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PRESS RELEASE

A tricky balancing act: antibiotics *versus* the gut microbiota

(March 10, 2014) Antibiotics are valuable, potentially life-saving tools that have significantly reduced human morbidity and mortality. Unfortunately, antibiotics may also have unintended consequences from their off-target effects that may increase the risk of many long-term conditions. Recent epidemiologic studies have detected a possible link between antibiotic use in childhood and weight gain¹ — with disruption to the normal gut microbiota considered the most likely cause.

“Infancy is an important time in the development of the human microbiota and these studies provide evidence that early exposure to antibiotics may disrupt the early-life microbiota and lead to changes in growth and metabolic development,” says Dr Laura Cox (New York University, USA). “In animal studies, we are carefully trying to understand how the intestinal microbiota influences body composition and metabolism and what impact antibiotics might have.” Her 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.

Antibiotics came into widespread use after the Second World War, with substantial public health benefits. Use of antibiotics has increased markedly, with infants and children averaging one course of antibiotics every year. Longstanding concerns over the broadening and sometimes inappropriate use of antibiotics (e.g. self-medication, use in viral infections, empirical use of broad-spectrum agents in cancer patients with neutropenia) have focussed primarily on the development of bacterial resistance, but it seems clear that antibiotics can also affect the bacteria we need in our guts, as well as those we want to eradicate. This, it seems, could have serious long-term consequences to our health.

Microbiota beyond the gut

The intestinal microbiota, composed of trillions of microbial cells, undertakes many vital immune, hormonal and metabolic functions. Disruption to normal colonization — through the over-use of antibiotic therapy — could, it has been suggested, be fuelling the dramatic increase in conditions such as obesity, type 1 diabetes, inflammatory bowel disease, allergies and asthma, which have more than doubled in prevalence in many populations. Evidence is also mounting that microbiota resilience decreases with each subsequent course of antibiotics² and that, once disrupted, the normal microbiota may never recover completely or it may be replaced by resistant organisms.^{3,4}

"We are just beginning to understand the roles that the intestinal microbiota plays in normal growth and development," says Dr Cox, "and further studies in both humans and experimental animal models are needed to characterize the potential impact of antibiotics on the microbiota and host physiology."

Body composition and metabolism

The spotlight has recently fallen on the role of the gut microbiota in normal growth and development, with scientists now concerned that altering the microbial balance in the gut with antibiotics may lead to weight gain. Low doses of antibiotics have been used for decades in the agricultural industry to promote weight gain in farm animals, and researchers have reported similar changes in body fat and tissue composition in laboratory animals given low-dose antibiotics.⁵ Studies are currently underway using sub-therapeutic antibiotic treatment as a tool to disrupt the microbial ecosystem and alter host body composition with the aim of identifying organisms within the microbiota that could either promote or protect against obesity.

"We are working hard to understand the link between antibiotic exposure, gut microbiota and body composition," explains Dr Cox. "Ultimately, our aim is to develop microbiota restoration strategies following antibiotic treatment to rebalance the gut microbiota and promote healthy growth and development."

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) Trasande L, Blustein J, Liu M, Corwin E, Cox LM, Blaser MJ. Infant antibiotic exposures and early-life body mass. *Int J Obes (Lond)*. 2013 Jan;37(1):16-23.
- (2) Dethlefsen L, Relman DA. Incomplete recovery and individualized responses of the human distal gut microbiota to repeated antibiotic perturbation. *Proc Natl Acad Sci U S A*. 2011 Mar 15;108 Suppl 1:4554-61.
- (3) Ghosh TS, Gupta SS, Nair GB, Mande SS. *In silico* analysis of antibiotic resistance genes in the gut microflora of individuals from diverse geographies and age-groups. *PLoS One*. 2013 Dec 31;8(12):e83823.
- (4) Sjölund M, Wreiber K, Andersson DI, Blaser MJ, Engstrand L. Long-term persistence of resistant *Enterococcus* species after antibiotics to eradicate *Helicobacter pylori*. *Ann Intern Med*. 2003 Sep 16;139(6):483-7.
- (5) Cho I, Yamanishi S, Cox L, Methé BA, Zavadil J, Li K, et al.. Antibiotics in early life alter the murine colonic microbiome and adiposity. *Nature*. 2012 Aug 30;488(7413):621-6.

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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