseph Wang, Nimble Science Ltd., Canada

Which, if any, probiotic or prebiotic can impact jejunal Crohn's? Gregor Reid, University of Western Ontario, Canada

Transcriptional recording captures bacterial nutrient sensing, Katie Guzzetta, ETH Zürich, Switzerland

Comparison of acute impacts of fermented foods, prebiotics and probiotics on the human gut microbiome and metabolome, Liam Walsh, Teagasc, Ireland

Strain level quantitation of a B. infantis probiotic using metagenomics Michael Shaffer, Bill & Melinda Gates Medical Research Institute, USA

Assessment of the safety of "probiotics" in food supplements, Mary O'Connell Motherway, University College Cork, Ireland

Live microbe intakes and health benefits: An emerging theme with industry significance? Maria Marco, University of California, Davis, USA

POSTERS AWARD WINNERS

SFA Poster Award

Natalia Rios Colombo, APC Microbiome, University College Cork

Natalia Rios Colombo and Cathy Lordan

SFA Poster Award

Saurabh Kadyan, Florida State University

Saurabh Kadyan and Cathy Lordan

People's Choice Poster Award

Gerrit Stuivenberg, Western University

Gerrit Stuivenberg and Anisha Wijeyesekera

POSTERS

All poster abstracts are found in the Meeting Guide.

SECTION 1: Fermented Foods and Synbiotics

Poster #1 SFA: Multi-omics approaches in unmasking the seasonal microbial variation and health-promoting properties in the soft chhurpi cheese of Sikkim Himalayan region. Md Minhajul Abedin (National Agri-Food Biotechnology Institute (NABI)

Poster #2 SFA: Impact of Probiotic Yoghurt on Gut Microbiome Dynamics: Insights from *In-Vitro* Fermentation and Metabolite Profiling. Choshani Dalukdeniya, University of Reading

Poster #3 SFA: Development of Ogi-Pro: A probiotic Nigerian fermented food with diarrhoea-mitigation potentials. Rachael T. Duche, Joseph Sarwuan Tarka University Makurdi-Nigeria

Poster #4 SFA: Synbiotic effect of probiotic Lactobacillus with Allium sativum L. Extract against Salmonella: A Metabolomic and Electron Microscopy Insights. Olalekan S. Fadare, Elizade University

Poster #5 SFA: In vitro fermentation characteristics of dietary fibers using starter bacterial culture, grain kefir culture, or canine feces as inoculum. Breanna N. Metras, Division of Nutritional Sciences, University of Illinois Urbana-Champaign

Poster #6: Effect of lactose in RGP and EPS receptors in streptococcal phages interactions. Natalia Diaz-Garrido, School of Microbiology & APC Microbiome Ireland, University College Cork

Poster #7: Factors governing the dominance of lactic acid bacteria in vegetable fermentations. Tom Eilers, Laboratory of Applied Microbiology and Biotechnology (LAMB), University of Antwerp

Poster #8: Characterization of genes involved in the metabolism of arabinose-containing complex glycans by *B. longum* subsp. *longum* NCIMB 8809. Lisa Friess, School of Microbiology & APC Microbiome Ireland, University College Cork

Poster #9: Adaptations and community changes in milk and water kefir microbiomes in response to environmental parameters (Kefir4All-Citizen Science Project). Liam H. Walsh, Teagasc Food Research Centre, Moorepark, Fermoy, School of Microbiology, University College Cork

Poster #10: Protective effect of synbiotic combination of *Lactobacillus* sp. and polyphenols against Benzo[a]pyrene-induced intestinal toxicity. Shivani Popli Department of Basic and Applied Sciences, National Institute of Food Technology Entrepreneurship and Management

SECTION 2: Microbiota, Metabolome and Gut Health Insights

Poster #11 SFA: Lactobacilli on intimate skin microbiome in Isala citizen science project. Sarah Ahannach, Laboratory for Applied microbiology and Biotechnology, University of Antwerp

Poster #12 SFA: isolateR: an R package for generating microbial libraries from Sanger sequencing data with potential for discovery of novel probiotic candidates. Brendan Daisley, Department of Molecular and Cellular Biology, University of Guelph

Poster #13 SFA: A Multi-faceted Exploration of Lactobacillaceae-derived Vitamin B2 in the Vagina. Caroline E.M.K. Dricot, University of Antwerp

Poster #14 SFA: The role of the gut microbiota in neuroblastoma tumour-bearing animals with varying immunotherapy response activities. Hasti Gholami, Department of Pathology and Laboratory Medicine, Western University

Poster #15 SFA: Nisin-like biosynthetic gene clusters are widespread, abundant and diverse in nature. David Hourigan, APC Microbiome Ireland, School of Microbiology, University College Cork

Poster #16 SFA: Prenatal exposure to omega-3 fatty acids shapes neonatal gut microbiome and improves long-term metabolic and neurocognitive development. Saurabh Kadyan, Florida State University

Poster #17: Beneficial effects of multi-mineral supplements on the intestinal barrier. Garance Coquant, Trinity College Dublin, APC Microbiome Ireland, University College Cork

Poster session

Poster #18: Profiling the bacterial microbiota of a diet fed in meal or pelleted form, delivered as dry, wet/dry or liquid feed and its impact on the faecal and intestinal microbiome of grow-finisher pigs. James T. Cullen, Eco-Innovation Research Centre, South East Technological University, Teagasc Pig Development Department, Animal and Grassland Research and Innovation Centre

Poster #19: Identification of a gut microbiota signature in patients with drug-resistant epilepsy upon ketogenic diet treatment. Laura Díaz-Marugán, Institute of Microbiology, Infectious Diseases and Immunology (I-MIDI) Charité - Universitaetsmedizin Berlin

Poster #20: The impact of iron and lactoferrin on the pre-weaning infant and adult gut microbiota. Jiyeon Jang, School of Biological Sciences, University of Reading

Poster #21: Early-life resistome and mobilome exploration in infant gut microbiome datasets from different geographical locations. Ilaria Larini, Department of Biotechnology, University of Verona

Poster #22: Monitoring changes in exhaled volatile organic compounds following iron supplementation for anemia treatment. Elena Piscitelli, Owlstone Medical Ltd.

Poster #23: Acute stress, sodium butyrate and the microbiota-gut-brain axis: focus on microbial regulation of barrier function and hippocampal plasticity. Rosell-Cardona C, APC Microbiome Ireland, University College Cork

Poster #24: Conditioning of *Lactococcus Lactis* with nisin and sucrose. Killian Scanlon, APC Microbiome Ireland and School of Microbiology, University College Cork.

Poster #25: Simba capsule captures small intestinal luminal content for metagenomics analysis and maps spatial differences along the GI tract as validated by saliva, duodenal endoscopy and feces. Gang Wang, Nimble Science Ltd.

Poster #26: Gut Microbiome Differences in Individuals with PTSD: A Systematic Review. Chantelle Winder, University of Surrey & University of Sheffield

SECTION 3: Prebiotic and Fibre-related Interventions

Poster #27 SFA: The efficacy of prebiotic HMOs in improving renal transplant outcomes. Kait F. Al, Department of Microbiology and Immunology, Western University

Poster #28 SFA: Daily consumption of galactooligosaccharide gummies ameliorates constipation symptoms, gut dysbiosis, degree of depression and quality of life among sedentary university teaching staff: A double-blind randomized placebo control clinical trial. Kankona Dey, The Maharaja Sayajirao University of Baroda, Vadodara

Poster #29 SFA: Establishing 2'-Fucosyllactose as a Prebiotic Candidate in Ulcerative Colitis using an in vitro Fermentation Model. James M Kennedy, University of Reading, Royal Berkshire NHS Foundation Trust

Poster #30 SFA: Assessment of the impact of oat and fruit-based foods and ingredients and on a human gut microbial community using an ex vivo distal colon model. Cathy Lordan, Teagasc Food Research Centre

Poster #31 SFA: Creation of a knock-in mouse model that synthesizes 2'-fucosyllactose in milk. Simone Renwick, University of California San Diego

Poster #32 SFA: A focus group study to assess perspectives of patients with Irritable Bowel Syndrome on human milk oligosaccharides and lifestyle insights. Patricia Sanz Morales, Department of Food and Nutritional Sciences, The University of Reading

Poster #33 SFA: Microbial metabolic responsiveness varies by individual and may be optimized by testing prebiotic combinations. Alexander W. Thorman, University of Cincinnati

Poster #34 SFA: Solutions to Enhance Health with Alternative Treatments (SEHAT): a double-blinded randomized controlled trial for gut microbiota-targeted treatment of severe acute malnutrition using rice bran in ready-to-use therapeutic foods in Indonesia. Annika M. Weber, Department of Food Science and Human Nutrition, Colorado State University

Poster #35 IAC: The Effect of Arabinoxylan Polyphenol Content on Short Chain Fatty Acid Production, Gas Production & Microbial Composition: Ex-vivo SIFR® technology. Hannah Ackermann, COMET

Poster #36 IAC: The efficacy of prebiotic inulin-type fructans at improving mood in the context of gut-brain axis: results from two randomized human trials. Yoghatama Cindya Zanzer, BENEO Institute

Poster #37 IAC: Shaping the infant gut: The influence of HMO-enriched infant formulae. Jonathan Lane, Health and Happiness Group

Poster #38: A randomized controlled intervention trial in healthy women demonstrates the beneficial impact of low dosages of prebiotic galacto-oligosaccharides on gut microbiota composition. Dianne Delsing, FrieslandCampina Innovation

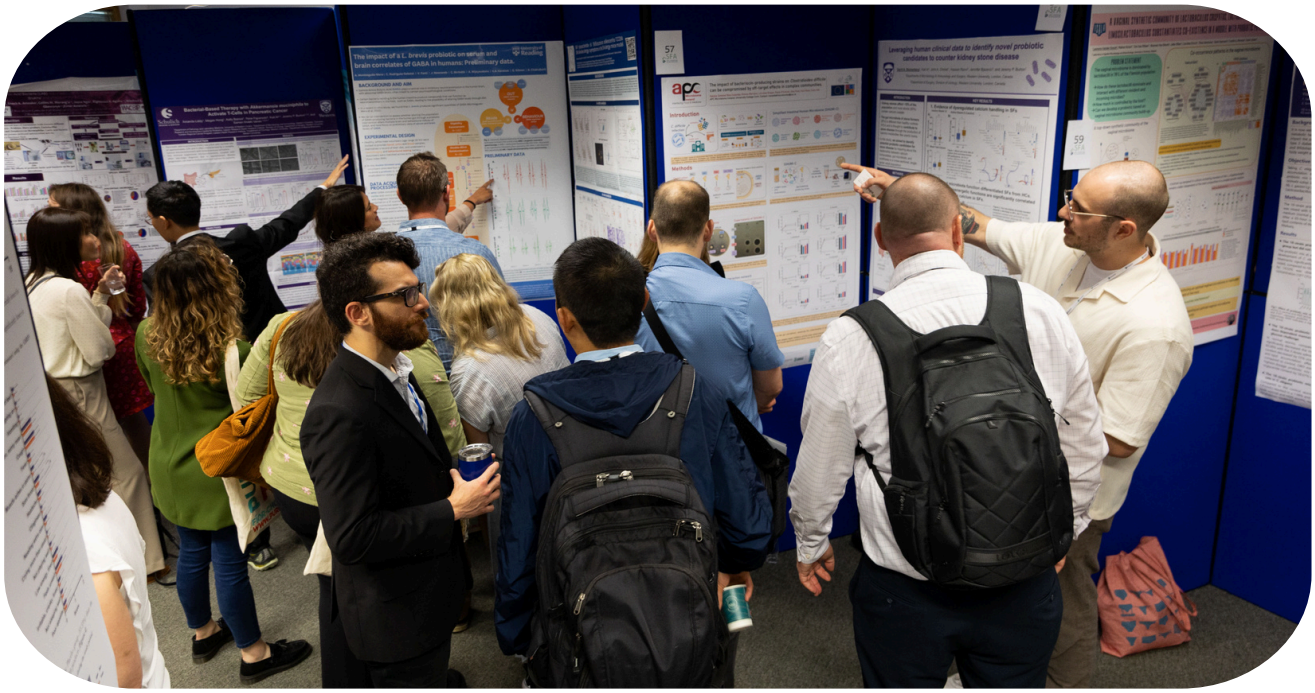
Poster #39 IAC: Microbiota modulatory effect of inulin-type fructans – current scientific data. Jessica Van Harsselaar, BENEO-Institute

Poster #40 IAC: Non-invasive continuous gut microbial fermentation measurement of inulin and resistant starch fibers for metabolic health. Veerle Dam, Sensus (Royal Cosun)

Poster #41: Effect of quinoa processing on human gut microbiome through in vitro fermentation approach. Franck Carbonero, Elson S. Floyd College of Medicine, Washington State University

Poster #42: Cradle to Cravings: Priming Healthy Eating behaviour from early life to adulthood in mice using microbiota-targeted interventions. Cristina Cuesta-Marti, University College Cork and APC Microbiome Ireland

Poster #43: Characterization of *Langra* mango peel powder and assessment of its prebiotic and antioxidant potential. Chhaya Goyal, Banaras Hindu University



Poster session

Poster #44: Fucoidan from *Ascophyllum nodosum* and *Undaria pinnatifida* attenuate SARS-CoV-2 infection *in vitro* and *in vivo* by suppressing ACE2 and alleviating inflammation. Xiao-Qiong Li, Zhejiang Academy of Agricultural Sciences

Poster #45: Ecological determinants of individualized effects of dietary fiber on the human gut microbiome. Daria Nikolaeva, APC Microbiome Ireland and University College Cork

Poster #46: Sensory evaluation of high-fiber reformulated cereal-based foods aimed to restore gut microbiome functionality. Sarah Kate Walsh, University College Cork, and APC Microbiome Ireland,

Poster #47: Methods for screening of fibre-based dietary prebiotics and in vitro testing of their metabolites across gut-brain-axis targets. Luiza A. Wasiewska, APC Microbiome Ireland, University College Cork

Poster #48: Harnessing Xylanase Producing Bacillus altitudinis XYL17 Isolated from High-Altitude Regions of Sikkim Himalaya for Sustainable Xylooligosaccharides Production for potential Prebiotic Applications. Loreni Chiring Phukon, Gauhati University, National Agri-food Biotechnology Institute (NABI)

SECTION 4: Probiotic, Postbiotic and Microbial Interventions

Poster #49 and #50: not presented

Poster #51 SFA: Probiotic lactic acid bacteria associated with fermented millet based milk beverage (Brukina) and effects on the gut microbiome.
Bless Hodasi, University of Ghana

Poster #52 SFA: Modified bacteria producing human hormone as a novel potential therapeutic strategy for MASLD in mice. Valeria Iannone, University of Eastern Finland

Poster #53 SFA: Bacterial-Based Therapy with Akkermansia muciniphila to Modulate Tumor and Gut Microbiome and Activate T-Cells in Pancreatic Cancer. Amanda Liddy, University of Western Ontario

Poster #54 SFA: Modified Escherichia coli Nissle expressing IGF1 and FGF19 reduce liver fat accumulation and restore microbial equilibrium in a metabolic dysfunction-associated steatotic liver disease mice model. Johnson Lok, University of Eastern Finland

Poster #55 SFA: The impact of a L. brevis probiotic on brain and behavioural correlates of GABA in humans: A trial protocol. Andrea Monteagudo, University of Reading

Poster #56 SFA: Complex studies of Bifidobacterium adolescentis CCDM 368 surface polysaccharide BAP1 confirmed its structure and its immunomodulatory properties in preventing allergic reaction. Katarzyna Pacyga-Prus, Hirszfeld Institute of Immunology and Experimental Therapy, Polish Academy of Sciences

Poster #57 SFA: Off-Target Effects can Impact the Ability of Bacteriocins to Control Clostridioides difficile in Complex Communities. Natalia S. Rios Colombo, APC Microbiome, University College Cork

Poster #58 SFA: Leveraging human clinical data to identify novel probiotic candidates to counter kidney stone disease. Gerrit A. Stuivenberg, Western University

Poster #59 SFA: A vaginal synthetic community of Lactobacillus crispatus, Lactobacillus jensensii and Limosilactobacillus substantiates co-existence in a module with probiotic potential. Leonore Vander Donck, University of Antwerp

Poster #60 IAC: A 10-strain probiotic mix decreases lipid accumulation by regulating fatty acid metabolism and food intake in *Caenorhabditis elegans,* Denis Guyonnet, Sanofi

Poster #61 IAC: Efficacy of a yeast postbiotic on cold/flu symptoms in healthy children: a randomized-controlled trial. Justin B. Green, Cargill Inc.

Poster #62 IAC: Beyond bacteria: Impact of yeast probiotic Saccharomyces cerevisiae on intestinal health of dogs. Legendre H, Phileo by Lesaffre

Poster #63 IAC: BG-L47: A B. longum subsp. longum with a broad probiotic toolbox. Ludwig Ermann Lundberg, Swedish University of Agricultural Sciences, BioGaia

Poster #64 IAC: Effects of the probiotics Lactiplantibacillus plantarum KABP011, KABP012 and KABP013 on serum bile acids and metabolic profile in healthy overweight subjects. Rodriguez-Palmero M, AB-BIOTICS SA

Poster #65 IAC: Acute physiological effects following *Bacillus subtilis* DE111® oral ingestion – a randomized, double blinded, placebo-controlled study in ileostomy participants. K. Rea, Deerland Ireland R&D Ltd./ ADM

Poster #66 IAC: In vitro and in silico assessment of probiotic and functional properties of Bacillus subtilis DE111®. K. Rea, Deerland Ireland R&D Ltd./ ADM

Poster #67 IAC: Immunomodulatory and Antioxidant Properties of a Novel Potential Probiotic *Bacillus clausii* CSI08. John Deaton, ADM Deerland Probiotics & Enzymes

Poster #68 IAC: *Bacillus megaterium* Renuspore® as a potential probiotic for gut health and detoxification of unwanted dietary contaminants. J. Deaton, Deerland Probiotics and Enzymes, ADM

Poster #69 IAC: Development of a multispecies probiotic formulation for use in recurrent urinary tract infections. Maria Stolaki, Winclove Probiotics B.V.

Poster #70: Comparative genomics of *Bifidobacterium dentium* reveals host adaptation and 2'/3-FL utilisation cluster in this species. Ortensia Catalano Gonzaga, APC Microbiome Ireland and School of Microbiology, University College Cork, Munster Technological University

Poster #71: Antibiotic susceptibility profiles of lactobacilli isolated from artisanal Minas cheese. Bianca de Oliveira Hosken, Teagasc Food Research Centre

Poster #72: *In situ* phytate degradation by *Bifidobacterium* spp. as a novel approach to tackle micronutrients deficiencies in early life. Di Stefano, E., APC Microbiome Ireland, University College Cork

Poster #73 and #74: not presented

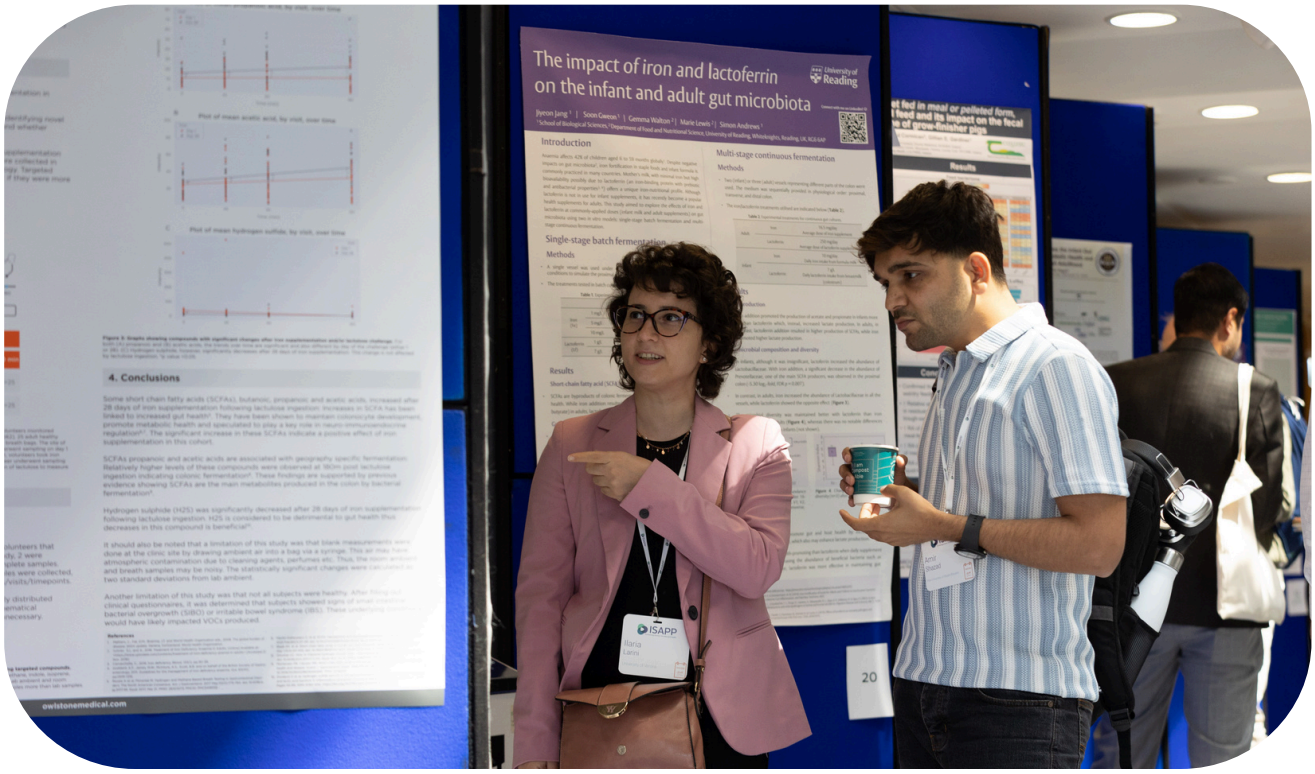
Poster #75: Bridging the Gut-Brain Axis: Evaluating the Psychobiotic Potential of Yeasts through a Multifaceted Approach. Amir Shazad, Libera Università di Bolzano

Poster #76: Early exposure of probiotics and gut microbiome in the TEDDY Study. Ulla Uusitalo, University of South Florida

Poster #77: Exploring the probiotic impact of orally administered lactic acid bacteria on the upper respiratory tract of children with otitis media. Joke Van Malderen, University of Antwerp

Poster #78: Comparing the effects of probiotic Bacillus subtilis DE111 administration alone to combined bacteriophage and probiotic administration on metabolic markers and gut microbiota. Williams N, Lee S, Colorado State University

Poster #79: Breast-milk derived *Bifidobacterium longum* subsp. *infantis* CCFM1269 regulates intestinal Th1/Th2 immune balance in early life. Bo Yang, Jiangnan University



Poster session

STUDENTS & FELLOWS ASSOCIATION

The ISAPP Students and Fellows Association (SFA) aims to establish an interactive global network of graduate students and postdoctoral fellows focused on probiotics, prebiotics, and related fields. This year, 29 participants were selected through a competitive abstract process to join the program. The innovation workshops, co-organized by the SFA and the Industry Advisory Committee, provided participants with enhanced opportunities for interaction with industry members and a platform to discuss the latest developments in the field. All SFA attendees presented their work within the poster session, and selected attendees gave oral presentations based on their research to both the SFA audience and on the main stage. Additionally, invited speakers provided career talks and participants received a tour of the fermentation facilities on the university campus. Attendees, hailing from 10 different countries and bringing diverse research backgrounds, contributed to a dynamic and informative meeting. The SFA conference summary, poster abstracts, and competition results can be found here: http://www.isapp-sfa.com/2024-meeting.

ISAPP 2024 Students and Fellows Association members

2024 ANNUAL MEETING PROGRAM

All program events will be held on campus at University College Cork in the Western Gateway Building (WGB) in the main auditorium (WGBG05) unless otherwise noted below. *Room numbers* are indicated in the left panel.
Abbreviations: IAC=Industry Advisory Committee (representatives of member companies); SFA=Students and Fellows Association

TUESDAY JULY 9

Closed meeting for invited guests and industry members

07:30 - 13:00	Registration desk open
Pre-meeting program **08:30 - 11:30:**	**Open only to IAC, SFA and Board of Directors**
08:30 - 09:15	IAC and Board of Directors meeting
09:15 - 10:45	IAC/SFA Innovation workshops (separate sign-up required). **1: Innovation in the gut-brain axis and potential role of biotics**
WGBG02	Mariya Petrova, Winclove Probiotics
	2: Best practice in designing studies with biotics
WGBG15	Shalome Bassett, Fonterra
	3: Novel techniques in biotic research
WGBG04	Cathy Lordan, Teagasc and APC Microbiome Ireland
	4: Innovation outside the gut (and environmental applications) for biotics
WGBG18	Brendan Daisley, University of Guelph
10:45 - 11:30 *Atrium* *Cafe*	Networking break Board & SFA IAC
11:30 - 12:30	Industry forum. **From lab to market: Scientific requirements for new biotic substances in the changing regulatory landscape** Bruno Pot, Yakult Europe BV, Vrije Universiteit Brussels, Belgium Diane Hoffmann, University of Maryland, USA Sarah Lebeer, University of Antwerp, Belgium Alison Winger, Novonesis, Ireland
12:30 - 13:15	Lunch break

2024 ANNUAL MEETING PROGRAM

13:15 - 17:30	**Discussion groups** (concurrent sessions) Open only to invited experts and IAC.
WGBG02	**1: Characterization and quantification of postbiotics** Gabriel Vinderola, National University of Litoral, Argentina and Seppo Salminen, University of Turku, Finland
WGBG04	**2: How can we establish causal mediation in microbiome intervention studies?** Daniel Tancredi, University of California, Davis, USA and Kristin Verbeke, Katholieke Universiteit Leuven, Belgium
WGBG16	**3: The microbiome and neurodegenerative and neurodevelopmental disorders** Eamonn Quigley, The Methodist Hospital and Weill Cornell School of Medicine, USA and Hania Szajewska, The Medical University of Warsaw, Poland
WGBG15	**4: Evidence for candidate prebiotics, including polyphenols, resistant starch, and animal-derived substances** Karen Scott, University of Aberdeen, UK and Kelly Swanson, University of Illinois at Urbana-Champaign, USA
WGBG18	**5: How does digestion affect prebiotic and probiotic function?** Anisha Wijeyesekera, University of Reading, UK and Maria Marco, University of California, Davis, USA
WGBG17	**6: Next-generation probiotics by implementation of genetic engineering and other tools** Sarah Lebeer, University of Antwerp, Belgium and Colin Hill, University College Cork, Ireland
17:30 - 20:00 *Aula Maxima*	**Welcome reception.** *Aula Maxima, University College Cork* In association with **APC Microbiome Ireland**. Includes **Welcome to University College Cork** from Paul Ross, APC Microbiome Ireland, **18:15 - 18:30.** Social event with light refreshments. Open registration delegates are welcome to attend.

WEDNESDAY JULY 10

Open registration meeting

07:30 - 08:30	Registration desk open
08:30 - 08:35	**Welcome**
08:35 - 09:05	**Health-associations in soil-based intervention trials – a probiotic and postbiotic perspective** Aki Sinkkonen, University of Helsinki, Finland
09:05 - 09:35	**Microbiota-human mucin interactions: Identification of key enzymes to prevent mucus barrier dysfunction.** Ana Luis, University of Gothenburg, Sweden

2024 ANNUAL MEETING PROGRAM

09:35 - 09:55	**The Sanders Award for Advancing Biotic Science 2024 Lecture: Yogurito: Challenges and achievements of a probiotic social assistance program** Maria Pía Taranto, National Scientific and Technical Research Council (CERELA-CONICET), Argentina
09:55 - 10:25	Break
10:25 - 10:55	**Mother-baby transmission of bifidobacterial strains: insights and prospects,** Douwe van Sinderen, University College Cork, Ireland
10:55 - 12:25	**Special Session: Probiotics and premature infants - Perspectives and paths forward** Geoffrey Preidis, Baylor College of Medicine and Texas Children's Hospital, USA Mark Underwood, Providence Sacred Heart Medical Center and Children's Hospital, USA Hania Szajewska, The Medical University of Warsaw, Poland Janet Berrington, Newcastle Upon Tyne Hospitals NHS Foundation Trust, UK Marie Spruce, NEC UK Charity, UK Diane Hoffmann, University of Maryland, USA Greg Leyer, Biotic Solutions Consulting, USA
12:25 - 13:25	Lunch break
13:25 - 14:50 *Atrium, WGBG14*	Poster viewing and SFA poster judging. Authors will be present for all posters.
14:50 - 15:20	**Developing models for the human small intestinal microbiota** KC Huang, Stanford University, California, USA
15:20 - 15:50	**The environmental implications of biotic use in agricultural animals** Steven Ricke, University of Wisconsin-Madison, USA
15:50 - 16:10	**The Glenn Gibson Early Career Researcher Award 2024 Lecture: Eat your (fiber-rich, fermentable) veg? A translational take on short-chain fatty acids as microbiota-gut-brain axis mediators in humans** Boushra Dalile, Katholieke Universiteit Leuven, Belgium
16:10 - 16:30	**The Gregor Reid Award for Outstanding Scholars in Developing Nations 2024 Lecture: Peptidome insights: Mining bioactive peptides in fermented dairy and non-dairy products in the Indian Himalayan Region** Rounak Chourasia, National Agri-food Biotechnology Institute, India
16:30 - 17:30	**Late Breaking News** Gregor Reid, University of Western Ontario, Canada
17:30 - 18:30	Break
18:30 - 22:00 *Cork City Gaol*	**Gala social event,** *Cork City Gaol, Convent Avenue, Sunday's Well, Cork City* Tickets available for purchase for open registration delegates.

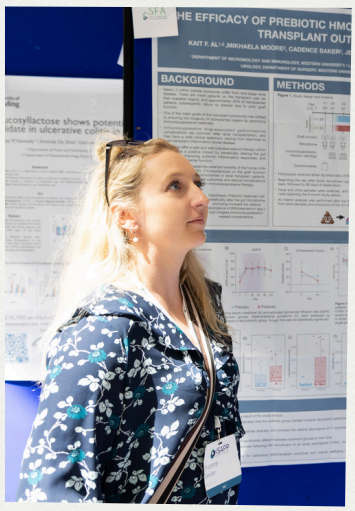
2024 ANNUAL MEETING PROGRAM

THURSDAY JULY 11

Open registration meeting

09:00 - 09:15	**IAC highlight: Human gut-associated Bifidobacterium species salvage exogenous indole, a uremic toxin precursor, to synthesize indole-3-lactic acid via tryptophan** Toshitaka Odamaki, Morinaga Milk Industry Co Ltd, Japan
09:15 - 09:30	**IAC highlight: An intestinal screening platform versus a clinical crossover intervention study: comparative evaluation with a dietary fiber mixture** Frank Schuren, Netherlands Organization for Applied Scientific research (TNO), the Netherlands
09:30 - 09:45	**SFA highlight: A multi-faceted exploration of lactobacillaceae-derived vitamin B2 in the vagina** Caroline Dricot, University of Antwerp, Belgium
09:45 - 10:00	**SFA highlight: Impact of probiotic yoghurt on gut microbiome dynamics: insights from in-vitro fermentation and metabolic profiling** Choshani Dalukdeniya Arachchilage, Sabaragamuwa University of Sri Lanka
10:00 - 10:05	**Announcement of poster award winners**
10:05 - 10:35	**Lactic acid bacteria and the gut-skin axis - a paradigm with therapeutic implications** Catherine O'Neill, University of Manchester, UK
10:35 - 11:00	Break
11:00 - 11:30	**Microbiome-gut-brain axis in health and disease - parsing causality** John Cryan, University College Cork, Ireland
11:30 - 13:00	**Summary reports from Discussion groups** SFA: **Students and Fellows Association report**. Cathy Lordan, Teagasc, Ireland DG1: **Characterization and quantification of postbiotics** DG2: **How can we establish causal mediation in microbiome intervention studies?** DG3: **The microbiome and neurodegenerative and neurodevelopmental disorders** DG4: **Evidence for candidate prebiotics, including polyphenols, resistant starch, and animal-derived substances** DG5: **How does digestion affect prebiotic and probiotic function?** DG6: **Next-generation probiotics by implementation of genetic engineering and other tools**
13:00	**Close**

Thank you to the 60 member companies for their support of ISAPP in 2024.



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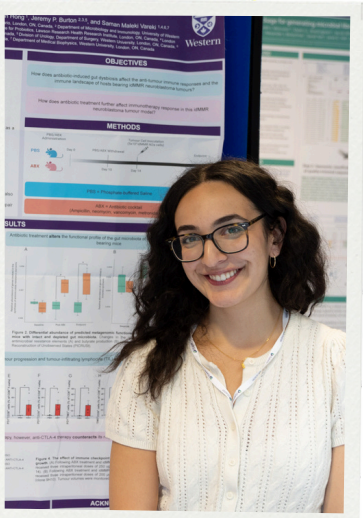












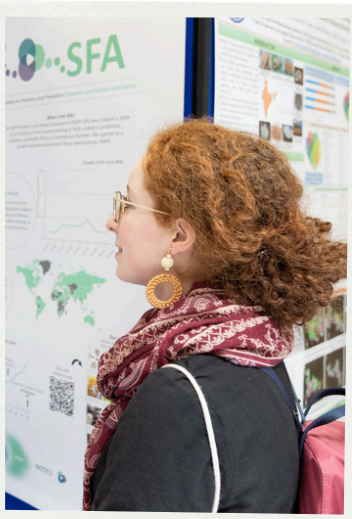




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