

# Seasonal Changes in Body Components During Growth in Merino Sheep

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Cirannual patterns in metabolism, growth and reproductive activities for sheep appear to be endogenous rhythms that are entrained to a seasonal photoperiodic pattern. It is also likely that body composition, an endpoint of physiological activities, would demonstrate a seasonal pattern.

The conventional method of analysing compositional data is to regress tissue component against total weight, which makes it difficult to detect any time based deviations. This study investigated the presence of seasonal oscillations in body components, using total body fat, muscle and empty body weight data from a long term serial slaughter experiment. The data were from 96 sheep from two sexes (rams and ewes) and three strains (high and low weaning weight and a randomly bred control flock) slaughtered from weaning to maturity (Thompson et al. 1985). Changes in total fat and muscle weight relative to empty body weight were analysed using the allometric model, to which a sine function was added to account for any seasonal oscillations in the residuals ( $Y = AX^b + d \cdot \sin(0.0172 \cdot t + q)$ , where Y was the component weight, X empty body weight and t time). Preliminary analysis using the log transformed model indicated a sex effect ( $P < 0.05$ ) on the allometric coefficient (b). In this study the data was analysed using non-linear regression within the sexes using the above model to which was added two single degree of freedom contrasts for strain.

For total body fat and muscle weights the allometric coefficients for both rams and ewes were

consistent with those from the log transformed analyses. For total body fat weight, the addition of the sine oscillation to the allometric model was significant for both rams ( $P < 0.05$ ) and ewes ( $P < 0.10$ ) with mean amplitudes of 1.01 and 0.58 kg, respectively. For muscle weight, the addition of the sine function was only significant for the rams ( $P < 0.01$ ), with a mean amplitude of 0.90 kg.

Oscillations in both fat and muscle indicate substantial seasonal changes in body components, that were independent of changes due to growth of empty body weight. In rams, the peak in the body fat oscillation occurred in mid summer, whilst in ewes the peak occurred 16 weeks later in autumn. In rams the oscillations in muscle appeared to be approximately six months (23 weeks) out of phase with those for total body fat. Therefore after adjustment for empty body weight, fat weight increased during summer, whilst muscle weight increased during winter. These oscillations indicate a seasonal effect on the priorities for muscle and fat accretion. In the growing animal these oscillations may have implications for finishing animals to fatness/weight specifications, whilst in mature animals oscillations may impact on maintenance costs.

## References

Thompson, J.M., Parks, J.R. & Perry, D. (1985). *Anim. Prod* **40**:55-70.