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Impact of whey protein isolate and leucine on postprandial glycaemia: findings from the Whey2Glo study

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Evidence suggests that whey protein can enhance glycaemic control[(1)] and that this effect is primarily due the insulinotropic effect of the amino acid L-leucine[(2)]. The Whey2Glo study aimed to compare the effects of whey protein isolate (WPI) with partially hydrolysed wheat protein (PHWP) and determine whether the L-leucine content of the PHWP treatment had an impact on postprandial glycaemia and gut hormones in participants with normal to moderately elevated fasting glucose concentrations. An acute, double-blind, controlled, cross-over study was conducted in 9 adults (mean±SD age: 61 ± 6 y, BMI: 24.4 ± 2.0 kg/m^2 and fasting glucose: 5.43 ± 0.94 mmol/L). After an overnight fast, they were randomised to consume iso-energetic sequential high-fat test meals at breakfast (0 min; 4.2 MJ, 52 g fat, 96 g carbohydrate and 37 g protein) and lunch (330 min; 2.6 MJ, 32 g fat, 47 g carbohydrate and 37 g protein), containing 25 g of either WPI, PHWP, or PHWP plus leucine (1.3 g) on separate occasions at least 3 weeks apart. Blood samples were collected before (fasting) and at 30, 60, 90, 120, 180, 240, 300, 330, 360, 390, 420 and 480 min after breakfast to measure serum insulin (primary outcome), glucose and gut hormones. Postprandial time course profiles were analysed using a 2-way repeated measures ANOVA and the summary measures area (AUC) and incremental area under the curve (iAUC) were calculated and analysed using 1-way repeated measures ANOVA.There was a significant effect of protein treatment on the postprandial insulin response ($P = 0.009$), with a higher AUC and iAUC observed after the meals containing PHWP plus leucine compared to PHWP alone ($P \leq 0.011$). The WPI containing meals also induced a higher insulin AUC than PHWP alone ($P = 0.046$) whereas the iAUC for the C-peptide response was significantly lower compared with PHWP plus leucine ($P = 0.049$). PHWP alone significantly increased the iAUC for the glucose-dependent insulinotropic polypeptide response compared to WPI ($P = 0.045$). Although fasting glucose concentrations were significantly different prior to the intake of the WPI compared with the PHWP ($P = 0.022$) containing meals, the iAUC for the postprandial glucose responses were found to be similar between protein treatments. No significant differences were observed for the ghrelin and glucagon like peptide-1 responses after the three protein interventions. Our data supports the hypothesis that L-leucine has a postprandial insulinotropic effect and may be one of the bioactive amino acids in WPI. However, despite the higher postprandial insulin concentrations, there was no effect on the postprandial glucose response which may represent a power issue for this secondary outcome measure. These findings need confirmation in larger, sufficiently powered postprandial studies in those with normal and hyper-glycaemia.

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References

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