Dietary fibers and propionate production in an in vitro gut fermentation system

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Introduction:
Gut microbiota could be important in metabolic disorders such as propionic acidemia (PA) where the biochemical and clinical features are caused by the accumulation of propionyl-CoA and other metabolites. Dietary fibers are known to influence the composition and activity of gut microbiota, and consequently, the production of short chain fatty acids (SCFA). Dietary fibers, recommended to manage constipation in PA, could influence the outcome of PA patients. The objective was to evaluate the effect of commercialized fiber mixtures, including those used in PA, on fecal microbiota composition and fecal SCFA production.

Methods:
The effect of 2 fiber mixtures with the 6 fibers: oligofructose, inulin, resistant starch, cellulose, arabic gum, and soy polysaccharides (with and without Guar Gum) and 2 partially hydrolyzed Guar Gum (with and without starch) mixtures as well as several controls (GOS, FOS, lactose), on fecal microbiota composition (16 S rRNA gene amplicon sequencing) and SCFA production were measured after 24-hour incubation in a high-throughput anaerobic colon model. The i-screen TM model was inoculated with standardized healthy human adult gut microbiota mixtures (fecal donations of 6 Caucasian adults).

Results:
The most striking difference between the fiber mixtures was observed in the propionic acid production, which was lower in the incubations of both 6 fiber mixtures versus both Guar Gum mixtures. Microbiota composition was comparable between the different mixtures.

Conclusion:
Different fiber mixtures result in variant levels of propionic acid production. Further research is needed to evaluate if fibers can modulate the clinical features of PA patients.