SEASONAL OSCILLATIONS IN THE MASS OF BODY COMPONENTS OF MATURE EWES FED AT A CONSTANT INTAKE

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Seasonal oscillations in total fat and carcass muscle above those due to changes in empty body weight have been identified in growing sheep (Ball *et al.* 1995) and in mature fallow deer does (Weber and Thompson 1995). In both experiments there were seasonal oscillations in feed intake, so it was unclear whether the observed changes in body components were a result of differences in nutrient utilisation arising from the variation in feed intake, or whether there was an inherent seasonal shift in metabolism, which was independent of variation in food intake. The present experiment examined whether there were seasonal patterns in body components of mature ewes fed a constant intake of the same pelleted ration (10.3 MJ/kg, 16% CP) for 260 days.

Four mature non-pregnant Coopworth ewes, housed individually in 3x3 metre pens within an open shed with natural light were fed once daily, from April 1993 until January, 1994. On 9 occasions, repeated *in vivo* estimates for carcass muscle, visceral lean, total fat and empty body weight (EBW) were obtained using a CAT-scanner (Thompson and Kinghorn 1992). Changes in body components (Y) of EBW, total fat, carcass muscle and visceral lean relative to time (t) were analysed using a non-linear model that contained a linear term and a sine function, $Y = a + b*t + d*\sin(0.0172*(t + \phi))$, where t = days from the first estimate (day 42) and ϕ = the phase shift of the sine oscillation from the starting point (days). As the use of the CAT-scanner provided repeated measurements of body components, changes in the tissues over time were analysed within animals.

The analysis for EBW showed no linear change over time, but did show a significant sine oscillation ($P<0.01$), with an amplitude of 1 .10 kg. For total body fat and muscle, the addition of the linear term together with the sine function was significant when compared to the model with a constant (a) (Table 1; $P<0.01$). For total fat and muscle the amplitudes of the oscillation were 2.02 kg and 0.81 kg respectively. For visceral lean the linear term was not significant ($P>0.10$), so the final model contained only the sine function ($P<0.01$), which had an amplitude of 0.34 kg.

Table 1. Parameters for linear and seasonal oscillations in EBW, total fat, muscle and viscera with time

Component	Model		Linear term		Sine oscillation	
	df	F-ratio[A]	Constant	Linear coefficient (b)	Amplitude (d, kg)	Phase shift (ϕ days)
EBW	2,30	22.02*	43.16	-	1.10	94.
Total fat	3,29	13.39*	14.91	0.021	2.02	70
Carcass muscle	3,29	22.24*	18.73	-0.014	0.81	242
Visceral lean	2,30	17.45*	5.22	-	0.34	109

[A] F-ratio for the variance associated with the addition of the linear change and sine oscillation in body components relative to the model that contained only a constant (a).

* ($P<0.01$).

The peak in the oscillations for EBW and total fat occurred in early summer, whilst the peak for carcass muscle occurred in late autumn. The presence of oscillations in EBW, total fat, carcass muscle and visceral lean in ewes fed at a constant intake, indicates that there are seasonal effects on the priorities for tissue deposition and retrieval that are independent of variations in feed intake. The changes in tissue weights and EBW with time indicate that the utilisation of a given weight of feed by mature ewes does vary with season.

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