



Evaluating the effect of replacing wheat flour with legume flour on ileal amino acid digestibility in healthy adults with an ileostomy

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Protein-rich animal foods are highly digestible, high-quality sources of protein, whereas the protein quality of plant-based foods can vary considerably. Given the growing interest in alternative non-animal-based sources of protein, it is important to establish the protein digestibility of these new foods and protein concentrates which have important health implications especially for vulnerable groups who don't consume sufficient dietary protein. The human ileostomy model is ideal for measuring protein digestibility as it enables protein digestion to be quantified independent of protein degradation in the large intestine. The aim of this study was to determine the protein digestibility and quality of a wheat-based food containing legume flours. This randomised, double-blinded, controlled cross-over intervention was conducted in 4 proctocolectomised adults with conventional and well-functioning permanent ileostomies. The study was conducted over 2 weeks and on each testing day, the participant consumed 2 test muffins (125 g each) or 2 protein-free cookies in the morning (breakfast and morning tea) followed by a standardised low-protein lunch and afternoon tea. Test muffins were made using a standard muffin recipe using wheat flour and for 2 of the test muffins 50% of the flour was substituted with soy or lupin flour. An indigestible marker, titanium dioxide was added to the muffins so that the completeness of muffin recovered in ileal digesta could be calculated. The digestible indispensable amino acid score (DIAAS) was determined by comparing concentrations of true ileal digestible indispensable amino acids to recommended amino acid requirements⁽¹⁾. Data was reported as mean \pm SD and repeated measures ANOVA was used to compare means between treatment groups with significance reported at $P < 0.05$. Substituting 50% of wheat flour in muffins with soy or lupin flour doubled the protein content of muffins (soy 11.8 g/100g and lupin 10.6 g/100g) compared to muffins that only contained wheat flour (wheat 5.1 g/100g). However, substituting wheat with legume flour did not affect protein digestibility which was similar for all muffin types; wheat ($76.8 \pm 7.0\%$), soy ($77.9 \pm 7.4\%$) and lupin ($81.6 \pm 6.9\%$) ($P = 0.181$). The DIAAS values for all muffins were below 75% which is classified as the cut off for a good quality protein food. In conclusion, substitution of wheat-based muffins with soy and lupin flour increased the protein content of wheat-based muffins but protein digestibility and overall protein quality was similar.

Keywords: legume; protein; amino acid; digestibility

Ethics Declaration

Yes

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Reference

1. Food and Agriculture Organization of the United Nations (FAO). Dietary Protein Quality Evaluation in Human Nutrition. Report of an FAO Expert Consultation. Rome: FAO; 2013.