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The potential of dairy and non-dairy proteins for blood glucose management

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Type II Diabetes Mellitus (T2DM), is an increasingly concerning global epidemic, worsened by a lack of physical activity and the current obesogenic environment[1,2]. Despite the existing efforts to manage this disease, there is a definite need for enhanced lifestyle interventions and novel dietary strategies to prevent and treat T2DM. Evidence suggests that proteins may play a role in the management of blood glucose levels, by numerous mechanisms, including their insulin stimulating effects[3,4]. The aim of this research is to elucidate the potential glycaemic management properties of a range of plant derived proteins alone or in combination with dairy proteins.

In vitro experiments were conducted in the BRIN-BD11 cell line. Acute insulin secretion experiments (n = 4) were performed. Cells were incubated for 20 mins in the presence of a range of intact proteins [1 mg/ml]: two dairy fraction proteins (DFP) (DFP-1 and DFP-2), and two plant derived proteins (PDP) (PDP-3 and PDP-4); and hydrolysed proteins [1 mg/ml] including two hydrolysed plant derived proteins (HPDP) (HPDP-5 and HPDP-6) and one hydrolysed dairy fraction protein (HDFP) (HDFP-7); all in 16·7 mM glucose. Insulin release was measured by ELISA assay (Mercodia Ultrasensitive Rat Insulin, Sweden). Statistical analysis was performed using SPSS V20 software.

HPDP-5 and -6 both stimulated insulin secretion above baseline, while the intact proteins and HDFP-7 did not. Exposure to HPDP-5 and -6 induced an insulin release significantly higher than the baseline, 16·7 mM glucose; and significantly higher than their respective intact proteins (PDP-3 and -4) (table 1). Exposure to a combination of DFP-1 + HPDP-5 demonstrated an enhanced insulin release, which was significantly higher than baseline, positive control, DFP-1, the combination of DFP-1 + HPDP-5 and the HPDP-5 alone, $p < 0{\cdot}05$ (table 1).

Table 1. $P < 0{\cdot}05$ vs baseline 16·7 mM glucose; a significantly higher than baseline 16·7 mM glucose; b significantly higher than respective intact protein; c significantly higher than positive control 16·7 mM glucose + 10 mM L-alanine; d significantly higher than intact diary fraction protein 1 (DFP-1) + hydrolysed plant derived protein 5 (HPDP-5).

Treatment	Mean Insulin Release (ng/mg protein)	SD	*p*-value
Baseline	18·587	3·429	–
Positive Control	32·635[a]	3·642	<·0001
HPDP-5	38·712[ab]	2·703	<·0001
HPDP-6	33·100[ab]	4·574	<·0001
HPDP-5 + DFP-1	61·644[abcd]	2·021	<·0001

The cellular mechanisms of the glucose stimulated insulin secretion (GSIS) observed by the HPDP-5 and its enhanced effect when combined with an intact dairy fraction protein, DFP-1, are currently being examined, and should also be studied *in vivo*. This research will lay the foundations for the development of innovative foods ingredients for potential use in functional foods, targeted at pre-diabetics and people with T2DM.

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