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The influence of a carbohydrate and whey protein based breakfast on metabolic and appetite parameters following a second meal

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Whey protein consumption may improve metabolic health outcomes by influencing glucose metabolism, appetite and consequently energy balance[1]. Ingestion of whey has been shown to amplify insulin secretion in comparison with other proteins[2,3] and this insulinotrophic property may be beneficial in reducing postprandial hyperglycaemia which, in the long term, is a significant risk factor for type 2 diabetes. The aim of the present study was to investigate the effect of adding whey protein to a carbohydrate breakfast on postprandial metabolism and appetite responses following a subsequent standard meal.

Healthy male participants ($n = 10$; age 24(2) y, mass 79·7(3·8) kg, BMI 24·5 (2·1) kg/m^2) performed three trials in a randomised and counter-balanced fashion, consuming either a carbohydrate breakfast (CHO) (1800 kJ, 86% energy from carbohydrate) with or without the addition of 20 g of whey protein isolate (CHO + WP), or omitting breakfast (NB). At 180 minutes post-breakfast participants consumed a standardised pasta based lunch meal (3427 kJ, 49%, 37% and 14% energy from carbohydrate, fat and protein respectively) and remained at rest for a further 180 minutes. Throughout, regular venous blood samples were collected for the determination of blood glucose, plasma insulin and plasma triglyceride. Visual analogue scales captured subjective appetite responses throughout the study protocol.

Blood glucose concentrations increased similarly after both breakfast meals (peak; CHO: 6·44(0·34) vs CHO+WP: 5·50(0·17) mmol/l, $p > 0·05$), with no change observed under NB ($p > 0·05$). Post breakfast insulinaemia was greater after CHO+WP than CHO (time averaged AUC; CHO: 154·7(18·5) vs CHO+WP: 193·1(26·3), $p = 0·033$), while similar triglyceride responses were observed between all three trials ($p > 0·05$). Following a subsequent meal there were no differences across all trials in glycaemia (CHO: 3·99(0·15) vs CHO+WP: 4·14(0·13) vs NB: 4·13(0·96) mmol/l, $p > 0·05$) or insulinaemia (CHO: 136·9(15·7) vs CHO+WP: 130·7(18·8) vs NB: 110·8(18·6) pmol/l, $p > 0·05$). Triglyceride concentrations were similarly elevated following lunch in CHO and CHO+WP (AUC; CHO: 0·99(0·11) vs CHO+WP: 1·16(0·16) mmol/l, $p = 0·327$), both remaining significantly higher than NB (0·82(0·10) mmol/l, $p > 0·05$). There were no differences in sensations of fullness (AUC; CHO: 45(5) vs CHO+WP: 48(4) mm, $p > 0·05$) or hunger (CHO: 54(4) vs CHO+WP: 49(4) mm, $p > 0·05$) between CHO and CHO+WP across the entire trial period (360 minutes).

The addition of whey protein to a carbohydrate-based breakfast increased the insulinaemic response to that meal, however it did not subsequently influence metabolic or appetite responses following a second meal. Omitting breakfast consumption induced comparable glycaemic, insulinaemic and appetite responses to subsequent feeding.

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