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DAVID A. MILLS

CV

PARTICIPANT AT:

THE HUMAN MICROBIOME. PRESENT STATUS AND FUTURE PROSPECTS

July, 2nd-3rd, 2015, Barcelona

David A. Mills, Professor in the Departments of Food Science & Technology and Viticulture & Enology at the University of California, Davis, USA

David Mills is a Professor in the Departments of Food Science & Technology and Viticulture & Enology at the University of California at Davis. Dr. Mills studies the molecular biology and ecology of bacteria that play an active role in gut health or fermented foods and beverages. In the last 20 years Dr. Mills has mentored over 30 graduate students and postdocs and published more than 120 papers, including seminal work on lactic acid bacterial and bifidobacterial genomics. In 2000, Dr. Mills founded the Lactic Acid Bacteria Genome Consortium, a multi-campus collaboration that led to the early genome sequencing of key lactic acid bacterial species, a critical advance for the probiotics and food fermentation fields. More recently he co-founded the Milk Bioactives Program, a successful multidisciplinary effort to define, investigate and translate the beneficial aspects of human milk and its role in human health. Dr. Mills has served as a Waksman Foundation Lecturer for the American Society for Microbiology and currently serves as an associate editor for the journal Microbiology. In 2010 Dr. Mills was awarded the Cargill Flavor Systems Specialties Award from the American Dairy Science Association, in 2012 he was named the Peter J. Shields Chair in Dairy Food Science and in 2015 he was named a Fellow in the American Academy of Microbiology. Dr. Mills also serves on the Science/Research Advisory Boards of several food and health-focused companies and his research has helped launch two start-up companies.

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ABSTRACT

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A Milk-Oriented Microbiota (MOM) in Infants: How a Good MOM Protects Infants

Human milk contains numerous components that shape the microbial content of the developing infant gastrointestinal tract. A prominent feature of milk is an array of complex glycans and glycoconjugates that serve a passive immune function by sequestering and deflecting pathogens while simultaneously enriching a protective, milk-oriented microbiota (MOM) often dominated by bifidobacteria. Recent research suggests the timing of establishment, and proper function of, a MOM is critical for infant development. A infant's MOM is initially established through environmental transfer to the gut and subsequently shaped by diet (milk) and host genetics. Once established, MOMs dominated by bifidobacteria exhibit low residual milk glycans and higher levels of short chain fatty acids in the feces, suggesting a strongly saccharolytic colonic microbiota. The mechanistic basis for milk glycan consumption by bifidobacteria has been the subject of active research. Different infant-borne bifidobacteria contain specific glycosidases and transport systems required to utilize free glycans or glycoconjugates. Consumption of milk glycans enhances specific bifidobacterial interaction with the infant host through both direct and indirect routes. Growth on free milk glycans results in increased bifidobacterial binding to epithelial cells and beneficially modulates intestinal function. In addition, metabolites generated during growth on milk glycans dampen inflammation and strengthen gut barrier function. In aggregate, these studies suggest a co-evolutionary relationship between mammalian milk glycans, infant-borne bifidobacteria and the infant host resulting in a programmed enrichment of a protective bifidobacterial-dominant MOM during a critical stage of infant development. Importantly, disruption of this programmed enrichment, by poor environmental transfer, antibiotic use, or infection, can lead to a "poorly functioning" MOM that may pose a risk for negative health outcomes. Further analysis of this naturally evolved system will shed light on effective pre- and probiotic tools that support and ensure a protective MOM for all at risk infants.

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