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Oral Abstract 11 - Lowering Glucose and Insulin Responses to a Starchy Staple: From Formulation to Flux (David Mela, The Netherlands)

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Objective: There is growing endorsement for the benefits of lowering acute post-prandial glucose (PPG) and insulin (PPI) responses to carbohydrate-rich staples. This work describes the selection and effects of incorporating viscous fibres and an alternative starch source into the wheat-based flour ('atta') used for making flatbreads, a widely-consumed carbohydrate source in South Asia.
Methods: From existing literature, *in vitro* glucose release, and product feasibility, guar gum (GG), konjac mannan (KM) and chickpea flour (CPF) were prioritized for clinical testing in freshly prepared flatbreads. Trial 1 (balanced-order incomplete block design, n=38 UK subjects) compared 10 modified atta formulations (2/4/6% GG; 2/4% KM; 15% CPF, and 10 or 15% CPF plus 2 or 4% GG) to an existing full-fibre commercial product reference. Based on those results, Trial 2 (full crossover design, n=50 Indian subjects) tested 3 formulations (15% CPF + 2/3/4% GG). Trial 3 then measured effects of CPF+GG on glucose fluxes using dual isotope labelling (n=12 Dutch males).
Results: In Trial 1, 6% GG, 4% KM, and 15% CPF plus 2 or 4% GG produced significant ($p<0.01$), ≥30% reductions in PPG 2-hr incremental area under the curve. A model with 3 *in vitro* parameters closely predicted these results ($R^2_{adj}=0.98$). Trial 2 largely confirmed the results for PPG also with marked PPI reductions, both GG dose-related. Trial 3 showed these reductions in PPG and PPI occurred with modest reductions in glucose uptake and clearance, and much more substantial suppression of hepatic glucose production rate.
Conclusions: 1) The combined CPF+GG formulations significantly reduce PPG and PPI; 2) *in vitro* assays can aid in prioritizing formulations for clinical testing; and 3) the dose-related PPG-lowering effects of GG+CPF predominantly reflect post-absorptive effects rather than rates of glucose uptake.
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