Anti-allergy effects of whey protein hydrolysates in human peripheral blood mononuclear cells

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Background: 20 to 30% of infants in Europe are diagnosed with an atopic (allergic) disease. The majority of first atopic responses are directed towards food proteins that are consumed during the first months of life. There is increasing evidence that certain milk-derived components have positive effects on infant health. Ongoing research in this area has identified immunomodulating ingredients (milk-derived hydrolysates) which have potential to support the immune system in an allergy setting. Hydrolysing the proteins in infant formula is one approach in the management of allergic responses in infants. These hydrolysed proteins which lack allergenic IgE binding sites can modulate T-cell differentiation away from a Th2 response and decrease inflammation. Our research focus is on identifying hydrolysates that can be added to infant formula to ameliorate cow’s milk allergy.

Objective: The aim of this study was to identify milk protein hydrolysates (peptides) with (anti-inflammatory/anti-allergy) properties using an in vitro approach.

Methods: To that end, hydrolysates were screened for their immunomodulatory properties in 4 cellular models, human peripheral blood mononuclear cells (PBMC), human monocyte dendritic cells (DC), T helper 1 (Th1) polarised and Th2 polarised cells. Specifically, T cell proliferation was analysed, before and after the addition of hydrolysates using a CFSE assay by flow cytometry and cytokine levels, released in the culture supernatants were measured by ELISA. DC maturation and cytokine production were also examined by flow cytometry and ELISA. Naïve human CD4^+ T cells were activated with plate-bound anti-CD3 and anti-CD28 and then cultured under Th1 or Th2 polarising conditions with or without hydrolysates for 4 days. Transcription factor expression was then assessed by flow cytometry.

Results: A number of hydrolysates significantly decreased T cell proliferation driven by anti CD3/CD28 beads and several downregulated the maturation marker CD86 in DCs. Select hydrolysates increased the expression of T-bet and Gata-3, decreased production of the pro-inflammatory cytokines IFN-gamma and IL-6 and increased anti-inflammatory IL-10.

Conclusion: Thus far we have identified a number of hydrolysates which promote an anti-inflammatory /anti-allergy T cell and DC phenotype. Further work will examine these hydrolysates in an in-vivo humanised mouse model of allergy in order to confirm their protective impact.

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