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# International Scientific Association for Probiotics and Prebiotics 2010 Meeting Report

*Mary Ellen Sanders, PhD*

**The International Scientific Association for Probiotics and Prebiotics (ISAPP) is a scientific society dedicated to advancing the scientific understanding of probiotics and prebiotics. Founded in 2002, ISAPP hopes to raise the scientific credibility of the field by providing an objective, science-based voice that will benefit the researchers, commercial entities, regulators and end users of these products. ISAPP held its 8th annual meeting August 28 to 30, 2010, in Castelldefels, Spain. Many scientific topics were explored at this meeting, including the role of probiotics and prebiotcs in perinatal nutrition, gut microbes and metabolic syndrome, the role of commensal and pathogenic bacteria on programming the neonatal immune response, the ability of probiotics and prebiotics to combat diseases in developing countries, and approaches to substantiation of health benefit claims for probiotic and prebiotic products. The following is a report of the activities at this meeting.**

**Key words:** *ISAPP, probiotic, prebiotic, meeting report*

The International Scientific Association for Probiotics and Prebiotics (ISAPP) convened its eighth meeting August 28 to 30, 2010, at the Gran Hotel Don Jaime, Castelldefels, Spain. Hosted by Dr. Francisco Guarner, this by-invitation meeting was attended by 123 participants, including 41 scientists from the ISAPP Industry Advisory Committee and invited delegates from 23 countries, including Russia, Argentina, Brazil, China, and India, as well as from North America and Europe. This year, the International Life Sciences Institute (ILSI) Europe was invited to be part of the program owing to their established probiotic and prebiotic task forces and the progress they have made in scientific issues related to scientific substantiation of health claims. The program began with a plenary session featuring lectures on the human microbiome projects, the role of indigenous prebiotics and probiotics in human milk, the relationship between gut microbes and metabolic syndrome, pili as a mediator of intimate host–microbe interactions, and the role of commensal and pathogenic bacteria on programming of the neonatal immune response. Presentations from ILSI Europe Task Force representatives included ''Guidance for Substantiating the Evidence for Beneficial Effects of Probiotics: Results from the ILSI Probiotic Task Force'' and ''From Prebiotic Concept to Prebiotic Effects: Metabolic and Health Benefits. ILSI Europe Prebiotic Taskforce Report.'' In addition, an introduction to a survey that ILSI Europe conducted on key probiotic questions was presented.

After the plenary lectures, a late-breaking news session was held. This session was composed of 5-minute lectures (maximum of three slides per lecture) that aimed to be provocative and highlighted new data, new perspectives, or new concerns related to the probiotic and prebiotic industries. The topics included the economic benefits attributable to public health cost savings from supplementation of infant formula with prebiotics, bovine oligosaccharides, bottlenecks for biomarker validation in clinical studies, a description of the new Probiotics European Scientific Foundation, the *Scientific American* editorial[1] equating functional foods with snake oil, and our past president's ''bucket list'' for the probiotic field.

## Discussion Groups

On the second day of the meeting, all meeting participants participated in one of six discussion groups. The discussion group members are listed in Table 1. Key conclusions from these groups follow.

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**Table 1.** Discussion Group Members

| *Last Name* | *First Name* | *Affiliation* | *Country* |
|---|---|---|---|
| *Discussion Group 1: Where Pathogenesis and Commensalism Meet* | | | |
| Antonsson | Martin | Probi AB | Sweden |
| Charbonneau | Duane | Procter & Gamble | USA |
| Christensen | Jeffrey | Chr. Hansen | Denmark |
| Daly | Charlie | University College Cork | Ireland |
| Hill (Co-chair) | Colin | University College Cork | Ireland |
| Hutkins | Bob | University of Nebraska | USA |
| Klaenhammer (Chair) | Todd | North Carolina State University | USA |
| Lahtinen | Sampo | Danisco Health and Nutrition | Finland |
| Lamoureux | Maryse | Agropur | Canada |
| McCormick | John | University of Western Ontario | Canada |
| Nes | Ingolf F. | Norwegian University of Life Sciences | Norway |
| Perdigon | Gabriela | CERELA | Argentina |
| Peterson | Daniel | University of Nebraska-Lincoln | USA |
| Pridmore | David | Nestlé | Switzerland |
| Sako | Tomoyuki | Yakult Europe | The Netherlands |
| Satokari | Reetta | University of Turku | Finland |
| Sleator | Roy | Cork Institute of Technology | Ireland |
| *Discussion Group 2: Gut Microbiota and Disease* | | | |
| Bienenstock | John | McMaster Brain-Body Institute | Canada |
| Ehrlich | S. Dusko | INRA | France |
| Eiberger | Inna | Merck Selbstmedikation GmbH | Germany |
| Guarner (Chair) | Francisco | University Hospital Vall d'Hebron | Spain |
| Haimet | Florence | INRA | France |
| Hunter | Kirsty | Nottingham Trent University | England |
| Klinder | Annett | University of Reading | England |
| Madduri | Krishna | The Dow Chemical Company | USA |
| Manichanh | Chaysavanh | University Hospital Vall d'Hebron | Spain |
| Martini | Peggy | Kraft Foods | USA |
| Menon | Ravi | General Mills Inc | USA |
| Murcia Muñoz | Alicia | Institut de Recerca, Hospital Vall d'Hebron | Spain |
| Ouwehand | Arthur | Danisco | Finland |
| Qin | Junjie | Beijing Genomics Institute | China |
| Ringel | Yehuda | University of North Carolina at Chapel Hill | USA |
| Rowland | Ian | University of Reading | England |
| van Hemert | Saskia | Winclove | The Netherlands |
| van Hylckama Vlieg | Johan | Danone Research | France |
| Versalovic (Co-chair) | James | Texas Children's Hospital | USA |
| *Discussion Group 3: Bioactives, the Grand Canyon of Our Field* | | | |
| Bäckhed | Fredrik | University of Gothenburg | Sweden |
| Bosscher | Douwina | Cargill R&D | Belgium |
| Cani | Patrice D. | Université catholique de Louvain, LDRI | Belgium |
| Chow | JoMay | Abbott Nutrition | USA |
| Claus | Sandrine | Imperial College | England |
| Delzenne (Co-chair) | Nathalie | Université catholique de Louvain, LDRI | Belgium |
| Fahey | George | University of Illinois | USA |
| Gibson (Chair) | Glenn | University of Reading | England |
| Lathrop Stern | Lori | Pfizer Consumer Healthcare | USA |

**Table 1.** Continued

| *Last Name* | *First Name* | *Affiliation* | *Country* |
|---|---|---|---|
| Lichtenwald | Kathy | The Dow Chemical Company | USA |
| Meeuws | Sarah | Winclove | The Netherlands |
| Meheust | Agnes | ILSI Europe | Belgium |
| Merrifield | Claire | Imperial College | England |
| Miller | Barbara | Procter & Gamble | USA |
| Möllstam | Bo | BioGaia AB | Sweden |
| Murphy | Eileen | University College Cork | Ireland |
| Murphy | Maeve | General Mills Inc | USA |
| Rastall | Robert | The University of Reading | England |
| Russell | Mike | Mead Johnson Nutrition | USA |
| Russell | Wendy | Rowett Institute of Nutrition and Health | Scotland |
| Scott | Karen | Rowett Institute of Nutrition and Health | Scotland |
| Swann | Jonathan | Imperial College London | England |
| Thomas | Carissa | Baylor College of Medicine/Texas Children's Hospital | USA |
| Tremaroli | Valentina | Wallenberg Laboratory at Sahlgrenska University Hospital | Sweden |
| *Discussion Group 4: Probiotics and Prebiotics in Perinatal Nutrition* | | | |
| Cabana (Chair) | Michael | University of California, San Francisco | USA |
| Connolly | Eamonn | BioGaia AB | Sweden |
| Davis | Steven | Abbott Nutrition | USA |
| Donovan | Sharon | University of Illinois | USA |
| Lynch | Susan | University of California, San Francisco | USA |
| Mills (Co-chair) | David | University of California | USA |
| Ringel-Kulka | Tamar | University of North Carolina at Chapel Hill | USA |
| Ross | Paul | Teagasc Food Research Centre | Ireland |
| Stahl | Bernd | Danone Centre for Specialised Nutrition Friedrichsdorf | Germany |
| Szajewska | Hania | The Medical University of Warsaw | Poland |
| Veereman | Genevieve | Free University Brussels | Belgium |
| *Discussion Group 5: Health Benefit Claims for Probiotic and Prebiotic Products* | | | |
| Ambrosetti | Lara | Ginsana SA | Switzerland |
| Bañares | Silvia | University Abat Oliva | Spain |
| Duffy | Linda | National Institutes of Health | USA |
| Durmont | Frederic | Lallamand SAS | Switzerland |
| Fletcher | Reg | Kellogg Europe Trading Ltd | Ireland |
| Gueimonde | Miguel | Asturian Dairy Products Institute | Spain |
| Gupta | Rajesh | Biocodex USA | USA |
| Heimbach | Jim | JHeimbach LLC | USA |
| Hinkel | Ulrika | Boehringer Ingelheim GmbH | Germany |
| Jankovic | Ivana | Nestlé | Switzerland |
| Kozianowski | Gunhild | Beneo Institute | Germany |
| Kumar | Ashok | LifeScience Advisory Group | India |
| Lähteenmäki-Uutela | Anu | University of Turku | Finland |
| Larsson | Niklas | Probi AB | Sweden |
| Lenoir-Wijnkoop | Irene | Danone Research | France |
| Leyer | Gregory | Danisco USA | USA |
| Macfarlane | Sandra | University of Dundee | Scotland |

**Table 1.** Continued

| *Last Name* | *First Name* | *Affiliation* | *Country* |
|---|---|---|---|
| Mackle | Tami | Pfizer Consumer Healthcare | USA |
| Morelli | Lorenzo | Institute of Microbiology UCSC | Italy |
| O'Rourke | Raymond | Food lawyer | Ireland |
| Palou | Andreu | University of Balearic Islands | Spain |
| Polzin | Kayla | Cargill, Inc. | USA |
| Pot | Bruno | Institut Pasteur Lille | France |
| Rijkers | Ger | UMC Utrecht and St. Antonius Hospital Nieuwegein | The Netherlands |
| Salminen (Co-chair) | Seppo | Functional Foods Forum | Finland |
| Sanders (Chair) | Mary Ellen | Dairy & Food Culture Technologies | USA |
| Sanz | Yolanda | Spanish National Research Council (CSIC) | Spain |
| Schoterman | Margriet | FrieslandCampina Domo | The Netherlands |
| Tancredi | Daniel | University of California, Davis | USA |
| van Loveren | Henk | National Institute of Public Health and the Environment | The Netherlands |
| Walker | Donald Carey | Mead Johnson Nutrition | USA |
| Welch | Rob | University of Ulster | Northern Ireland |
| Zhao | Jia | Yakult Europe | The Netherlands |
| *Discussion Group 6: Probiotics and Prebiotics to Combat Enteric Diarrheal Diseases and HIV in the Developing World* | | | |
| Cunningham-Rundles | Susanna | Weill Cornell Medical College | USA |
| Diaz | Maria Alejandra | Baylor College of Medicine | USA |
| Ermond | Eric | Nestec SA | Switzerland |
| Guerrant | Richard | University of Virginia School of Medicine | USA |
| Hummelen | Ruben | Erasmus University Medical Center Rotterdam | The Netherlands |
| Kemperman | Robèr | Unilever R&D | The Netherlands |
| Kerac | Marko | UCL Centre for International Health & Development/Valid International | England |
| Kort | Remco | TNO Quality of Life | The Netherlands |
| Merenstein (Co-chair) | Dan | Georgetown University | USA |
| Monachese | Marc | Lawson Health Research Institute | Canada |
| Panigrahi | Pinaki | University of Nebraska Medical Center | USA |
| Ramakrishna | Balakrishnan | Christian Medical College Vellore | India |
| Reid (Chair) | Gregor | Lawson Health Research Institute | Canada |
| Safdar | Nasia | University of Wisconsin–Madison | USA |
| Shane | Andi | Emory University School of Medicine | USA |
| Sheveleva | Svetlana | Institute of Nutrition Moscow | Russia |
| Trois | Livia | Grupo de Apoio a AIDS Pediatric, Children's Hospital Conceicao, Rio Grande do Sul | Brazil |

### Group 1: Where Pathogenesis and Commensalism Meet

*Chair: Todd Klaenhammer; Co-chair: Colin Hill*

Although pathogens that cause infectious disease harbor uniquely distinct properties from commensals and probiotics, pathogens and commensals do meet in the gut and face a number of shared environmental challenges. These include survival through gastric juice and bile, competition with the existing microbiota, attachment or retention in the intestinal mucosa, interactions with the immune system, and impacts to health—positively for commensals and negatively for infective pathogens. As a

result, the two groups share very similar strategies for survival and competition in this niche, such as pili, fimbriae, bile salt tolerance mechanisms, IgA proteases, IgA binding proteins, and oxidative stress genes. Because many of these factors were first discovered in pathogens, they are often referred to as virulence factors on the basis that inactivation usually impacts the virulence of the pathogen. However, it is not surprising that many innocuous commensal bacteria also share these features. With the application of more genome sequencing and high-throughput technologies, it is likely that many genes encoding structures or strategies previously associated with ''virulence'' will be identified in commensal bacteria. It is important that a clear distinction is retained between true ''virulence factors'' (pathogen-specific factors such as toxins, which damage the host, or internalins, which facilitate entry into host cells) and those shared survival and colonization strategies employed by all gut-associated bacteria. This discussion group proposed that a more accurate description of these shared structures or strategies would be ''survival, tolerance, or competition'' factors.

**Group 2: Gut Microbiota and Disease**
*Chair: Francisco Guarner; Co-chair: James Versalovic*

Presentations and discussion in group 2 were aimed at describing the characteristics of a ''normal'' gut microbiota in terms of structure and functions, that is, microbial composition and activities that are considered to be commonly present in human subjects. A second aim of the group was to review clinical conditions associated with dysbiosis, that is, associated with abnormal characteristics of the gut microbiota. This double approach was considered the practical way of gathering the relevant information to eventually define a ''healthy'' gut microbiota. The group included a number of scientists actively involved in projects from the International Human Microbiome Consortium (IHMC; <www.human-microbiome.org>). These projects are currently going on in the United States, Europe, and China. The MetaHIt study suggested that up to 3 to 4 million microbial genes and about 20,000 functions encoded by these genes are present in the human gut microbiota.[2] The National Institutes of Health Human Microbiome Projects have investigated in-depth samples from healthy individuals. These studies have clearly detected age-related differences between healthy children and adults. Data from different studies on irritable bowel syndrome, inflammatory bowel disease, type 2 diabetes, and obesity are providing information about consistent changes in gut microbiota composition. This information can be applied to rational remodeling or ''tailoring'' of human-associated microbial communities and their associated functions.[3] The group concluded that it is still too early to define the structure of a ''healthy'' gut microbiota. However, markers associated with disease (microbial signatures) are expected to be available soon. These markers may eventually be useful as diagnostic tools. Prospective studies will be needed to provide information about cause-and-effect relationships.

**Group 3: Bioactives, the Grand Canyon of Our Field**
*Chairs: Nathalie Delzenne and Glenn Gibson*

Each group participant was invited to choose a topic related to the bioactivity of probiotics and prebiotics.

*Galactoglucomannan Oligosaccharide*

This is an oligosaccharide that has demonstrated functional properties in animal foods. This new candidate prebiotic is isolated from waste materials. The unique galactoglucomannan oligosaccharides (GGMOs) may play a role in digestive health and immune function. Animal and in vitro models have been used for testing temulose. The GGMO is a promising prebiotic based on current evidence. Human trials are to be considered for the future.

*Bacteriocin from* Lactobacillus salivarius *UCC118*

The bacteriocin-producing probiotic *Lactobacillus salivarius* UCC118 alters the composition of the gut microbiota in diet-induced obese mice. Research has focused on (1) understanding the links between diet, gut health, inflammation, and metabolic function and (2) the identification of food components that impact the development of obesity and associated metabolic abnormalities and the underlying mechanisms by which these effects occur. UCC118 reduced Actinobacteria but increased Bacteroidetes in a model with diet-induced obesity.

*Gnotobiotic Mouse Models*

This presentation addressed the role of the gut microbiota in host physiology and metabolism using gnotobiotic mouse models. Research is especially focused on the mechanisms by which the gut microbiota contributes to

the pathogenesis of obesity, insulin resistance, diabetes, and atherosclerosis. Mice kept under germ-free conditions have reduced adiposity compared to colonized mice. Lipidomics demonstrated that the gut microbiota had global effects on the host's lipid metabolism, characterized by increased hepatic and adipose triglyceride levels.

*Butyrate*

Butyrate is an important short-chain fatty acid metabolite produced during anaerobic fermentation by gut bacteria that helps maintain a healthy gut. Butyrate is the preferred energy source for gut epithelial cells and induces apoptosis of cancer cells. Butyrate production also helps maintain a slightly acidic colonic pH, thereby assisting in pathogen exclusion. Some of the more abundant gut bacteria produce butyrate, including *Faecalibacterium prausnitzii* and *Roseburia* species. Other bacteria synthesize butyrate from other bacterial metabolites, including lactate. Production of butyrate is substrate dependent, and growth on starch and fructo-oligosaccharides (prebiotics) results in butyrate production.

*Bile Acid Signatures*

This research explored the influence of the gut microbiota on the bile acid signatures of host tissue compartments and the potential for the gut microbiota to modulate the signaling capacity of these transgenomic metabolites. This work used a targeted high pressure liquid chromatography-mass spectroscopy approach to characterize the bile acid signatures in the liver, kidney, heart, and plasma of conventional, germ-free, and antibiotic-treated rats. In addition, work explored the impact of binge drinking on cognition in humans. The aim of this study was to screen a wide range of urinary metabolites using a $^{1}$H nuclear magnetic resonance (NMR) spectroscopy–based metabonomic approach to establish the relationship between the metabolic effects of alcohol consumption and cognitive impairment. The initial phase of this study has demonstrated an association between urinary markers and specific forms of cognitive impairment (spatial working memory). These markers are also linked to gut microbial metabolism.

*Gut Flora and Metabolic Syndrome*

The field of interest is the role of the gut microbiota in the development of metabolic disorders, such as obesity, type 2 diabetes, and low-grade inflammation. Research covers the fundamental mechanistic aspects of host–gut microbe interactions, as well as the impact of nutritional modulation of the gut microbiota by using pre- and probiotics. Special attention is given to the role of the endocannabinoid system and its impact on the control of gut barrier function and adipogenesis. Future strategies on the role of probiotics and prebiotics in metabolic syndrome were discussed.

*Immunomodulation*

The aim is to isolate and identify the effector molecule produced by *Lactobacillus reuteri* that is capable of inhibiting tumor necrosis factor (TNF) production from activated human myeloid cells. This has been done using a combination of mass spectroscopy and NMR techniques. The second objective is to understand the mechanism of probiotic-mediated TNF suppression.

*Phenylpropanoid Compounds*

Current research focuses on phenylpropanoid-derived compounds in the diet that are released and transformed by the colonic microbiota to form antiinflammatory metabolites. Particular compounds of interest are ferulic acid and its derivatives. These compounds undergo deesterification hydrogenation, demethylation, and dehydroxylation by the gut bacteria. The species responsible for these molecular transformations are being described with a view to development as potential probiotics.

*Gut Flora and Xenobiotics*

Research focuses on the metabolic interactions between the gut microbiota and its host metabolism, with a particular interest in the liver and the brain. The complex relationships between drugs, drug metabolism, and the gut flora were described, as well as the effect of dietary modulation. In this context, antibiotics as a means to modulate the host metabolism through alteration of the microflora and xenobiotic metabolism may lead to new research on pro- and prebiotics.

*Fatty Acids and the Gut*

The focus was on the interactions between fatty acids and commensals in the gastrointestinal tract. This interaction between administered microbes and fatty acids could result

in a highly effective nutritional approach to the therapy of a variety of inflammatory and neurodegenerative conditions. For the specific case of conjugated linoleic acid, its antiproliferation effect was described. Species of bifidobacteria may produce conjugated linoleic acid at varying levels.

*Immunoglobulins*

Urinary metabolic and mucosal immunoglobulin responses of the pig to nutritional intervention around the weaning period indicated that *Bifidobacterium lactis* has a differential effect on both of these parameter sets depending on the initial weaning diet, even after a dietary washout period.

*Antiadhesive Activities of Prebiotics*

Prebiotics are generally thought of as fermentation substrates, manipulating the microbiota composition and activity. Oligosaccharides can, however, act as antiadhesive agents, preventing pathogens from binding to host cell receptors. These oligosaccharides are being developed as an approach to therapy, typically involving complex multivalent derivatives. There is, however, accumulating evidence that galacto-oligosaccharides also have the ability to prevent pathogens from binding to cells, although the evidence for an effect in vivo is currently lacking. This type of activity could, however, be a feature in the design of future prebiotic oligosaccharides.

The group concluded with a general discussion to ascertain whether bioactives are capable of inducing health benefits similar to those of probiotics and prebiotics and/or explaining mechanisms of effect. The question was raised as to whether bioactive compounds could be a new market with nutrition or medical applications.

### Group 4: Probiotics and Prebiotics in Perinatal Nutrition

*Chair: Michael Cabana; Co-chair: David Mills*

This group discussed the increasing use of probiotics and prebiotics by infants and young children. One effect of these dietary agents is changes in the infant microbiota. Attempts to define the ''normal'' or ''typical'' infant microbiota, metagenome, and metabolome were discussed. There are many confounding factors to these efforts, such as mode of delivery, antibiotic exposure, breast milk exposure, and gestational age. In addition, there are no accepted standards for stool collection. Stool itself may be an imperfect representation of the microbiota; however, given the limitations of current technology, it would not be ethical to use more invasive methods in well infants. Definition of the infant microbiota may allow us to find correlations with infant disease states and develop biomarkers for clinical trials. Experiences were shared among group participants on attempts to manipulate the gut microbiota by probiotics and prebiotics. In addition, human breast milk as a delivery agent for prebiotics and microbes was discussed. The potential of adding human milk oligosaccharide mimics to infant formula was also discussed. In addition, the potential long-term impact of infant formula products supplemented by probiotics and prebiotics on long-term infant health was considered.

### Group 5: Health Benefit Claims for Probiotic and Prebiotic Products

*Chair: Mary Ellen Sanders; Co-chair: Seppo Salminen*

This group discussion opened with brief descriptions of differences among regulatory frameworks for probiotics in the United States, Canada, Europe, China, and India. All of these geographic regions had in common the principle of consumer protection, although the means to this end varied. There was agreement that health claims should be substantiated by generally accepted scientific evidence, taking into account the totality of the available scientific data and weighing this evidence to determine the strength of the support.

Of note, although both the United States and Europe allow disease risk reduction claims, in the United States, foods have not been allowed to be used to reduce the risk of acute diseases, such as colds or flu, but in Europe, this is, in theory, possible if evidence is provided. India is in the process of developing specific probiotic guidelines, and it is still possible to provide scientific input into this process.

Discussion about the wording of health claims emphasized that this is a very difficult endeavor. It often entails translating complicated scientific findings into claims that can be understood accurately by average consumers. Companies must first define what the most important message is and then use wording that is simple, not vague, confusing, or misleading, and that accurately reflects the strength of the scientific evidence.

Another concern regarding substantiating claims was the issue of biomarkers. In Europe, this has a special importance as the regulation specifically indicates that a change in a risk factor must be established in addition to convincing evidence directly on the end point, if needed. However, in the field of probiotics and prebiotics, few valid biomarkers are available for the types of end points these substances target. Furthermore, considering that regulators are focused on the role of foods in health, there is a great need for valid approaches for evaluating health instead of disease. Biomarkers would also be very useful for identifying subpopulations of responders and nonresponders to increase the focus of human studies.

Important themes that emerged during this discussion:

- Regarding the difficulty in measuring health, the focus of studies could be the measurement of homeostasis. From a statistical point of view, if a study were able to minimize the variation around the mean for a specific measure (even in the absence of changing the mean), it could be a reflection of improved health, assuming a biological rationale exists that tighter control of the parameter is physiologically advantageous. In other words, lessening the fluctuation around an individual's biomarker could be interpreted as contributing to improving health. This novel idea emphasizes the importance of homeostasis as a focus of studies on health and provides a rationale based in solid statistical theory as a way to measure this.
- Another issue that emerged was the frustration about regulatory ''boxes.'' Although scientists would agree that there is a continuum between health and disease, in regulatory terms, these are distinct states. Likewise, there are numerous examples of foods having pharmaceutical-like properties, such as reducing the risk of acute infections. However, some regulatory authorities see such actions as valid only for ''drugs.'' The consequences of such constraints can be significant for scientists and the studies they design and for consumers and how they might benefit from certain products.

### Group 6: Probiotics and Prebiotics to Combat Enteric Diarrheal Diseases and HIV in the Developing World

*Chair: Gregor Reid; Co-chair: Dan Merenstein*

This discussion group comprised experts from the developing world, others who had worked on projects there, and participants committed to helping with this major morbidity and mortality problem. All were positive about the evidence to date and potential for probiotics and prebiotics to help lower the burden of disease and suffering in a cost-effective manner that could engage and empower local people in developing countries such as Tanzania, Kenya, Rwanda, South Africa, Ghana, India, Bangladesh, Pakistan, China, Brazil, and Peru. This group aimed to build on the ISAPP's commitment to consider issues in developing countries and attempt to bring probiotic and prebiotic concepts and products to these regions. Furthermore, the group was interested in a follow-on discussion from the Gates Foundation meeting in London (January 2010), which concluded that no funding was yet warranted for the use of probiotics for diarrhea in developing countries.

The group addressed the following issues:

1. Determining the scientific rationale for using probiotics and/or prebiotics to combat diarrheal diseases and/or human immunodeficiency virus/acquired immune deficiency syndrome (HIV/AIDS) in the developing world.
2. Write practical recommendations for prebiotics and probiotics on issues such as choice of: probiotic strains, prebiotic, dosages, appropriate target diseases, test populations. Other issues to address include how to deliver the products in challenging settings, how to offset the cost of the treatment and use of unique, effective models.

With an eye to the issues stated above, the group set three objectives for the session:

1. Set up collaborations and projects in the developing world.
2. Create a roadmap for how to bring probiotics to a developing country, even if only for research and not for profit.
3. Create project ideas that can identify plausible mechanisms whereby ''biotics'' combat diarrheal diseases and HIV.

Studies were proposed that would address the impact of pro- and prebiotics on HIV/AIDS or on diarrheal diseases. Specific issues of best measurement end points, study population, and confounders, as well as other issues, were considered.

Recommendations were made on how to facilitate progress in this area. Funding for research and young scientists is a major problem in the developing world. The suggestion was made that ISAPP could solicit funds from

its IAC (Industry Advisory Committee) members to set up a program to provide funding (≈$40,000–50,000) for:

1. Two studies per annum for developing world scientists, possibly in collaboration with ISAPP-selected scientists from developed countries, targeting this research area.
2. Fund an African junior faculty member, to enable him/her to spend 1 year working in an established program to learn methodologies, grant writing, collaboration skills, and how to conduct independent research. This person would be selected by his/her department, with the stipulation that the department would provide ongoing research support.

## Student and Fellow Association

The newly formed Student and Fellow Association (SFA) convened two programs: a poster session and an informal ''Opportunities Everywhere'' session.

### Poster Session

Eight young researchers who were awarded travel grants to attend the meeting presented their research as posters. Subjects ranged from mucosal immunity and Crohn disease to HIV and the developing world.

- Annett Klinder, University of Reading, United Kingdom: ''Higher Fruit and Vegetable Consumption Increased Butyrate-Producing Bacteria in *Faecalibacterium prauznitzii* in Human Volunteers''
- Ruben Hummelen, Lawson Health Research Institute, Canada: ''Deep Sequencing of the Vaginal Microbiome among Women with HIV''
- Claire Merrifield, Imperial College, United Kingdom: ''Weaning Diet Initiates a Sustainable Metabolic Reprogramming Event in the Pig that Impacts the Action of *Bifidobacterium lactis*''
- Alicia Murcia, Hospital Vall d'Hebron, Spain: ''The Mature Dendritic Cell Subpopulation Is Augmented in the Intestinal Lamina Propria of Crohn's Disease Patients''
- Carissa Thomas, Baylor College of Medicine, United States: ''Probiotic *Lactobacillus reuteri* Suppresses TNF through Inhibition of TAB1 and Downstream MAPK Pathways''
- Maria Alejandra Diaz, Baylor College of Medicine, United States: ''Characterization of *Lactobacillus* spp. Isolated from *Tursiops truncatus* for use as Dolphin Probiotics''
- Marc Monachese, Lawson Health Research Institute, Canada: ''Potential New Applications for Probiotics in the Developing World''.

The following promising young researchers were selected to receive the travel grant but were unfortunately not able to attend:

- Alireza Shenavar Masouleh, University of Tehran, Iran: ''Molecular Identification of *Leuconostoc mesenteroides* and *Enterococcus faecium* in Persian Sturgeon''
- Valentina Tremaroli, Sahlgrenska University Hospital, Sweden: ''Linking Immunity and Metabolism: Microbial Signaling through GPR43 and Expression of iNOS in the Mouse Intestine''.

### "Opportunities Everywhere" Session

With an astonishing picture of Barcelona in the background and the glorious (and blocking) view of chair Ruben Hummelen in the foreground, the SFA held its first seminar targeted specifically at students. Five scientists, who survived all the mistakes that we (students and fellows) are still about to make, contributed to the seminar by sharing their ''life lessons'' and experiences. The first speaker, Gregor Reid, emphasized the value of having an external advisor, separate from your supervisor, who may be out of your own field of research, to provide advice and feedback with important decisions.

Michael Cabana gave great examples of how, in larger, multidisciplinary projects, the assembly of a team of people who are top in their own field may be the most important part of a project. The advice of Fredrik Bäckhed on how to survive in increasingly multidisciplinary teams was illuminating: learn different (scientific) languages but stick to what you are best at. Also, we were alerted to the importance of developing your own independent scientific profile, distinct from that of your former boss. The challenge is taking something with you from your postdoctoral experience that you can independently develop into your own area of expertise. In that way, a fruitful collaboration with your supervisor is still possible and you have the chance to develop an independent profile.

John McCormick challenged us with the question of whether any of us have followed through with an idea that we thought was great but that our supervisor disagreed

with. Two people lit up the session, explaining that they have been Bohemians, which meant that they were ready as independent scientists. Also, McCormick advised us to dare to dream about our own laboratory only if we absolutely love our work.

Remco Kort inspired us not to feel limited by doing only what is possible within our group or company as there are many possibilities to blaze our own path by starting our own company or organization. Kort explained that there are many advantages in industry, such as the quick turnover of interesting ideas and projects. However, the customer- or market-driven nature of industry makes it difficult to develop and maintain your own unique area of expertise.

## Acknowledgment

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