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Gut Microbiology: from sequence to function

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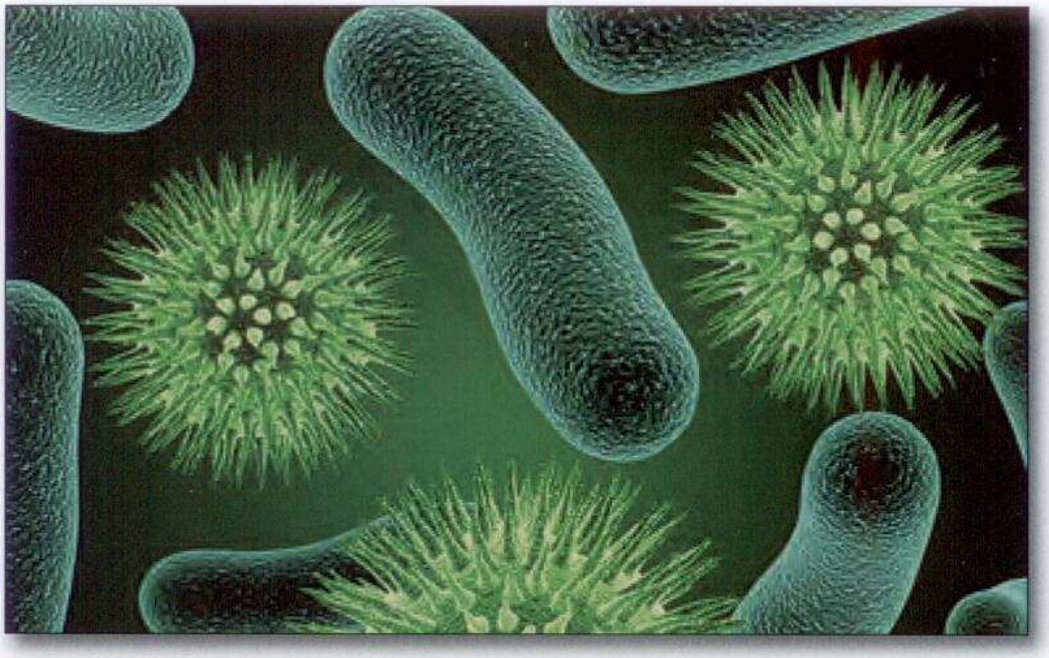

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P 121

Different apple varieties modulate the composition and activity of the human gut microbiota *in vitro*.

Francesca Fava, Athanasios Koutsos, Maria Lima, Lorenza Conterno, Urska Vrhovsek, Fulvio Mattivi, Roberto Viola, Kieran Tuohy
Department of Food Quality and Nutrition, Research and Innovation Centre - Fondazione Edmund Mach,, San Michele all'Adige, Trento, 38010, Italy

Apples are among the most frequently consumed fruits and a good source of both polyphenols and soluble fibre. A major proportion of apple polyphenols escape digestion in the stomach and small intestine, and together with apple non-digestible polysaccharides reach the colon and may serve as substrates for bacterial fermentation. The aim of the current study was to assess the effect of four commercial apple varieties - Gold Rush, Renetta, Golden Delicious and Pink Lady – on the composition and metabolic activity of human gut microbiota compared to a readily fermented fiber (inulin) and a fiber poorly fermented by the human gut microbiota (cellulose), using pH controlled in vitro batch cultures following simulated gastric and small intestinal digestion. Inulin and all apple varieties significantly increased numbers of bifidobacteria and to a lesser extent, lactobacilli. Apples also showed a smaller increase in enterobacteria compared to inulin andcellulose. Upon UPLC/QqQ-MS/MS, the fermentations of the different apples varieties showed different nutrikenitics for the major apple polyphenolic compounds, with Renetta Canada showing high levels of gallic acid, epicatechin, phlorizin and chlorogenic acid, while Gold Rush fermentations were characterized by higher concentrations of quercetin, quescetin-3-Rha and Quescetin-3-glc and derivatives over the 24 h fermentation period. This in vitro study shows the potential of different apple varieties to modulate the composition of the gut microbiota towards a more health promoting profile. We are currently conducting a human dietary intervention with Renetta Canada in subjects at risk of the metabolic syndrome.

P 122

Influence of yeast autolysates on rumen fermentation in vitro

Christian Stoiber, Ilse Dohnal, Anja Ganner, Daniel Kössler, Gerd Schatzmayr
BIOMIN Research Center, 3430 Tulln, Austria

Yeast has been used as feed additive for ruminants for several years. Inactivated yeast derivatives serve as nutritional source in the rumen and thereby support the growth of beneficial microbes. One special type of inactivated yeast is produced by autolysis. This process degrades macromolecules of the yeast cell, whereby active components, such as peptides and B-vitamins, are released and are highly available for the microbial flora in ruminants. Objective of the current study was to investigate the influence of different autolysis durations of Saccharomyces cerevisiae on rumen fermentation parameters in vitro using batch fermentations.

Rumen fluid, together with synthetic saliva, concentrate feed and chopped hay, was incubated under anaerobic conditions for 24 hours at 39 °C. Yeast products with different autolysis durations were added at the start of fermentation. Samples of fermentation broth were taken at 0 and 24 hours of incubation. Parameters of interest were the pH value and concentrations of organic acids (acetate, propionate, butyrate and lactate).

Generally, addition of yeast products resulted in increased concentrations of acetate, propionate and butyrate. Yeast products with longer autolysis durations elevated acid concentrations to a greater extent than those with shorter autolysis durations. These results support the hypothesis of a time-dependent release of ingredients during autolysis and may contribute to optimization of industrial downstream processing for ruminant-specific yeast derivatives.