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A STUDY OF THE DIGESTION
OF PROTEIN IN HUMANS
USING ILEAL AND FAECAL
ASSAYS.

A thesis presented in partial fulfilment of the
requirements for the degree of Master of Science in
Biochemistry at Massey University.

Angela Marie Rowan

1989

MASSEY UNIVERSITY



1061195579

*This thesis is dedicated to my husband,
Grant, and to my parents for always wanting
and expecting the best for me.*

ABSTRACT.

A study was conducted with 12 adult human subjects including six ileostomates, to determine the digestibility of protein in a single mixed diet. Significant ($P < 0.05$) differences were found between ileal and faecal amino acid digestibility values for most amino acids (histidine, arginine, aspartate, threonine, serine, glycine, proline, valine, leucine, phenylalanine, methionine, cysteine and tryptophan). The ileal digestibility coefficients ranged from 71.5 to 93.6% for glycine and lysine, respectively, whereas the faecal values ranged from 77.9 to 94.7% for glycine and leucine, respectively. The absolute differences between the methods ranged from 0.2 to 15.0% units for alanine/isoleucine and glycine respectively, and the average of the differences was 3.7% units.

The ileostomised growing pig (25kg) was investigated as a model animal to allow more routine determination of the ileal digestibility of protein in human foods, and good agreement was found between the species for apparent ileal amino acid digestibility. There were no significant differences between the two species for the apparent ileal amino acid digestibilities of amino acids, except for lysine, glutamate, proline and alanine.

The endogenous flows of amino acids at the terminal ileum were determined in both species, following consumption of a single protein-free meal. The amino acid compositions of the protein flows were similar for pigs and humans, with significant differences only being found for histidine, threonine, alanine, valine and methionine. The endogenous flows were used to correct apparent coefficients to give true estimates of digestibility. The latter values indicated near complete absorption of the dietary amino acids for the human subjects and growing pigs. When the interspecies comparison was based on the true digestibility values, there were only significant differences for the amino acids glutamate, phenylalanine, cysteine and methionine. The absolute differences

between the mean amino acid digestibility values for each species were smaller for true coefficients than for the apparent values.

The daily excretions of deoxyribonucleic acid (DNA) and diaminopimelic acid (DAP) were determined to indicate the levels of bacteria present at the terminal ileum and in the faeces of pigs and humans. There were higher levels of both of these marker compounds in human faeces samples than in ileal digesta. The opposite was observed for DNA in the pig, while the levels of DAP were similar at the two sites. The digestibility of fibre was also determined to indicate the extent of bacterial activity at these sites, and the values were greater in the faeces than in the ileostomy output of both species.

ACKNOWLEDGEMENTS.

Many people have assisted me with different parts of this study, to whom I am very grateful. Firstly, I would like to thank Dr P. Moughan for giving me the opportunity to study this particular topic, for his help throughout the study, and especially for his support and encouragement. I am also grateful to Dr M. Wilson for her help and support during my project.

I would like to acknowledge the assistance of Prof. C. Tasman-Jones of the Auckland Medical School, and the involvement of the Auckland and Manawatu Ostomy Societies. I am very grateful to all the people who took part in the trial work, and would like to thank them not only for their willingness to be involved, but also for the care taken to comply with the format of each trial. Special thanks go to Kerry Maher for her assistance during the preparation of the trial work in Auckland.

I am also very grateful to Dr D. Carr for the surgery performed on the animals used in this study, and to Dr C. Reid and Mrs I. Hall for their involvement with the surgery. I would also like to thank Mr B. Parlane and Mr M. Gall for their practical help with the pigs.

Several people gave me helpful advice concerning analytical methods, and I am grateful to Dr G. Midwinter and Mr J. Reid for their help with amino acid analyses, to Drs I. Andrew and J. McIntosh for advice on GLC procedures, and to the staff of the Nutrition Lab., Animal Science Dept., Massey University, for the use of equipment and technical advice. I would also like to thank Dr D. Garrick and Mr J. Rendel for their assistance and advice concerning the statistical analysis of the data, and acknowledge the help of Mr G. Pearson in performing the analyses.

I would also like to thank and acknowledge Mrs K. Batchelor for carefully preparing the illustrations in this thesis.

Lastly, I would like to specially thank those of my lecturers who took part in trial work, and my friend Anne. Also thanks to my husband, Grant for his involvement, but especially for his love and support throughout my masterate programme.

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