



**THE 1ST INTERNATIONAL CONFERENCE ON
MICROBIOTA-GUT-BRAIN AXIS**

MIND, MOOD & MICROBES

CONFERENCE SUMMARY

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MIND, MOOD & MICROBES; A MAGICAL CONNECTION

On December 1 and 2, 2016, hundreds of healthcare professionals and researchers from all over the world gathered in Amsterdam for 'Mind, Mood & Microbes', the first international conference on microbiota-gut-brain axis. This unique congress not only brought together many disciplines ranging from psychiatry to microbiology, but also gained momentum for the increasing interest and growing insights into the fascinating influence of gut microbiota on brain function.

"The enormous influence of the microbiome is crystal clear when we realize that humans are genetically > 99% microbe, and < 1% human," Prof. Dr. John Cryan (University College Cork, Ireland) told the audience. During our lifetime, the microbiome influences various aspects of wellbeing. For some decades, it has been known that the microbiota can influence for instance certain conditions like Irritable bowel syndrome (IBS), but now it appears that they are even a key factor in the development of the brain and profoundly influence brain functioning.



INFLUENCE OF MICROBES ON PSYCHIATRIC DISORDERS

Debilitating conditions such as Parkinson's disease (PD), bipolar disorder, Alzheimer's disease (AD), schizophrenia and traumatic brain injury might seem very different but they share similar traits and symptoms like apathy, low mood and cognitive dysfunction. Some of the underlying mechanisms of these brain disorders are also shared with a decreased connectivity between brain areas seen in almost all brain disorders. Interventions with microbiota (diet and probiotics) possess an enormous potential in the possible treatment of these disorders as microbiota is able to impact on these mechanisms. This is also supported by extensive research in rodents. It has been shown in various

studies that germ-free mice exhibit deviant social behaviour and stress response compared to normal mice as well as showing different brain development (smaller brain size). Their microbiota can be altered and 'reset' which results in normalized behaviour. It should be emphasized though that only live bacteria have proven to be effective; heat-killed bacteria do not have the same effects.

PARKINSON'S DISEASE AND MULTIPLE SCLEROSIS

Research showed that the intestinal tract can also be considered a target for Parkinson's Disease (PD), as Prof. Dr. Aletta D. Kraneveld (Utrecht University, the Netherlands) explained. This is due to alterations of the intestinal barrier, changed intestinal microbiome composition as well as gut microbiota-central nervous system (CNS) communication and low grade (intestinal) inflammation associated with immune deficits. A publication in *Cell* the day before the symposium demonstrated that gut microbes promote α -synuclein-mediated motor deficits and brain pathology. Also, depletion of gut bacteria reduces microglia activation, short-chain fatty acids (SCFA) modulate microglia and enhance PD pathophysiology. Administration of human gut microbiota from PD patients induces enhanced motor dysfunction in mice. Other research has shown that astrocytes play important roles in the CNS during health and disease; type I interferon's (IFN-I) signalling in astrocytes limits neurodegeneration through a mechanism mediated by the ligand-activated transcription factor AhR and SOCS2. In multiple sclerosis (MS) patients, AhR agonists were decreased which led to the hypothesis that decreased AhR signalling may act as a potential contributor to disease pathogenesis in MS.

AUTISM

Autism is another example of a disease in which microbiota play a key role. The cascade of events in early life (starting from pregnancy onwards) with regard to brain development emphasize the need to acknowledge and actively address the window of opportunities.

Mouse models have demonstrated that the offspring of mice who were fed a maternal high-fat diet (MHFD) are impaired in reciprocal social interactions as well as in social conditioned place preference. They also have significant long-term dysbiosis of the gut microbiome. Faecal transplantation with 'healthy' bacteria normalizes their social behaviour. Moreover, it is striking that gastrointestinal (GI) problems occur frequently in children suffering from neurodevelopment disorders such as autism and attention-deficit hyperactivity disorder (ADHD) with estimations of up to 90%. These findings add to the hypothesis that the gut-brain axis is of key importance in these disorders. Research in germ-free mice shows that microbiota influence behaviour, stress circuitry, stress responsively and brain structure, as Prof. Dr. Jane Foster (McMaster University, Canada) pointed out. "Host genetics and environment factors influence microbiota composition and diversity, and deciphering the molecular mechanisms involved is necessary to advancing the use of microbiota-targeted therapies for use in clinical populations."

FOOD FOR THOUGHT

The major modulator of gut microbiome variation is diet, and food items can make specific changes. For instance, milk protein/gluten-free diet has demonstrated to improve autistic behaviour. Reduced *Bifidobacterium* species were found at the age of 6 months in children later diagnosed with ADHD/Autism Spectrum Disorder (ASD).

Early life supplementation with probiotics was shown to increase the number of *Bifidobacterium* species and lower incidence. Taking these findings into account, dietary counselling as part of a mental health treatment plan can be seen as a realistic step towards a more holistic view of therapy. Research from Australia suggests that altering nutrition could even treat major depression. "Bacteria which may influence the capacity to deal with stress, reducing anxiety, and perhaps positively impacting on mood are called psychobiotics," Prof. Dr. Ted Dinan (University College Cork, Ireland) said. "Psychobiotics have potential in managing stress-related conditions and may improve cognition. We need more translational studies in this field to gain more insight." Prebiotics and probiotics will have a role as adjunctive therapies, Dr. Phil Burnet (University of Oxford, UK) concluded, but they will certainly not replace treatment with medication. A Dutch study assessing the effect of a multispecies mixture of probiotics on cognitive reactivity to sad mood showed a reduction in vulnerability to develop depression, in particular aggressive and ruminative thoughts were improved. Further studies in high risk populations are needed to establish potentially clinical relevant effects in prevention and enhancement of well-being, but so far, the future looks promising. In years to come, much more of the mysteries surrounding Mind, Mood & Microbes will be unravelled. Bringing the science and healthcare profession together is key to unravel the mysteries surrounding Mind, Mood & Microbes in the future. The first steps are made during this successful conference.

As initiating partner Winclove declares this will most definitely not be the last Mind, Mood & Microbes.



MIND, MOOD & MICROBES

The ability of gut microbiota to communicate with the brain is emerging as an exciting concept in health and disease. Mounting evidence, mostly from rodent studies, suggests that gut microbes help shape normal neural development, brain biochemistry, and behaviour.

Bridging the gap between animal studies and application for treatment in humans will be the next big challenge. There are still many mysteries when it comes to understanding how the microbiome might affect the brain. If research is able to resolve even a fraction of them, the microbiota-brain axis could be a powerful target for influencing mood and behaviour, such as anxiety and depression, as well as preventing or treating brain-related diseases, including (potentially) Parkinson's disease, Alzheimer's disease, schizophrenia and autism.

Watch or share the short video, with speakers from Mind, Mood & Microbes at



For more information or to subscribe to receive updates visit www.mindmoodmicrobes.org

The extended conference summary of the presentations of Mind, Mood & Microbes can be found at www.mindmoodmicrobes.org

The content of the conference scientific report is written by Constance de Koning from Medscope.

INITIATING PARTNER

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