



# ISAPP

International Scientific Association  
for **PROBIOTICS** and **PREBIOTICS**

## **2021 Meeting Report**

**June 1-3<sup>rd</sup> 2021**

**Virtual Meeting**

[www.ISAPPscience.org](http://www.ISAPPscience.org)

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## Executive Summary

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Lingering inability to travel due to COVID-19 restrictions compelled ISAPP to hold its 2021 annual meeting virtually. Despite disappointment that we could not meet in person, our 2021 virtual annual meeting, held June 1-3, 2021, was a success! The event was split into members-only and open registration tracks, and had over 700 registrants, with 350 people joining live and many others viewing the recorded talks. Now that the event platform has closed, selected talks are available to view on the [ISAPP website](#)<sup>1</sup>.

Nine invited academic speakers and two industry speakers, as well as four students shared cutting-edge science in the meeting's plenary sessions and innovation talks. A highlight of the event was a panel with the title "Ask us anything, we dare you" featuring questions and career stories from longtime ISAPP scientists and board members. The meeting also featured two opportunities for virtual networking.

ISAPP came out of the meeting with both a new President, Prof. Daniel Merenstein, MD, as well as a new look! At the meeting we were pleased to unveil ISAPP's new logo, signaling that we are looking ahead to ISAPP's 20<sup>th</sup> anniversary and the organization's continued leadership in the scientific fields of probiotics, prebiotics and related substances. Outgoing president, Prof. Seppo Salminen, led ISAPP assiduously during the planning and execution of this meeting. Prof. Glenn Gibson retired from the board and we welcomed new board member, Dr. Anisha Wijeyesekera.

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<sup>1</sup> ISAPP member companies can email [info@isappscience.org](mailto:info@isappscience.org) for the password to view this content.

## The ISAPP Board of Directors

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The board members and roles, as of the close of the 2021 annual meeting, are:

- Prof. Daniel Merenstein MD, President
- Prof. Maria Marco PhD, Vice-President
- Prof. Seppo Salminen PhD, Past-President
- Dr. Gabriel Vinderola PhD, Secretary
- Prof. Daniel Tancredi PhD, Treasurer
- Prof. Robert Hutkins PhD, Member-at-Large
- Dr. Karen Scott PhD, Member-at-Large
- Prof. Eamonn Quigley MD, Member-at-Large
- Prof. Colin Hill PhD, Member-at-Large
- Prof. Sarah Lebeer PhD, Member-at-Large
- Prof. Hania Szajewska MD, Member-at-Large
- Prof. Kelly Swanson PhD, Member-at-Large
- Dr. Anisha Wijeyesekera PhD, Member-at-Large
- Dr. Mary Ellen Sanders PhD, Executive Science Officer

## Virtual Meeting Program Overview

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Given the changing circumstances surrounding COVID-19, the 2021 annual meeting was specifically designed as a virtual event. (This is in contrast with the 2020 meeting, which was originally designed as an in-person event and rapidly converted to a virtual event.) To accommodate both North American and European participants, the event was split over three consecutive days, June 1 to 3, 2021, and ran from 10:00 am to 1:00 pm Eastern Time each day. This totaled nine hours of opportunities for virtual learning and interaction.

In response to feedback last year from the ISAPP community, part of the virtual meeting program was open to all. The remainder of the program was open to ISAPP members only, to provide added value for membership and allow more direct interactions with board members and speakers. Given the virtual format, ISAPP removed the limit on the number of individuals per member company who could attend.

The meeting was held on a virtual platform (Chime Live). Overall, the meeting had over 700 registrants, with 350 people joining live and many others viewing the recorded talks afterward on the ISAPP website. Over 100 participated in the virtual networking sessions, and almost 290 subscribers were added to the ISAPP newsletter mailing list throughout the course of the event.

The event featured nine talks by academic speakers, invited by the ISAPP board for their innovative approaches and scientific findings. One cluster of talks focused on **the microbiota-gut-brain axis**, and another on **probiotics, COVID-19 and vaccines**. The program committee also invited industry members and Students and Fellows Association members to submit abstracts in advance of the event; from these, two industry speakers and four students were selected to participate in the program by giving short talks. Other sessions featured updates on ISAPP activities, short talks on postbiotics with a subsequent discussion, and a panel called “Ask us anything, we dare you” featuring questions and career stories from longtime ISAPP scientists and board members. Two opportunities for

virtual networking were provided: one for all participants and another for members and invited guests only. The networking sessions were loosely structured and were hosted by ISAPP board members.

ISAPP unveiled a new logo at the virtual meeting! The new look reflects the organization's growth and evolution as ISAPP nears the 20<sup>th</sup> anniversary of its existence. Read more about the logo [here](#).

## Session Highlights

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The opening session focused on probiotics and prebiotics for the brain. **Harriët Schellekens of University College Cork, Ireland**, talked about mechanisms for targeting the microbiota-gut-brain axis, summarizing rodent studies showing prebiotics may have brain health / cognitive benefits and reduce the impact of stress via the immune system. Further, the prebiotic inulin may improve mood in a subset of those with obesity who have a specific gut microbial signature. Schellekens emphasized the close link between metabolic and mental health, demonstrated by these mechanisms.

**Ali Keshavarzian of Rush University Medical Center, USA**, spoke about Parkinson's disease (PD). According to the latest research, gut microbiota appears to be either a trigger or a marker of progression for Parkinson's Disease, and gut-microbiota-targeted strategies are promising for preventing or treating the condition. An emerging line of evidence shows (in mouse models) that butyrate-stimulating prebiotics may have positive effects for those with PD.

Another key session focused on probiotics, COVID-19 and vaccines, highlighting timely research at the intersection of these three areas. **Paul Wischmeyer of Duke University, USA**, described the utility of probiotics for patients in the intensive care unit, and talked about the ongoing Protect-EHC trial, looking at probiotics to prevent the spread of COVID-19 among household contacts of COVID-19 cases. **Gregg Dean of Colorado State University, USA**, then turned to the issue of COVID-19 vaccine development and the use of novel genetically engineered probiotic vaccines. He has focused on the strain *L. acidophilus* NCFM, building on the work of the late Todd Klaenhammer. A fascinating presentation by **Irina Spacova and Ilke De Boek of University of Antwerp, Belgium**, focused on using topical lactobacilli against COVID-19 and other respiratory viruses.

**Kieran Tuohy of Fondazione Edmund Mach – Istituto Agrario San Michele All'Adige, Italy**, highlighted the need for convincing cause and effect studies in humans with regard to

prebiotics – both established ones such as FOS and GOS, and especially emerging prebiotics. He showed that in order to design RCTs that capture appropriate health effects, scientists should know the specific mechanism of action for a prebiotic. An understanding of microbial prebiotic metabolism is also helpful for explaining observations at the microbial community level. Tuohy's talk was followed by a panel on postbiotics, covering the scientific challenges in bringing postbiotic supplements to the marketplace.



## Students & Fellows Association

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Members of the ISAPP Students & Fellows Association (SFA) were active participants in the virtual meeting. Approximately 90 students and fellows (both SFA members and non-members) participated overall.

Members of the SFA executive introduced the SFA speakers chosen from submitted abstracts and moderated a brief Q&A after each talk. They also directed conference attendees toward the short ‘poster’ presentations posted on the ISAPP website and available to view.

According to feedback from several SFA members, the “Ask Us Anything, we dare you” session at the virtual meeting was particularly enjoyable and enlightening.

## Appendix A: 2021 ISAPP Meeting Program

Day 1: June 1, 2021

### ISAPP Welcome EDT



**Seppo Salminen**  
ISAPP President,  
University of Turku, Finland

10:00-10:15

### Plenary Session: Probiotics and prebiotics for the brain EDT



**Harriët Schellekens**  
University College  
Cork, Ireland

10:15-10:45

#### Targeting the microbiota-gut-brain axis: Towards evidence based approaches for metabolic and mental health

The gut harbors an enormous diversity of microbes essential for the maintenance of homeostasis in health and disease. The importance of the microbiota has been shown in metabolic disorders, including obesity, as well as in affective disorders, such as anxiety and depression, which are often associated with changes in food preference and intake. However, the mechanisms by which this comes about have yet to be elucidated. Understanding the mechanisms by which the gut microbiota influences host appetite, metabolism and mood, will provide a better understanding of conditions wherein appetite is dysregulated, leading to novel microbiota-targeting strategies. In this talk, I will look at the latest research into how the microbiota-gut-brain axis may be implicated in metabolic and mental wellness, exploring preclinical and clinical evidence for prebiotic and probiotic impact on gut-brain axis function.



**Ali Keshavarzian**  
Rush University Medical  
Center, Chicago, USA

10:45-11:15

#### Prebiotics and degenerative neurological disease

Parkinson's disease (PD) is a progressive neurodegenerative disease that affects 1% of the population over 60 years. Treatments for PD are focused on managing symptoms by correcting dopamine (DA) loss, but these treatments do not impact the underlying cellular degeneration. There is an unmet need for PD-modifying interventions to halt clinical progression. Recent studies provide evidence that an abnormal intestinal microbiota (dysbiosis) may promote PD pathogenesis. We hypothesize that intestinal microbiota are pathologically altered in PD with neuro-inflammatory, toxic consequences that contribute to PD pathogenesis but can be mitigated by therapies, like prebiotics, directed at beneficially modifying the microbiota. This hypothesis is based on: (a) PD patients have dysbiotic microbiota that is characterized by a high relative abundance of LPS-containing bacteria and reduced abundance of short chain fatty acids (SCFA) producing bacteria with concurrent low levels of SCFA in the stool, (b) Stool from PD patients transplanted into a mouse model of PD ( $\alpha$ -synuclein ( $\alpha$ -syn) overexpressing (ASO)) promotes PD-like pathology and behavior, (c) Our pilot study showed that SCFA promoting prebiotics beneficially modified microbiota in PD patients and improved PD-like behavior and pathology in ASO mice. In this talk, we present data to show that: (1) intestinal microbiota is disrupted in PD patients and PD model, (2) dysbiotic microbiota is a potential trigger/enabler for neuroinflammation and DA loss, (3) SCFA promoting prebiotic can modify dysbiotic microbiota in PD patients and mitigate PD like pathology and behavior in mouse model of PD- a potential paradigm shift in PD therapeutics.



**Rita Ferreira**  
University of Groningen,  
The Netherlands

11:15-11:30

#### ISAPP Students and Fellows Association selected talk: *Blautia* spp. Attenuates Gastrointestinal Toxicity Induced by 5-Fluorouracil Treatment

Gastrointestinal mucositis remains a significant complication of cancer treatment. To date, the gut microbiota has received significant attention for its ability to influence the development of mucositis. We have shown that the abundance of the commensal microbe, *Blautia*, before chemotherapy predicts an individual's risk of development mucositis. We therefore aimed to understand the mechanism(s) responsible for this observation evaluating the proliferative and immunomodulatory properties of *Blautia* spp. *Blautia* spp. isolated from a fresh stool of a healthy individual were cultured anaerobically and supernatant (SPN) subsequently isolated via centrifugation. T84 cells were treated with 5-fluorouracil (5-FU) chemotherapy  $\pm$  SPN (10, 20, 50%) and proliferation and barrier integrity assessed using the xCelligence system and an electric voltometer. T84 cells were stimulated with LPS and IFN- $\gamma$  and treated prophylactically or therapeutically with SPN. Co-culture of T84 cells with 10 and 20% *Blautia* SPN significantly stimulated epithelial proliferation and promoted barrier integrity compared to controls, both under physiological conditions as well as pre- and post-5-FU treatment. Pre-treatment with the SPN (10%) entirely prevented 5-FU induced cell death. Prophylactic treatment with *Blautia* SPN significantly reduced inflammation in LPS and IFN- $\gamma$  stimulated macrophages, as observed by reduced nitrite production. Enhancing *Blautia* before and after cytotoxic chemotherapy may be important in protecting against gastrointestinal toxicity by 1) strengthening the mucosa against cytotoxic injury, 2) restoration of the intestinal barrier and 3) reducing gut inflammation.

Break

11:30-11:45

## ISAPP Member Session

EDT



**Seppo Salminen**  
ISAPP President,  
University of Turku,  
Finland



**Marla Cunningham**  
ISAPP IAC  
Representative



**Mary Ellen Sanders**  
ISAPP Executive  
Science Officer 11:45-12:30

### ISAPP activities and industry collaboration, Q&A

ISAPP is a dynamic organization that supports various global efforts to advance the science of probiotics, prebiotics, synbiotics, postbiotics and fermented foods. This session will provide ISAPP industry members with an update on ISAPP's activities throughout the past year and will highlight opportunities to get involved. ISAPP President Seppo Salminen will welcome new members and discuss some updates to ISAPP's board of directors and committees. Executive Science Officer Mary Ellen Sanders will cover ISAPP's accomplishments and ongoing activities. Industry Advisory Representative Marla Cunningham will share the take-home points from ISAPP industry member interviews during the past year and will list specific ways to collaborate and contribute to the efforts of the ISAPP community. A Q&A session will follow, so please come with your questions about ISAPP and its activities!



**Kristina Campbell**  
Communications  
Director



**Dragana Skokovic-Sunjic**  
BScPhm, RPh, NCMP, Clinical  
Pharmacist and Author of Clinical Guide  
to Probiotic Products, Canada and US

12:30-13:00

### Overview of ISAPP's initiative to engage with pharmacists

Building on the momentum of last year's virtual discussion groups on communicating probiotic and prebiotic science, ISAPP has formed a Communications Strategy Committee, which is responsible for overseeing ISAPP's communication and engagement efforts with various stakeholder groups and for developing a focused, long-term communication strategy. Kristina Campbell, ISAPP's consulting communications director, will describe the work of the committee over the past year and explain how, in the coming years, the group aims to focus on communicating with a sub-group of healthcare professionals: pharmacists. Then, Dragana Skokovic-Sunjic, a clinical pharmacist, will join to explain what kinds of consumers seek information from pharmacists about probiotics and other 'over the counter' products, how pharmacists can influence consumer decisions about probiotics, and how to equip pharmacists to guide these consumer choices.

Day 2: June 2, 2021

## Plenary Session: Probiotics, COVID and vaccines

EDT



**Paul Wischmeyer**  
Duke University, USA

10:00-10:30

### Probiotic COVID trials

Randomized clinical trials of probiotics have shown that prophylaxis with probiotic organisms may reduce lower respiratory tract infections, sepsis, and pneumonia by 30-50%. These benefits appear to be mediated by immune system modulation as our and other studies show probiotics can upregulate antiviral factors, increase clearance of infections from respiratory epithelium, increase regulatory T cells and decrease pro-inflammatory cytokines to attenuate inflammatory responses and disease severity. These clinical and immunomodulatory benefits are relevant to individuals who have or are at risk of developing COVID-19. Clinical trials of probiotics to prevent or treat COVID-19 are ongoing to address probiotics as a safe, inexpensive, and commercially available for mass-distribution, ideal agent in COVID-19, other current infectious pathogens, and future pandemic diseases.



**Gregg Dean**  
Colorado State  
University, USA

10:30-11:00

### Use of genetically engineered probiotic vaccines to prevent COVID

The urgent need for an efficacious vaccine against SARS-CoV-2 has accelerated investigation of a broad array of vaccine platforms, antigens, and routes of delivery. First generation vaccines are unlikely to sufficiently address the needs of all or even most populations of people around the globe. Second and third generation of vaccines will be necessary as correlates of protection are determined, safety risks are assessed, and manufacturing and distribution bottlenecks are fully recognized. Because the viral spike protein (S) is responsible for binding the host cell receptor, it has been targeted as the key immunogen. However, other viral antigens should also be considered particularly as part of a pan-coronavirus vaccine to prevent the emergence and spread of novel coronaviruses in the future. Since coronaviruses are transmitted at mucosal surfaces, immunization via a mucosal route might enhance a robust immune response that can provide protection. On this premise, we have constructed mucosal vaccines against SARS-CoV-2 based on the commensal organism *Lactobacillus acidophilus* as a vaccine platform. Importantly, a *L. acidophilus* vaccine can be inexpensively manufactured and rapidly deployed to low income regions because cold-chain and trained medical personnel are not required for distribution and administration. Strategies for antigen and adjuvant expression and the impact of oral vaccination on the host intestinal microbiome will be discussed.

## Plenary Session: Probiotics, COVID and vaccines

EDT



**Irina Spacova**  
University of  
Antwerp, Belgium



**Ilke De Boek**  
University of Antwerp,  
Belgium

11:00-11:15

### ISAPP Students and Fellows Association selected talk: Topical lactobacilli against respiratory viruses and their clinical application in COVID-19

Viruses such as SARS-CoV-2 initiate infection at the upper respiratory tract mucosa, where the resident microbiota plays a gatekeeper function. Beneficial bacteria applied directly to the airways represent a promising strategy against respiratory viral diseases. Here, we report on the mechanisms and selection of lactobacilli with antiviral action, as well as the formulation and efficacy of a broad-acting antiviral probiotic throat spray in COVID-19 outpatients. Specific lactobacilli isolated from humans induced nuclear factor- $\kappa$ B and interferon regulatory factors involved in host antiviral defenses, and reduced cytotoxicity of respiratory viruses in vitro. Intranasal prophylaxis with Lactocaseibacillus strains conferred protection against cellular airway inflammation resulting from infection with the model respiratory syncytial virus (RSV) in mice. Subsequently, in a randomized, double-blind, placebo-controlled pilot trial (ClinicalTrials.gov NCT04793997), a throat spray with beneficial lactobacilli was administered for 2 weeks in 78 patients with PCR-confirmed SARS-CoV-2 infection. Combined nose-throat swabs were remotely self-sampled to evaluate the microbiome composition and viral loads, blood samples were self-collected for antibody measurements, and online questionnaires were used to evaluate disease progression. No side effects were reported, and symptom and molecular analysis is underway. Optimization of the innovative spray formulation is ongoing to improve the taste and therapy compliance. This study demonstrated the possibility of selecting and formulating topical lactobacilli with antiviral and anti-inflammatory activity. Furthermore, remote clinical studies in outpatients are feasible and form a useful framework to evaluate probiotic and related therapies based on online symptom scoring and self-sampling for microbiome and basic immune analyses.

Break

11:15-11:30

## Panel with Longtime ISAPP Scientists

EDT



**Moderator: Maria Marco**

11:30-12:30



**Glenn Gibson**



**Bob Hutkins**



**Gregor Reid**



**Irene Lenoir-  
Wijnkoop**



**Mary Ellen Sanders**

### Ask us anything, we dare you

This is a fun science session where long established ISAPP Board Members will take questions. You can ask them about probiotics, the microbiome, prebiotics, guts, urogenital microbiota, ISAPP itself, or anything related. Actually, you can also ask them about anything unrelated as well, just to check they have a life outside of research. The more challenging the better, so make it more thought provoking than 'favourite colour' or 'kids' names'. This will be a spontaneous session with no pre-scripted clues for panelists. Please join in and put them on the spot.

## Networking

EDT

Video networking with participants, speakers and board members

12:30-13:00

Day 3: June 3, 2021

Plenary Session: Advances in probiotic and prebiotic development

EDT



**Kieran Tuohy**  
Fondazione Edmund Mach –  
Istituto Agrario San Michele  
All'Adige, Italy

10:00-10:30

**Lactulose, AXOS, Aleurone and Apples – prebiotics are prebiotics, apples are apples**

Currently, a prebiotic is defined as "a substrate that is selectively utilized by host microorganisms conferring a health benefit" (1). Established, emerging, and novel prebiotics targeting host health therefore must be selectively utilized by the gut microbiota and provide evidence of a cause and effect relationship between prebiotic ingestion and a recognized health effect. Both are readily demonstrated for leading prebiotics like FOS and GOS, but in humans, for emerging prebiotics, inter-individual variation in gut microbiota, host genetics, background diet, health status and environmental and lifestyle factors introduce variability making it difficult to pick up subtle diet induced changes within the gut microbiota and necessitating careful design of randomized controlled trials to demonstrate health effects. Similarly, the choice of microbiota analysis tool can hinder identification of biologically significant changes in specific microbiota members due to P value attrition upon stringent statistical correction for multiple testing. This presentation will discuss, using lactulose, AXOS, aleurone and apple, issues related to measuring microbiota modulation and demonstrating cause and effect relationships between prebiotic ingestion and recognized markers of human health or disease risk. The aim is to raise discussion on issues related to validating recognized prebiotics, emerging prebiotics or even forgotten prebiotics.



**Moderator: Hania Szajewska**

10:30-11:15



**Sarah Lebeer**



**Gabriel Vinderola**



**Patrice Cani**



**Seppo Salminen**

**Postbiotics: scientific, industry, and regulatory perspectives**

The fact that non-viable microorganisms, their cell components, metabolites or fermentation products can confer some health benefits is not new for the scientific community. In 2019, the ISAPP convened a panel of experts in order to review this field, to choose an appropriate term for this category of substances and develop consensus around the definition and criteria for the term. The term 'postbiotic' was chosen and it was defined as a 'preparation of inanimate microorganisms and/or their components that confers a health benefit on the host'. Postbiotics must contain deliberately inactivated microbial cells or cell components, with or without metabolites, and a health benefit must be demonstrated. One technological aspect of interest is the inherent stability of postbiotics, due to the absence of live microbes, which provides an attractive alternative for long shelf-life products or for reaching regions where the cold-chain may be challenging. Safety is another feature of interest of postbiotics, since the lack of viability precludes the risk of infectivity. This could be an important characteristic for use in immunocompromised hosts such as preterm babies or patients undergoing medical practices that imply immunosuppression. Postbiotics share many of the multifactorial mechanisms of action already demonstrated for probiotics. This definition may contribute to regulatory clarity, promote innovation and encourage development of new postbiotic products. In the European Union, the EFSA Qualified Presumption of Safety system forms a model for safety assessment of live microbes, which includes continuous monitoring of safety issues, and which could be adapted also to postbiotics. The application of postbiotic concept may offer a safer alternative for novel microbes intended to be introduced into foods or supplements provided no viable microbes are present. Thus, the concept might lead to fewer regulatory hurdles and a faster regulatory process. The example of Akkermansia and its derived products, such as the protein Amuc\_1100, will be discussed, with emphasis on the industrial challenge for the translation of research findings into a marketable product.

IAC & SFA Innovation Talks

EDT



**Victoria Onwuliri**  
Nnamdi Azikiwe University,  
Nigeria

11:15-11:30

**ISAPP Students and Fellows Association selected talk: Can topical cream containing Lactobacilli control body odor?**

**Background/Aim:** There is paucity of data on the use of live lactobacilli to control axillary malodor, this study determined whether application of topical oil-based cream containing live Lactobacilli could decrease malodor-producing bacteria in the axilla of healthy subjects.  
**Method:** Axillary skin swabs were self-collected from 12 adult males and 13 adult females. Oil-based topical cream incorporated with lyophilized Lactobacillus pentosus KCA1 was applied at the armpit twice daily for a period of 14 days after which skin swabs were re-collected. Bacteria DNA was extracted, 16S rRNA V4 region was amplified and sequenced with an Illumina Miseq platform. Microbial taxonomy to species level was generated using Greengenes database.  
**Result:** KCA1 probiotic cream was observed to have great impact on both the male and female axillary microbiome. In females, the relative abundance of Actinobacteria and Proteobacteria decreased from 70% to 24% and 2.4% to 1.6% respectively, same was observed in males as the relative abundance of Actinobacteria decreased from 65% to 38%. On the other hand, Firmicutes increased from 26.6% to 73.9% in females and increased from 24% to 57% in males. Lactobacillus diversity increased from 26 to 39 species among females and in male subjects, the number of species increased from 28 to 44 species. A decrease in the relative abundance of some Corynebacterium species were also observed. Pyridoxal protein-dependent enzymes involved in biotransformation of malodor precursor to volatile thioalcohols were down-regulated.  
**Conclusion:** A significant decrease in the relative abundance of odor-producing Corynebacterium and Staphylococcus species in both female and male subjects and an increase in the diversity and abundance of non-odor producing Lactobacillus species by over 385% was observed.



**Ludwig Lundqvist**  
BioGaia, Swedish University  
of Agricultural Sciences

11:30-11:45

**ISAPP Industry member selected talk: Extracellular membrane vesicles of *Limosilactobacillus reuteri* DSM 17938 – Effects in host interaction models and a tentative link to relief of infantile colic**

Bacterial extracellular membrane vesicles (MV) are potent mediators of microbe-host interactions, and not only important in host-pathogen interactions but also for the interactions between mutualistic bacteria and their hosts. *Limosilactobacillus reuteri* DSM 17938 is a well-studied probiotic bacterium and have among other been proven to ameliorate infantile colic. MV from DSM 17938 have recently been shown to modulate gut motility in an ex vivo mouse model and dampen pro-inflammatory cytokine responses in stimulated PBMC. To this we can now shed more light on the multifunctionality of *L. reuteri* derived MV:

- The MV contain DNA, RNA and carry both lipoteichoic acid and a 5'-nucleotidase. This enzyme is an analogue to CD73 present on e.g. Treg cells, and catalyze the production of the potent signal molecule adenosine.
- MV display additional effects in host interaction models.
- Dampen capsaicin activation of the pain receptor TRPV1 in a model with primary dorsal root ganglion cells from rat.
- Decrease epithelial cell leakage caused by enterotoxigenic *E. coli* (ETEC) in Caco-2/HT-29 monolayers.
- Induce upregulation of IL-1 $\beta$  and IL-6 in naive PBMC, and dampened IFN- $\gamma$  and TNF- $\alpha$  responses in *Staphylococcus aureus* challenged PBMC.

The demonstrated effects of the MV reproduce the mechanistic actions by which strain DSM 17938 is thought to ameliorate infantile colic, providing key information for development of new, innovative products.



**Shirin Moossavi**  
University of Calgary, Canada

11:45-12:00

**ISAPP Students and Fellows Association selected talk: Probiotic supplementation accelerates gut microbiome maturation in extremely preterm infants**

Background: Probiotics are increasingly administered to extremely premature infants to prevent necrotising enterocolitis and neonatal sepsis. However, little is known about their ecological effects on the trajectory of gut microbiota assembly.

Methods: Using a randomized, open-label, controlled trial, we characterized the effects of a FloraBABY probiotic product containing four *Bifidobacterium* strains and one *Lactocaseibacillus* strain on fecal bacterial and fungal communities in extremely premature infants before, during and after the intervention. Probiotic strains were quantified using strain-specific qPCR and bacterial and fungal communities were profiled using 16S rRNA and ITS2 gene sequencing, respectively. Untargeted fecal metabolomics was performed using liquid chromatography-mass spectrometry.

Results: Probiotic *Bifidobacterium* but not *L. rhamnosus* strains stably persisted at 6-months corrected age. The intervention accelerated the transition to a mature microbiome configuration that resembled that of healthy term infants, and displayed higher community richness, stability, and species interconnectivity. Besides infant age, fecal cell numbers of the probiotic *Bifidobacterium* strains and stool creatinine were the best predictors of microbiome maturation in a random forest classifier, and structural equation modeling confirmed probiotics as a major determinant for the trajectory of microbiome assembly.

Conclusion: We demonstrated that extremely premature infants can be rapidly and stably colonized by *Bifidobacterium* strains, which function as ecosystem engineers that accelerate microbiome maturation to a healthy term born-like state. These findings provide an ecological framework that can be used to restore the profound gut microbiome alterations in premature infants.



**Beinta Marr**  
CP Kelco

12:00-12:15

**ISAPP Industry member selected talk: A potential novel prebiotic – Gellan oligosaccharide**

Gellan oligosaccharides are obtained from hydrolysis of gellan gum, a well-known food additive, and are mainly composed of the characteristic tetramers of gellan (2 glucose, 1 rhamnose and 1 glucuronic acid) that are resistant to digestion in the upper part of the digestive tract. We therefore evaluated their potential for selective fermentation in the large intestine to determine whether they could qualify as prebiotic. According to ISAPP's most recent expert consensus, prebiotic is a substrate that is selectively utilized by host microorganisms conferring a health benefit. As this had never been studied so far, we initiated an in vitro study utilizing the TNO i-screen model using pooled faecal samples from healthy adult donors (n=6) and from donors suffering from ulcerative colitis (n=4), respectively. Changes in the microbiota composition were analyzed using mass V4 16S rDNA amplicon sequencing after 24 hours of fermentation. Surprisingly high levels (up to 200-fold) of *Faecalibacterium prausnitzii* were demonstrated along with high levels of other beneficial bacteria, such as *Parabacteroides*, *Blautia*, and *Clostridium* XVIII, in comparison to negative control/inulin. Interestingly, this effect was observed with faecal samples from both healthy and ulcerative colitis subjects. To confirm the potential of gellan oligosaccharides to be metabolized and to stimulate the growth of *F. prausnitzii*, we conducted another in vitro fermentation study using different *F. prausnitzii* strains against glucose as positive control. We confirmed that *F. prausnitzii* is able to develop at a range similar to glucose when gellan oligosaccharides is the only carbon source available in the medium. While data in humans are still needed, these results encourage the development of gellan oligosaccharide as a prebiotic candidate targeting *F. prausnitzii*. While *Bifidobacteria* and *Lactobacilli* have been the two main groups of focus it is now recognized that prebiotic effect extends beyond them and there is increasing interest in *F. prausnitzii*, which is among the top 30 human gut bacterial species to show the strongest overall correlations with markers of nutritional and cardiometabolic health.

**ISAPP wrap-up**

**EDT**



**Dan Merenstein**  
Incoming ISAPP President, Georgetown  
University Medical Center, USA

12:15-12:30

**Networking**

**EDT**

**Networking with IAC members, speakers / invited guests,  
SFA members and board members**

12:30-13:00

## Appendix B: Acknowledgements

### ISAPP Industry Members in 2021

ISAPP heartily thanks the 53 member companies who supported its work in 2021!

