



MICROBIOME MOVEMENT HUMAN NUTRITION

November 9-11 • Digital Event

POST EVENT REPORT

The Past, Present, and Future of Microbiome-targeting Applications in Nutrition

By Lauren Bass
Lauren Bass Growth Marketing Consulting

The Past, Present, and Future of Microbiome-targeting Applications in Nutrition

By Lauren Bass

Lauren Bass Growth Marketing Consulting

The industry's preeminent microbiome scientists, researchers, business executives, and brands came together in Boston for the 2019 *Microbiome Movement* Human Nutrition Conference. Sharing cutting edge research and actionable new insights, they built and fostered relationships that have already been key in accelerating their work focused on diet, health and the microbiome.

A variety of themes were covered in-depth, focusing on two key areas:

1. The **latest developments in research** at the intersection of nutrition, the microbiome, and the treatment and prevention of chronic disease.
2. Useful **insights from the brands successfully commercializing** the health promoting products emerging from this research, and building the microbiome market among doctors and consumers.

In the remainder of this report, we will walk through the key themes and insights from the conference, touching on:

- the **microbiome and its link to various chronic illnesses** from food allergies to diabetes, psoriasis, IBS and more
- the role of **personalized nutrition** in microbiome therapy
- human milk oligosaccharides (HMOs) and **development of the infant microbiome**
- the expansion of the microbiome market beyond probiotics, to **prebiotics and postbiotics**

Is there a Causal Relationship Between the Microbiome and Chronic Disease?

During his talk, **The Gut Microbiota, Food Science, and Human Nutrition: A Timely Marriage**, Michael Barratt, Assistant Professor, Pathology & Immunology at Washington University, argued that we need to move beyond studies of association to define causal relationships between the microbiome and chronic diseases.

“The conference was filled with tons of great technical content at the intersection of industry (biotech & consumer goods) and academia.”

Dan Erickson, Nestle Purina

Walking the talk, he shared the experimental frameworks he is using to demonstrate a causal relationship between the composition of the microbiome and both obesity and childhood undernutrition.

Similarly, Azza Gadir, Director of R&D for Seed Health, shared insights from her team's research into the relationship between the microbiome and chronic illness. In her presentation, **Live Microbes Drive the Activation of Immune Responses and Inhibit the Development of Food Allergies**, Gadir concludes that a shared regulatory mechanism enables different commensal bacteria to suppress food allergies, indicating a potential for microbial therapies to treat this disorder.

Studying how the microbiome and diet drive another chronic illness, IBS,

Muriel Derrien, Senior Gut Microbiota Scientist at Danone Nutricia Research, and her team found that severe IBS has a distinct microbiota signature in humans. Not only that, in her talk, **Rethinking Diet from the Perspective of the Gut Microbiota**, she walked us through some important experiment results:

1. Through a clinical study her team demonstrated that a higher dose of ingested strains of probiotics was associated with higher fecal recovery.
2. In mice, antibiotics cause an alteration in gut microbiota following clindamycin, with an incomplete recovery, and that when the *L. paracasei* strain is ingested after the antibiotic it promotes microbiota resilience.

“It was a great combination of academic science, entrepreneurial development, and final translation into commercial product all in the Human Nutrition sector.”

David Kyle, Evolve Biosystems



“Networking and collaborating to move the field forward.”

Aubrey Levitt, Postbiotics Plus

“Good opportunity to meet scientific leaders from the nutrition world, and to understand their needs and opportunities regarding microbiome science.”

Julius Goepf
Scaled Microbiomics

“Hoping to educate and be educated, and potentially synergize with other participants.”

Momo Vuyisich, Viome

The learnings from these presentations, plus others, exposed a number of actionable insights at the forefront of research and product development focused on the microbiome and nutrition.

The Potential of Personalized Nutrition in Microbiome Therapy

In his talk, **A Personalized Dietary Framework for Exploiting the Fermentation Capabilities of a Patient's Microbiota**, Thomas Gurry, Senior Research Associate at the University of Geneva, asked an important question:

Can we engineer microbiota composition and metabolic output through targeted dietary interventions to improve health outcomes?

Gurry's research quantified the effect that dietary compounds - protein, saturated fat, unsaturated fat, pectin inulin, cellulose - could have on microbiota composition using tightly controlled feeding studies. The results showed that prebiotic supplementation resulted in reproducible blooms in microbiota and that the same species can respond differently in different individuals.

When studying the metabolic output via short-chain fatty acid production via ex-vivo framework, the results indicated that fermentation capabilities differ between healthy people. Vesta Biosciences is being built from this foundation to offer diagnostics for patients to determine

their personal microbiota fermentation capabilities and offer personalized diet recommendations. The goal is to develop nutritional therapies to treat and prevent obesity, metabolic disorders, and anxiety and depression.

Josh Stevens is the President of DayTwo, a startup offering a food-as-medicine solution for personalized glycemic control for people with type 2 diabetes. From its research, DayTwo found that people have variable glycemic responses to the same foods, which are driven in part by each individual's unique microbiome composition.

In his presentation, **Machine Learning in the Microbiome: Providing Predictable Personalized Nutrition based on your Gut**,

Stevens walked through how DayTwo uses inputs, such as microbiome profiling, blood tests, and food diaries, and others, and applies machine learning to predict personal glycemic responses to different foods.

From this data they're able to create personalized diets that lower glycemic response and have successfully helped patients put type 2 diabetes and prediabetes into remission, and reduce prescription medications. They've found that microbiome profiling is a more useful tool to predict glycemic response than traditional calorie and carbohydrate counting, because it takes the patient's unique traits into account, not just the traits of the food.

DayTwo has created microbiome driven personalized diets for 50,000+ patients, and has outcome data to back up their effectiveness. 77% of patients surveyed saw an improvement in health, 34% have been able to reduce medications and 54% have seen an increase in energy.

Where does the Infant Microbiome Fit into the Equation?

One of the key themes that emerged across multiple presentations was the importance of breastfeeding and the role of human milk oligosaccharides (HMOs) in the healthy development of the infant microbiome.

In her talk, **A Multi'omic Dive into Understanding How Diet Modulates Host-Microbiome Interactions in Human Infants**, Sharon Donovan, Professor of Nutrition and Health at the University of Illinois, walked us through some results of her research. The goals of the research is to access host-microbe interactions in infants, which components in the diet affect intestinal microbiota, and use that information to improve outcomes for formula-fed babies.

Her team's research showed that short and long-term disease risk and microbiome composition differ between breast and formula fed infants, and that human milk provides the ideal nutrition for infants. Despite this, only 46% of infants are exclusively breastfed at 3 months, and 25% at 6 months.



One of her ongoing longitudinal studies, called STRONG Kids 2, will enable long-term follow up to understand the effects of early life nutrition and microbiome composition.

On another related topic, David Sela, Assistant Professor at the University of Massachusetts Amherst, outlined his research in, **Human Milk Directs the Function of Bifidobacteria within the Infant Gut Microbiome**. His team is trying to understand the molecular properties of human milk that promote bifidobacterial fitness in the infant gut. The goal is to make the connection between food structure and microbiome function to inform intervention strategies with precision.

“A good mix of basic and translational nutrition research.”

Michael Barrett
University of Washington
St Louis



“This conference is where you go to hear the most cutting-edge science and innovation from pioneers advancing the microbiome field.”

Erin Glynn
Beachbody

Through their research, they've made some important discoveries:

- Formate production may be linked to inflammatory outcomes
- Keystone strain *B. infantis* uses urea as a nitrogen source to break down HMOs into usable substrates for the host

This is all leading to ongoing research to understand how urea nitrogen metabolism impacts the emergent properties of the infant gut microbiome.

A talk from David Kyle, Executive Chairman and Chief Science Officer for Evolve Biosystems, **The Natural**

Symbiosis between *B. infantis* and HMO Provides Colonization Resistance for the Early Infant Gut - A Clinical Update, built off the findings in Sela's research. Kyle explained that while infants in developing countries have guts dominated by bifidobacterium, including *B. infantis*, infants in developed countries have shown a loss of *B. infantis* and a corresponding prevalence of pathogens.

Inspired by this data, Evolve developed an infant probiotic, Evivo, featuring *B. infantis* EVCO01. Kyle shared the promising results of the product's clinical trial showing that *B. infantis* EVCO01 successfully colonized the infant gut and provides pathogen colonization resistance, as long as it is fed with breast milk. This strain of *B. infantis* works by converting the HMOs in breast milk into acetate and lactate and lowers gut pH, which provides protection against pathogen colonization and infant gut dysbiosis.

He also cited other recent studies (Henrick et al (2019), Orivuori et al, (2015); Henrick (2018)), showing that dysbiosis leads to chronic intestinal inflammation for infants and that high fecal calprotectin precedes atopic dermatitis and asthma at 6 years old. These insights point to the role *B. infantis* EVCO01 can have in restoring key function to the infant gut and preventing the development of chronic disease.

The Opportunities Beyond Probiotics

As important as probiotics like Evivo have been, they're just the tip of the spear. They have been pivotal in building the first generation of the microbiome market, educating doctors and consumers about the existence and role of "good" bacteria. They've also opened the market to the possibilities of using microbial therapy to treat and prevent illness and promote health.

Despite the fact that the probiotic market is already large at \$75B, the science and innovation around the microbiome is starting to reach far beyond probiotics.

In his talk **Microbiome-Focused Nutrition: Moving Away from Probiotics**, founder and CEO of

ThinkBiome, Robert Heath, explained the factors expanding the market and creating new opportunities around what he called the microbiome trinity:

- **Prebiotics** - certain fibers and other specific compounds, such as polyphenols, that feed specific beneficial bacteria and supports its growth
- **Probiotics** - live bacteria that support the growth of beneficial bacteria in the gut
- **Postbiotics** - dead bacteria, and bacterial products and components that confer benefits on the host

Prebiotics and postbiotics are a fast expanding frontier of research and opportunity in the microbiome space. This could be seen in the sheer volume of interest and discussions at this

year's *Microbiome Movement Human Nutrition* conference focused on these areas. At the end of day one at the conference, attendees self selected into one of three discussion groups focused on probiotics, prebiotics and postbiotics. The last two were just as popular, if not more so, than the probiotic discussion.

Lynn Dornblaser, Director of Innovation & Insight at Mintel, shared some useful data in her talk, **Positioning the Microbiome to Consumers**. While the health claims of fiber have historically dominated the consumer's mind when it comes to digestive health, probiotics, prebiotics, synbiotics (a combination of probiotics and prebiotics), and postbiotics are gaining momentum.

Trends in Food Science & Technology, published a study titled "Postbiotics: An evolving term within the functional foods field" that reflects the growth of consumer interest in 'biotic' terms. It revealed that on Instagram, Pinterest, and Twitter from July, 2018 to July, 2019 mentions of probiotics grew 41%, prebiotics 83% and postbiotics 91%.

One of the key challenges facing the pre and postbiotics, and the microbiome market in general, is still consumer education. Dornblaser concluded her presentation reminding us that the consumer understanding of what the microbiome is and why it is important is shaky at best, and it's our job as researchers, scientists and business leaders in the field to educate the market. ■

"I see it as an opportunity for the leaders in nutrition and the microbiome to commune and learn from each other."

Afif Ghannoum

"I'm looking forward to make new connections and participating in some great education"

Len Monheit
Global Prebiotics Association