

Effects of increased soluble dietary fibre and protein on body fat and metabolic health in high fat diet-induced obese rats

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Use of food ingredients that enhance satiety, promote weight loss and improve metabolic health may have practical application in obesity management. The macronutrients most commonly associated with increased satiety are protein and dietary fibre and here we investigate their potentially interactive effects in diet-induced obese (DIO) rats. The soluble fermentable dietary fibre pectin (10% w/w) promotes satiety and weight loss in our DIO model⁽¹⁾ but the effects of increased protein of either animal (casein) or plant (pea) origin are unknown. Young adult male outbred Sprague Dawley rats that had been reared on a high fat diet to generate DIO (standard purified diet with 45% energy from fat; HF) were offered the following 6 purified experimental diets *ad libitum* for 4 weeks (*n* 8 per group): high fat diet alone (HF), or high fat diet with high fibre (10% w/w pectin; HF+P), with high casein protein (40% energy from protein; HFHC), with high pea protein (HFHP), with high casein protein and high fibre (HFHC+P), or with high pea protein and high fibre (HFHP+P). Voluntary food intake was measured daily, body weight twice weekly, body composition at start and end (by MRI), and final trunk blood samples were analysed for plasma hormones (by RIA). Mean (SEM) body weight and total body fat at the start were 567 (8.0) g and 96 (4.6) g, respectively, and final results after 4 weeks were:

	Diet (<i>n</i> 8 per group)						SED
	HF	HF+P	HFHC	HFHC+P	HFHP	HFHP+P	
Cumulative intake (kcal)	2792 ^a	2128 ^{bc}	2584 ^{ad}	1939 ^c	2420 ^{bd}	2176 ^c	242.2
Body weight change (g)	106 ^a	34 ^{bc}	86 ^{ad}	-4.2 ^c	63 ^{bd}	24 ^c	12.4
Fat mass change (g)	39 ^a	-15 ^{bc}	30 ^a	-25 ^b	1.6 ^c	-24 ^b	8.8
Lean mass change (g)	34	59	56	36	44	39	11.3
Total GLP-1 (ng/ml)	16.5 ^a	28.7 ^{bc}	22.2 ^{ac}	33.5 ^b	22.8 ^{abc}	30.7 ^{bc}	3.8
PYY (pg/ml)	215 ^a	365 ^b	227 ^a	374 ^b	201 ^a	343 ^b	34.9
Leptin (ng/ml)	8.9 ^a	3.5 ^b	8.2 ^{ac}	2.3 ^b	5.0 ^{bc}	2.6 ^b	1.01
Insulin (ng/ml)	2.5 ^a	1.3 ^{bc}	1.5 ^{bc}	0.9 ^c	1.9 ^{ab}	1.2 ^{bc}	0.25

Within rows, mean values with different superscript letters are significantly different, *P* < 0.05 (ANOVA).

Food intake and body weight gain were decreased and satiety hormones PYY and GLP-1 increased in all diets with added pectin compared with HF diet. Food intake and body weight gain were intermediate in diets with high pea protein alone and were not affected by high casein protein alone. Lean mass gain was not different between groups but all pectin-containing diets induced loss of body fat and high pea protein alone prevented body fat gain. Plasma leptin and insulin concentrations were decreased by all pectin-containing diets compared with HF diet and were intermediate on diets with high pea protein alone and high casein protein alone.

Therefore, soluble fermentable dietary fibre appeared more effective than high protein of either animal or plant origin for decreasing voluntary caloric intake, decreasing adiposity and improving metabolic health while on a high fat diet, and there was little evidence for interaction between these two dietary constituents.

Research funded by the Scottish Government Rural and Environment Science and Analytical Services Division.

1. Adam CL, Thomson LM, Findlay PA, Ross AW (2014) *Proceedings of the Nutrition Society*, OC142