Modulation of fructose fermentation in fecal slurries obtained from obese subjects by *Anaerostipes caccae*, different *Lactobacilli* species, dietary electron acceptors and antibiotics

Fouad M. F. Elshaghabee¹, Wilhelm Bockelmann¹, Diana Meske¹, Hans-Georg Walte², Michael de Vrese¹, Jürgen Schrezenmeir³, Knut J Heller¹

¹ Department of Microbiology and Biotechnology, Max Rubner-Institut, Kiel, Germany
² Department of Safety and Quality of Milk and Fish Products, Max Rubner-Institut, Kiel, Germany
³ Johannes Gutenberg-University, Mainz, Germany

Increased consumption of high fructose diets correlates well with increased obesity and non-alcoholic fatty liver disease (NAFLD). Ethanol produced by the intestinal microbiota has been discussed to be involved in development of NAFLD in animals and humans. In order to take a closer look at this problem, a simple fermentation model was established for evaluating the modulation of fructose fermentation of fecal slurries obtained from four obese healthy subjects by addition of *Anaerostipes caccae*, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Lactobacillus fermentum*, *Weissella confusa*, citrate, pyruvate, vancomycin or neomycin. The results obtained generally reflected the anticipated metabolic activities. Mannitol, lactate, acetate and ethanol were the major metabolites of fructose fermentation by fecal slurries. Occurrence of mannitol in fermentations of fructose in slurries could be considered as an indicator for presence of heterofermentative lactobacilli. Butyrate was the major metabolite when *A. caccae* was inoculated with fecal slurries. Addition of *W. confusa* (mannitol-negative) resulted in increased ethanol amounts and alcohol dehydrogenase activity. No ethanol could be detected when fermentation media were supplemented with *L. acidophilus*, *L. bulgaricus*, *L. fermentum* (mannitol-positive), citrate, pyruvate, vancomycin or neomycin. Our results represent the first *in vitro* trial for modulation of metabolites of obese gut microorganisms by using two heterofermentative lactobacilli species differing in their abilities to produce mannitol from fructose fermentation, the latter resulting in reduced production of ethanol. We now plan to examine the effects of dietary pyruvate, citrate, *L. fermentum* and butyrate-producing bacteria like *A. caccae* in animal model. By this we want to see, whether combinations of dietary electron acceptors, *A. caccae* or *L. fermentum* will change the overall metabolic profiles in general and production of ethanol in particular, and thereby effect development of NAFLD.

Key words: *Weissella confusa*, *Lactobacillus fermentum*, *Lactobacillus acidophilus*, *Lactobacillus bulgaricus*, *Anaerostipes caccae*, fructose fermentation, ethanol, pyruvate, vancomycin, neomycin, intestinal microbiota, metabonomics