INCREASED ENERGY EXPENDITURES IN LAMBS WITH HIGHER INTAKES: SPECULATION ON THE ROLE OF VISCERAL ORGAN MASS AND ACTIVITY

R. D. Sainz*

Animals increase their energy expenditures as feed intakes increase (Baldwin and Bywater 1984), possibly due to hypertrophy of organs with high rates of metabolic activity (e.g. liver, intestines, kidneys). This report describes a quantitative analysis of energy expenditures by lambs with intakes from ½ maintenance to *ad libitum*, in terms of visceral mass and basal metabolism (see Sainz *et al.* 1990 for experimental details). Visceral mass and H increased with level of intake. These results were further examined with the aid of a mechanistic model of lamb metabolism (Sainz and Wolff 1990). The standard model accounts for energy expenditures in tissues based on stoichiometric heat losses and a large undefined mass-dependent component. For this exercise, the undefined energy expenditure was allowed to increase linearly with tissue mass alone (standard) or with mass and energy intake (modified). Results from these equation forms fitted to experimental data are shown in the table.

TABLE 1 Effects of visceral mass (kg) and basal metabolism on heat production (H, $kJ/kg^{0.75} \cdot d$) in wether lambs

Diet	Intake (kg/d)	-- Observed -- Viscera	H	---------- Predicted ---------- Viscera	H, standard	H, modified
Lucerne chaff	0.33	6.09	392	5.01	394	360
	0.65	9.01	466	6.68	449	483
	1.16	10.89	634	8.63	507	635
Pellets (lucerne/barley)	0.30	5.14	362	5.36	399	370
	0.58	8.52	462	6.96	447	491
	0.97	10.54	623	8.49	487	623
	1.61	10.63	818	9.88	523	785
Pooled SE	0.13	1.01	68			
Statistical significance:						
Diet	ns	**	ns			
Intake	***	***	***			

The standard model predicted that visceral mass and H would increase with nutrient input. However, H was over-predicted at low intakes and under-predicted at high intakes with the standard model, This systematic bias was eliminated with the modified model. Therefore, undefined energy expenditures, which include costs of ion transport and other substrate cycles, probably increase with feed intake. This is in agreement with the data summarized by Milligan and Summers (1986), but contrary to results reported by Burrin et a7. (1990). Further work is needed to elucidate changes in energy expenditure with intake.

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* School of Agriculture & Forestry, The University of Melbourne, Parkville, VIC 3052