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PRESS RELEASE

More than just bacteria: the importance of microbial diversity in gut health and disease

(March 10, 2014) The gut microbiota contains a vast number of microorganisms from all three domains of life, including bacteria, archaea and fungi, as well as viruses. These interact in a complex way to contribute towards both health and the development of disease — interactions that are only now being elucidated thanks to the application of advanced DNA sequencing technology in this field.

"Using novel metagenomic approaches, scientists are at last beginning to characterise the taxonomic abundance and community relationships not only of bacteria, but also the other microbes that inhabit the gut environment,"[1] says Professor Gary Wu (University of Pennsylvania, USA). "This exciting work is bringing us one step closer to understanding the importance of microbial diversity in intestinal health and disease and could ultimately lead to new ways of diagnosing and treating gastrointestinal (GI) disease." His talk was one of the topics presented at the Gut Microbiota for Health World Summit in Miami, FL, USA. On March 8–9, 2014, internationally leading experts discussed the latest advances in gut microbiota research and its impact on health.

The microorganisms that inhabit the gut can be broadly divided into prokaryotes (bacteria and archaea), bacteriophages (viruses that infect prokaryotes), eukaryotic viruses, and the meiofauna (microscopically small benthic invertebrates that live in both marine and fresh water environments — primarily fungi and protozoa).[1] Of these, bacteria have been the most extensively studied. The gastrointestinal tract is now considered one of the most complex microbial ecosystems on earth and understanding how the multiple communities interact presents both opportunities and challenges.

"We have known for some time that the bacteria in the gut play an important role in both health and disease," says Prof. Wu. "It is also now becoming clear that the non-bacterial microbiota interacts in a complex way with the bacterial microbiota to contribute to these processes."

Viruses in the gut

The most common viruses in the gut are the bacteriophages. These rapidly-evolving viruses can outnumber bacteria by a factor of 10 to one; they infect and destroy bacterial cells and have the ability to transfer genetic material from one bacterium to another, with potentially profound implications for GI health and disease.

"There is a predator–prey relationship between bacteriophages and bacteria that may play a role in altering the bacterial microbiota in conditions such as inflammatory bowel diseases (IBD)," says Prof. Wu. "The fact that bacteriophages induce immune responses in bacteria and may also transmit genomic material into bacteria that may alter their function makes these viruses extremely important and we need to know much more about them."

Meiofauna in the microbiota

DNA sequencing techniques have also confirmed the presence of commensal meiofauna in the GI tract that may be important in promoting health and disease.[1] Certain types of meiofauna (e.g. helminths and *Blastocystis*) are thought to protect against IBD by suppressing inflammation, and others believe that increased fungal diversity may contribute to GI diseases, including IBD.

"Decreases in fungal diversity have been shown to correlate with an increase in healthy bacterial colonisation following probiotic therapy, suggesting niche competition between fungi and bacteria," says Prof. Wu. "This effect is also evident in the development of mucosal *Candida* infection following antibiotic treatment."

Non-bacterial microbes and the future

Prof. Wu and others believe that the importance of trans-domain interactions in health and disease are only just beginning to emerge. By studying the complex relationships between bacterial and non-bacterial microbes in the gut, it is hoped that a greater understanding of pathogenic mechanisms will be gained, leading ultimately to novel approaches to diagnosis and treatment.

The microbial communities that reside in the human gut and their impact on human health and disease are one of the most exciting new areas of research today. To address the most recent advances in this rapidly developing field, scientists and health-care professionals from all over the world came together at the Gut Microbiota for Health World Summit in Miami, Florida, USA, on March 8–9, 2014. The meeting was hosted by the Gut Microbiota & Health Section of the European Society of Neurogastroenterology and Motility (ESNM) and the American Gastroenterological Association (AGA) Institute, with the support of Danone.

(1) Norman JM , Handley SA , Virgin HW. Kingdom-agnostic Metagenomics and the Importance of Complete Characterization of Enteric Microbial Communities. Gastroenterology. 2014 Feb 5. pii: S0016-5085(14)00154-1. doi: 10.1053/j.gastro.2014.02.001. [Epub ahead of print]

About the Gut Microbiota For Health Experts Exchange website

The www.gutmicrobiotaforhealth.com Experts Exchange, provided by the Gut Microbiota & Health Section of ESNM, is an online platform for health-care professionals, scientists, and other people interested in the field. Thanks to being an open, independent and participatory medium, this digital service enables a scientific debate in the field of gut microbiota.

Connected to www.gutmicrobiotaforhealth.com, the Twitter account @GMFHx, animated by experts, for experts from the medical and scientific community, actively contributes to the online exchanges about the gut microbiota. **Follow @GMFHx on Twitter. You can follow the Twitter coverage of the event using #GMFH2014**

About the Gut Microbiota & Health Section of ESNM
ESNM stands for the European Society of Neurogastroenterology and Motility, a member of United European Gastroenterology (UEG). The mission of the ESNM is to defend the interests of all professionals in Europe involved in the study of neurobiology and pathophysiology of gastrointestinal function. The Gut Microbiota & Health Section was set up to increase recognition of the links between the gut microbiota and human health, to spread knowledge and to raise interest in the subject. The Gut Microbiota & Health Section is open to professionals, researchers, and practitioners from all fields related to gut microbiota and health.
www.esnm.eu/gut_health/gut_micro_health.php?navId=68

About the AGA
The American Gastroenterological Association is the trusted voice of the GI community. Founded in 1897, the AGA has grown to include more than 16,000 members from around the globe who are involved in all aspects of the science, practice and advancement of gastroenterology. The AGA Institute administers the practice, research and educational programmes of the organisation. www.gastro.org

About Danone and Gut Microbiota for Health
Danone's conviction is that food plays an essential role in human health namely through the impact that the gut microbiota may have on health. That is why Danone supports the Gut Microbiota for Health World Summit and Experts Exchange web platform with the aim to encourage research and increase knowledge in this promising area, in line with its mission to "bring health through food to as many people as possible".
www.danone.com

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