

THE EFFECTS OF DIET ON BLOOD FLOW TO THE REGIONS OF THE RETICULO-RUMEN IN GROWING LAMBS

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Capillary blood flow to the rumen of sheep is one factor involved in the uptake of nutrients from this region of the gut, and is increased after feeding (Barnes *et al.* 1983). The objective of this experiment was to describe the effects of both diet, and of time after feeding, on blood flow to the different regions of the reticulo-rumen (RR).

Aseptic surgery was conducted on seven, 12 month-old female crossbred lambs. Lambs were anaesthetised (Pentobarbitone sodium) and polyvinylchloride catheters inserted into the left ventricle of the heart via a carotid artery, and into the descending aorta via a femoral artery. No measurements were made for at least 2 days after surgery. Sheep were fed daily at 0900 hours with *ad libitum* oaten chaff (C, n=3) or *ad libitum* oaten chaff plus 300 g lupin grain (S, n=4). Blood flows to the RR were measured with 15µ diameter coloured microspheres (E-Z-Trac, USA) immediately prior to feeding (0900 hours), and 1.5 hours (1030 hours), 3.0 hours (1200 hours), 4.5 hours (1350 hours) and 6.0 hours (1500 hours) after feeding. At each measurement time, approximately 8 million microspheres of a different colour were injected into the left ventricle while a reference sample was withdrawn (6 mL/minute) from the descending aorta. On the day after the experiment was completed, lambs were euthanased (Pentobarbitone sodium) and the RR dissected into its components (cranial sac, dorsal sac, ventral sac, reticulum) and weighed. To estimate blood flow, the numbers of microspheres of each colour were estimated in both reference blood samples and RR tissue following digestion in 2 M NaOH, as described by Burrell *et al.* (1993):

Liveweight (31.0±4.9 vs. 27.0±2.4 kg), full-RR weight (4.2±0.4 vs. 4.6-to.3 kg) and oaten chaff intake (529±53 vs. 484±242 g/day) of C lambs were not significantly different from S lambs. Blood flow (mL/minute.100 g) to the reticulum of C lambs (65±7) was not significantly different from S lambs (76±8), and did not significantly change with time after feeding. The blood flow to the cranial sac of S lambs was higher (P<0.05) than for C lambs, whereas there was no significant difference between C and S lambs in values of blood flow to the dorsal sac and ventral sac. Blood flow increased (P<0.05) to all regions of the rumen after feeding for S lambs, but not significantly for C lambs (Table 1).

Table 1. Blood flow (mL/minute.100 g) to regions of the reticulo-rumen in lambs fed oaten chaff (C) or oaten chaff with 300 g lupin seed (S), before and after feeding

	Cranial sac		Dorsal sac		Ventral sac	
	C	S	C	S	C	S
Pre-feeding	46±10 ^a	61±21 ^a	68±35 ^a	32±5 ^a	61±7 ^a	30±3 ^a
1.5 h	63±4 ^a	110±6 ^b	62±13 ^a	74±9 ^b	62±1 ^a	64±14 ^{ab}
3.0 h	56±13 ^a	127±31 ^{bc}	42±4 ^a	96±29 ^b	58±2 ^a	84±32 ^b
4.5 h	75±3 ^a	152±4 ^c	77±33 ^a	101±17 ^b	88±26 ^a	89±35 ^b
6.0 h	66±15 ^a	131±9 ^{bc}	77±11 ^a	60±6 ^{ab}	71±11 ^a	59±18 ^{ab}

^a Different letters within columns indicate a significant difference (P<0.05).

Blood flow to the cranial sac of the rumen increased more after feeding in S lambs than did flows to the other regions of the RR. The proximity of the cranial sac to the vaso-neural plexus regulating outflow of material from the RR suggests that differential blood flow within the RR may provide a means by which satiety is monitored by the animal and warrants further investigation.

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