

Hot topics at a glance

Latest findings presented at the Gut Microbiota for Health Summit Miami illuminated the various roles of the gut microbiota as a crucial factor in health maintenance, prevention and therapy. From diseases induced by gut microbial imbalances to the therapeutic potential of probiotics – the scientific program mirrored the impressive scientific progress in that field. What follows is a short overview of selected “hot topics”.

Gut microbiota composition: a new kind of biomarker?

The composition and the changes of the gut microbial communities provide a huge potential of new biomarkers for indicating, monitoring and predicting intestinal conditions. At the Summit leading experts presented what has been found out in this exciting research area.

PROF. MAX NIEUWDRP

University of
Amsterdam,
Netherlands



A change in diet can alter the gut microbiota very rapidly and have a deep impact on the risk to develop colon cancer. This is demonstrated by a study led by Prof. Stephen J. O’Keefe’s team (University of Pittsburgh/USA). African Americans and rurally living South Africans swapped diets. Within two weeks the colon cancer risk was

PROF. CHRISTIAN JOBIN

University of
Florida, USA



Patients with metabolic conditions have a significantly altered gut microbiota composition, which can serve as a biomarker and support diagnosis. Studies presented by Prof. Max Nieuwdorp (University of Amsterdam / The Netherlands) show that an enrichment of *Lactobacillus gasseri* and *Streptococcus mutans* in the gut can be taken as a good predictor for the development of insulin resistance. Equally important is the observation that the amount of bacteria that produce short chain fatty acids such as *Roseburia* and *Faecalibacterium prausnitzii* is reduced in patients with Type 2 Diabetes.

DR KISHORE VIPPERLA

University of
Pittsburg, USA



dramatically increased in the South African participants who were now consuming a western style diet and decreased in the Americans who had switched to traditional African food.

E. coli belongs to the so called commensal bacteria which feed on the same nutrients as their human hosts, albeit making use of different components. However, as Prof. Christian Jobin from the University of Florida (Gainesville/USA) pointed out, certain strains are involved in the onset of colitis and colorectal cancer (CRC). They are harmful because of their capacity to adhere to the epithelial cells lining the mucosa, and invade them. These so-called adherent-invasive *E. coli* (AIEC) induce inflammation and produce the toxin colibactin, which damages DNA and is essential in generating tumours.

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Hot topics at a glance (continued)



World-leading experts presented exciting research results in eleven lectures and six workshops

potential pathogens then reach the liver and activate its immune system. A promising approach towards novel therapies is the stabilization of the gut barrier by restoring the underlying gut microbiota imbalance through intake of probiotics. Recent trials show that *Lactobacillus* strains can restore the microbial equilibrium and reduce the amount of pathogens in liver patients.

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Gut's helpers: What can be expected from probiotics?

When the gut microbiota gets out of balance

and neuro-developmental disorders – for example depression, anxiety and autism – could be linked to dysbiosis of the gut microbiota.

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PROF. FRANCISCO GUARNER

University Hospital Vall d'Hebron
Barcelona, Spain

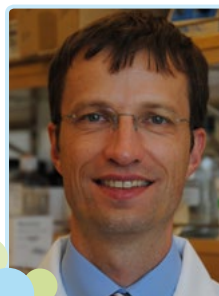


A disturbed equilibrium in the gut microbiota – called dysbiosis – can have severe consequences. Prof. Francisco Guarner from the University Hospital Vall d'Hebron (Barcelona / Spain) gave an overview of how these perturbations are linked to various disorders and diseases. These include diarrhea, IBS, IBD, colo-rectal cancer as well as certain liver diseases and allergies, and nutrition-related conditions such as obesity, Type 2 Diabetes and celiac disease. Altered composition of the intestinal microbiota also affects the central nervous system as gut and brain are connected by a multitude of communication pathways used by bacterial metabolites and transmitters. So, it is not surprising that even mental

Gut microbiota imbalance harms the liver

PROF. BERND SCHNABL

University of California
San Diego, USA



A disturbed microbial balance in the intestine might lead to severe liver diseases such as non-alcoholic fatty liver disease or cirrhosis. According to Prof. Bernd Schnabl (University of California San Diego/USA) raised amounts of potentially detrimental bacteria and a reduced portion of beneficial strains can induce inflammation which might weaken the gut barrier, thus allowing harmful bacteria and their metabolic products to enter the portal blood stream. These

PROF. PHILIPPE MARTEAU

Paris 7 University,
France



Probiotics act in various ways: Some have anti-inflammatory effects while others can regulate bowel transit or mitigate bloating, flatulence or abdominal pain. Functional bowel disorders, diarrhea and IBD have been the main areas, where probiotics have proven to be beneficial. Prof. Philippe Marteau (Paris 7 University, Paris / France) held that probiotic effects are to be attributed to bacterial strains rather than to species. He stated that probiotic interventions should be assessed against the background of the increasing knowledge about the intestinal community, which can be regarded as an ecosystem, consisting of microbial "landscapes", nodes of interaction and specific core microbes. Successful application of probiotics increases the biodiversity and genetic richness of this ecosystem, thus restoring its balance, and enhancing its stability, resistance and resilience.

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An international hub of scientific exchange

GMfH World Summit Miami 2016 provided a platform for distinguished gut microbiota experts to present and discuss current findings and concepts

Since 2012 when the first GMfH World Summit took place this meeting has become a leading platform of scientific exchange for gut microbiota experts from all over the world. This tradition was strongly confirmed by the GMfH 2016 World Summit in Miami, which attracted 260 internationally renowned gastroenterologists, hepatologists and microbiologists as well as nutritionists, dietitians and general practitioners coming from 30 countries. The event was organized by the Gut Microbiota & Health Section of the European Society of Neurogastroenterology and Motility (ESNM) and the American Gastroenterological Association (AGA) together with the European Crohn's and Colitis Organisation (ECCO) and the European Society for Paediatric Gastroenterology, Hepatology and Nutrition (ESPGHAN) and with the support of Danone and Biocodex. Eleven talks and six workshops



260 experts coming from 30 countries attended the Gut Microbiota for Health World Summit in Miami

presented cutting edge research from all subspecialties of this rapidly evolving field whose dynamics were mirrored by a program that covered a broad range of topics, from the dramatic impact of diet switch on the gut microbiota to the consequences of gut-brain connections on mental states. Several presentations were dedicated to the role of diet for gut microbiota modulation and the use of gut

bacterial compositions as biomarkers. During a lively discussion nearly 1300 tweets including the specific #GMfH2016 were produced. 70 new followers joined the community on @GMFHx and @GutMicrobiotaWW

If you missed to attend the Summit you can watch the plenary sessions' replay [here](#) or download fact sheets on selected topics from the online [media center](#).

Securing the scientific future

Young gut microbiota investigators were awarded for innovative studies



Young investigator Özgün Umu presented her findings during the poster session

Encouraging promising young researchers is a major concern of the organizers of the GMfH Summit. In Miami young investigators were awarded by AGA and ESNM for their

innovative studies in various areas related to the gut microbiota. The scientists presented their findings during a workshop to an expert panel that consisted of members of the Scientific Committee of the GMfH World Summit. The study performed by **Anne Katrine**

Bolvig (Aarhus University/Denmark) addressed the impact of antibiotic treatment on the production of health protecting enterolactone. **Jonathan Jacobs** (University of California

Los Angeles / USA) identified an IBD-associated enterotype that can serve as a risk predictor for not yet diseased relatives of IBD patients. The consequences of antibiotic exposure in early childhood and the development of the BMI were **Dervla Kelly's** (Trinity College Dublin / Ireland) object of research. **Özgün C. O. Umu** (Norwegian University of Life Sciences, Ås, Norway) investigated the role of bacteriocins (antimicrobial peptides) on the gut microbiota composition. Two other young scientists received 500 \$ awards for their poster presentations: **Marie Claire Arrieta** (University of British Columbia / Canada) examined how microbiota alterations early in life influenced asthma risk in an Ecuadorian birth cohort and **Nadiya Boyko** (Uzhhorod National University / Ukraine) investigated the potential of personalised diet for preventing and treating Type 2 Diabetes.

Bacteria against anxiety

Psychobiotics: Probiotics for the brain

The gut, its microbiota and the brain are connected through a complex network of bidirectional routes. This offers a fascinating potential for future treatments of mental conditions, as Prof. Ted Dinan (University of Cork, Ireland) pointed out.

The communication routes between gut microbiota and brain include the vagus nerve, spinal pathways, short chain fatty acids, cytokines and tryptophan as well as the hypothalamic-pituitary-adrenal axis as part of the neuroendocrine system. All these modes of exchange have a deep impact on many physiological and psychological processes. It is quite in line that common neurotransmitters such as serotonin or GABA that are present in the brain to regulate mood and cognitive functions are also produced by gut microbes.

The active role of gut bacteria is becoming increasingly clear. Prof. Dinan presented studies showing that germ-free animals – that is, without micro-organisms in their guts – have deficient neurotransmitter systems corresponding with memory deficits and autistic-like behaviour. Similar associations have been observed in patients with depression whose gut microbial diversity is reduced as compared to healthy individuals.

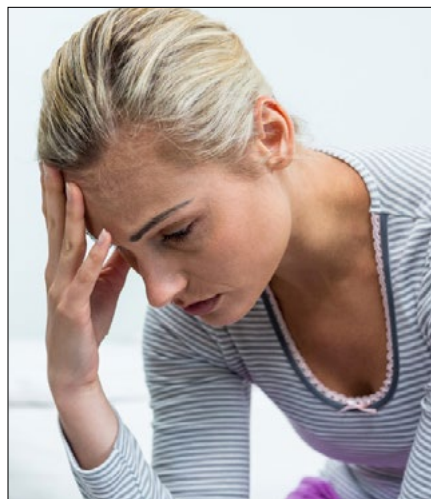
TRANSPLANTING MENTAL HEALTH STATES

To further elucidate these connections Prof. Dinan and his team transplanted rats whose gut microbiota had been eliminated by antibiotics with faecal samples from patients with depression or from healthy controls. The rats whose gut microbiota came from depressive patients showed anxious behaviour and indifference towards pleasure-related stimuli, thus providing evidence that the patients' condition had in fact been translated. This was accompanied by changes in the release of corticosterone – which corresponds to the stress hormone cortisol in humans – and an altered metabolism

PROF. TED DINAN
University
College Cork,
Ireland



of the amino acid tryptophan, which is produced by *Bifidobacteria* and is a precursor to serotonin. "So before starting to treat a patient with fecal microbiota transplantation it should be made sure that the donor does not have a history of mental diseases," said Prof. Dinan. On the other hand, as he pointed out, these findings open up



The gut microbiota composition can influence mental conditions such as anxiety and stress

a whole lot of new treatment options if bacteria with a beneficial impact on mental states can be identified. One of these "psychobiotics" is *Lactobacillus rhamnosus*: It could be demonstrated in rats that it reduces anxiety, stress and despair while improving cognitive capacities. This is associated with a

variety of physiological alterations, among them a decreased release of corticosterone. *L. rhamnosus* acts by changing GABA receptors in the brain, using the vagus nerve which connects gut and brain as a mediating channel. Reversely, the intake of these bacteria has no impact on the brains and behaviours of vagotomized animals. The observation that patients with vagotomy have a reduced risk of developing Parkinson's disease sheds additional light on these links: It is suggested that Parkinson's has its starting point in the gut microbiota and then moves up the vagus nerve to finally unfold in the brain.

At an advanced age the gut-brain-axis can carry increased health risks since it might lose its capability to deal with stress in a flexible manner. Prof. Dinan pointed to animal studies showing that stress increases the gut permeability in older animals far more than in younger ones. This is associated with inflammatory processes and a reduced diversity of the gut microbiota. "The gut microbiota certainly plays a pivotal role in stress response and many other mental processes and it is a potential target for psychobiotics. To which extent such micro-organisms will be capable to replace psychiatric drugs remains to be seen. But there is no doubt that this is one of the most exciting areas within gut microbiota research."

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