ILEORECTAL ANASTOMASIS: AN ANIMAL MODEL FOR STUDYING PROTEIN DIGESTION IN THE SMALL INTESTINE OF RUMINANTS

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Introduction

Feed protein consumed by a ruminant may pass undegraded though the rumen (UDP) or be degraded (RDP) and resynthesized into microbial protein. The constant amino acid composition of microbial protein results in a constant digestibility of this protein in the small intestine (NRC, 1985), while the UDP fraction may vary considerably in its degree of absorption (Hvelplund, 1985). Although the degree of digestibility may be determined by traditional techniques, which make use of radio-isotopes and are laborious and expensive, it may also more easily be estimated by using sheep in which the large intestine has been bypassed by means of an ileorectal anstomosis (Green et al., 1987). Since this technique has, to date, only be validated in pigs, it was decided to test this technique in sheep.

Materials and Methods

SA Mutton Merino wethers (10) were ramdomly divided into 2 equal groups. All sheep were surgically fitted with cannula in the rumen and duodenum. In addition, group A were fitted with an additional cannula in the ileum, while group B received an ileorectal anastomosis. The sheep were kept in metabolism crates and fed a lucerne hay diet *ad libitum*, with free access to water and a urea-salt lick. Intakes of feed, water and lick as well as excretion of faeces and urine were determined daily. Partial digestibilities of dry matter and nitrogen were determined about 2 months after surgery, using dual-label techniques (Faichney, 1980). After a further three weeks, flow rates of solid and liquid digesta were determined using the same labelled material.

Results

Mean daily feed intake was found to be 1332 ± 149 and 1454 ± 238 g/day DM for normal and IRA sheep respectively. Of these intakes, 154 ± 8 and 280 ± 83 g/day for normal and IRA sheep respectively was due to intake of the urea-salt

TABLE 1. THE ABSORPTION FROM, AND FLOW OF DIGESTA THROUGH, THE GASTRO-INTESTINAL TRACT OF INTACT AND IRA SHEEP

Absorption of (%)	Pre-intestine		Small intestine		Large intestine		Total GIT	
	Intact	IRA	Intact	IRA	Intact	IRA	Intact	IRA
DM	47(6)	46(5)	19(5)	26(6)*	19(9)	–	57(3)	62(2)*
TN	36(7)	45(5)*	58(4)	58(4)	13(9)	–	74(3)	77(2)
TCA-protein	41(5)	38(7)	54(6)	57(6)	–9(7)	–	73(4)	74(3)
Retention time (h)								
Liquids	10(1)	10(2)	3(1)	5(1)*	12(2)	–	25(1)	16(1)*
Solids	15(1)	14(3)	4(1)	4(1)	13(3)	–	32(4)	17(2)*

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lick. Total nitrogen intake was found to be 37 ± 4 g/day and 43 ± 8 g/day for intact and IRA sheep espectively. The dry matter, total nitrogen and TCA-protein absorption from the various gut compartments is summarized in table 1, as is the flow of liquid and solids digesta.

Bypassing the large intestine increased only the TV absorption from the pre-intestine and DM from the small intestine and total GIT of the IRA sheep. The retention time of liquids digesta was increased in the small intestine of IRA sheep, and liquids and solids in the total GIT of the intact sheep.

Discussion

Although the total DM intake did not differ between the 2 groups, the IRA sheep had a significantly higher intake (55 %) of salt-urea lick. This suggests that bypassing the large intestine has an effect on mineral or urea metabolism in such animals. The higher absorption of TN from the pre-intestine of IRA sheep may be due to an increased uptake of NH_4, as TCA protein did not change. The increased absorption of DM from the small intestine, and total GIT of IRA sheep, is due to the absorption of nutrients other than TN and protein. This may be due to an increased retention time in the small intestine. On the other hand, the lower DM absorption from the total GIT of the intake sheep, is partly due to the synthesis of microbial protein in the large intestine and its excretion in the faeces.

In general, therefore, the IRA technique can be used to study the absorption of protein from the small intestine of sheep.

(Key Words: Sheep, Ileorectal Anastomosis, Small Intestine, Absorption, Protein).

Literature Cited

Faichney, G.J. 1980. Measurement in sheep of the quantity and composition of rumen digesta and the fractional outflow rates of digesta constitutents. Aust. J. Agric. Res. 31:1129-1137.

Green, S., S.L. Bertrand, M.J.C. Duron and R. Maillard. 1987. Digestibility of amino acids in maize, wheat and barley meal, measured in pigs with ileorectal anastomosis and isolation of the large intestine. J. Sci. Food Agric. 41:29-43.

Hvelplund, T. 1985. Digestibility of rumen microbial protein and undegraded dietary protein estimated in the small intestine of sheep and by *in sacco technique*. Acta. Agric. Scand. 25 (suppl): 132-144.

NRC. 1885. Ruminant nitrogen usage. National Academy Press, Washington, D.C.