

Targeted delivery of propionate to the human colon prevents body weight and intra-abdominal adipose tissue gain in overweight adults

E. S. Chambers¹, A. Viardot¹, A. Psichas¹, D. J. Morrison², K. G. Murphy³, S. E. K. Zac-Varghese³, K. MacDougall⁴, T. Preston², M. C. Tedford⁴, J. D. Bell⁵, E. L. Thomas⁵, S. Mt-Isa⁶, D. Ashby⁶, W. S. Dhillon³, S. R. Bloom³, W. G. Morley⁷, S. Clegg⁷ and G. Frost¹

¹Nutrition and Dietetic Research Group, ²Scottish Universities Environmental Research Centre, University of Glasgow, G75 0QF, UK, ³Section of Investigative Medicine, Imperial College London, W12 0NN, UK, ⁴School of Science, University of the West of Scotland, Paisley PA1 2BE, UK, ⁵MRC Clinical Science Centre, Imperial College London, W12 0NN, UK, ⁶Imperial Clinical Trials Unit, Imperial College London, W2 1NY, UK and ⁷Leatherhead Food Research, Leatherhead KT22 7RY, UK

The colonic microbiota ferment available carbohydrates, producing short chain fatty acids (SCFAs), which trigger the release of the anorectic gut hormones peptide YY (PYY) and glucagon like peptide-1 (GLP-1) by stimulating the free fatty acid receptors (FFAR) 2 and 3 on the enteroendocrine L cells⁽¹⁾. We have developed a novel inulin propionate ester that targets delivery of gram quantities of the SCFA propionate to the human colon and which significantly increases PYY and GLP-1 secretion and reduces food intake following acute ingestion at a dose of 10 g (unpublished observation). We hypothesised that long-term supplementation with propionate ester would prevent weight gain in overweight adults.

Forty nine men and women aged 40–65 years, with a body mass index (BMI) of 25–40 kg/m² were recruited and randomly assigned to receive either 10 g/day inulin control (*n*=24) or 10 g/day propionate ester (*n*=25) for 24-weeks. Body composition data, assessed using magnetic resonance imaging, was collected from 17 subjects in the propionate ester group and 15 subjects in the control group.

AT Distribution (% Total AT)	Control (<i>n</i> =15)				Propionate Ester (<i>n</i> =17)				Propionate Ester – Control	
	Week 0		Week 24		Week 0		Week 24		Mean	95% CI
	Mean	SE	Mean	SE	Mean	SE	Mean	SE		
Subcutaneous AT	81.3	1.9	80.6	1.8**	76.3	1.7	76.0	1.6	-0.59	1.69, 0.50
Internal AT	18.7	1.9	19.4	1.8**	23.7	1.7	24.0	1.6	-0.23	-1.09, 0.64
Intra-Abdominal AT	10.6	1.2	11.1	1.4***	13.2	1.2	13.1	1.1	-0.46	-0.87, -0.05†
Abdominal Subcutaneous AT	23.1	0.9	22.7	0.8	21.9	0.7	21.6	0.7	-0.23	-0.88, 0.42

AT, adipose tissue. ***P*<0.01 within-group, ****P*<0.001 within-group, †*P*<0.05 between groups.

Significantly fewer subjects gained ≥3% (*P*=0.036) and >5% (*P*=0.033) of their baseline body weight following propionate ester supplementation. Weight loss after 24 weeks was greater in the propionate ester group, but this effect was not significantly different between groups (-1.02 kg [95% CI, -2.10 to 0.04] propionate ester vs. 0.38 kg [95% CI, -0.95 to 1.72] control; *P*=0.099). The change in the distribution of intra-abdominal adipose tissue (AT) was significantly lower in the propionate ester group compared with control supplementation (*P*=0.027). Furthermore, internal AT (*P*=0.002) was significantly increased within the control group, but not in the propionate ester group.

In conclusion, this investigation provides the first direct evidence that colonic propionate can prevent body weight and intra-abdominal AT gain in humans. Dietary strategies that promote colonic propionate production may play a role in weight management over the life-course.

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1. Tolhurst G, Heffron H, Lam YS, *et al.* (2011) *Diabetes* 61, 364–371.