

## Comparison of meat versus soya based high-protein diets on faecal microbiota and microbial metabolites

S.W. Gratz<sup>1</sup>, L. Scobbie<sup>1</sup>, A.J. Richardson<sup>1</sup>, X. Zhang<sup>2</sup>, C. Fyfe<sup>1</sup>, F.M. Farquharson<sup>1</sup>, G. Duncan<sup>1</sup>, J. Filipe<sup>3</sup>, W.Y. Zhu<sup>2</sup>, A.M. Johnstone<sup>1</sup>, P. Louis<sup>1</sup> and W.R. Russell<sup>1</sup>

<sup>1</sup>Rowett Institute, University of Aberdeen, Aberdeen, UK,

<sup>2</sup>College of Animal Science and Technology, Nanjing Agricultural University, Nanjing, China and

<sup>3</sup>Biomathematics and Statistics Scotland, Aberdeen, UK

High-protein, low carbohydrate diets are popular and efficient weight loss regimes, but we have previously shown that meat based high-protein diets had a negative effect on faecal metabolites and gut microbiota <sup>(1)</sup>. We therefore conducted a study to investigate whether vegetarian high-protein diets would have the same effect.

After 3 days on a balanced weight maintenance diet, 20 obese men received two high-protein weight loss diets with either beef or soya as the main protein source for 2 weeks each <sup>(2)</sup>. Faecal samples were collected at the end of each dietary period and faecal microbial DNA was extracted for qPCR bacterial profiling. Faecal water was extracted by high-speed centrifugation for short chain fatty acid (SCFA) analysis by GC and metabolite analysis by LC-MS/MS. Data were analysed by ANOVA with volunteer as a random effect and diet as a fixed effect and where diet effect was significant ( $P < 0.05$ ), means were compared with post hoc t-test.

The soya diet resulted in significant ( $p < 0.05$ ) shifts in gut microbiota composition increasing the proportions of *Faecalibacterium prausnitzii* and *Lactobacillus* spp. while decreasing the proportions of bacteria related to some *Ruminococcus* spp., *Oscillibacter*, *Desulfovibrio* spp. and Methanogens compared to the meat diet. Total faecal SCFA and the proportions of individual SCFA did not differ between individuals consuming meat or soya diets ( $p > 0.05$ ). Protein-derived metabolites (phenylacetic acid, phenylpyruvic acid and the proportion of branched-chain fatty acids iso-butyrate and iso-valerate) tended to be higher on both high-protein diets with no significant differences between soya and meat diets ( $p > 0.05$ ).

Several toxic and proliferative polyamines were significantly lower ( $p < 0.05$ ) on the soya diet compared to meat (cadaverine 69.4% decrease, piperidine 66.0% decrease, spermidine 49.4% decrease, spermine 81.5% decrease).

Heterocyclic amines were also significantly ( $p < 0.05$ ) lower on the soya diet compared to meat (IQ 26.7% decrease, MeIQ 36.7% decrease, MeIQx 44.8% decrease, 4,8DiMeIQx 69.6% decrease, DMIP 30.9% decrease). N-nitrosocompounds were also significantly lower on soya diet compared to meat (41.1% decrease) whereas genotoxicity of faecal waters remained unaltered by diet changes ( $p = 0.56$ ).

These results suggest that high-protein diets based on plant protein are less problematic in terms of intestinal health when compared to meat-based diets and might offer a safe option to support weight loss regimes.

1. Russell WR, Gratz SW, Duncan S, Holtrop G, et al. (2011) *Am J Clin Nutr* **93**, 1062–1072.
2. Neacsu M, Fyfe C, Horgan G & Johnstone AM (2014) *Am J Clin Nutr* **100**, 548–558.