

Seasonal oscillations in body components in mature female Fallow deer

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Several temperate and arctic species of deer show marked seasonal patterns of food intake, live weight and body composition. In entire male deer there is an annual oscillation in voluntary food intake, accompanied by a severe intake depression during the rut in autumn. This can result in up to a 30% loss in body weight and almost total depletion of body fat in male deer. In female deer there is evidence of a seasonal cycle in food intake and live weight, although there is little information on changes in body composition.

An experiment was conducted to investigate seasonal changes in body composition in mature fallow does (*Dama dama*). Two groups, each of 4 mature fallow does (>4 years) were group fed either a high (11.2 MJME/kgDM, 17.5%CP) or low (9.3 MJME/kgDM, 15.3%CP) energy ration, *ad libitum*. Group feed intakes and live weights were measured weekly. On 10 occasions over a 17 month period body composition was estimated on all animals using computer-aided tomography (CAT) (Thompson & Kinghom 1992).

At the commencement of the experiment the does were in poor condition and all animals showed an increase in both body weight and body components over the 17 month period. Changes in body components (Y) over time (t) were analysed using a non-linear model to describe the increase in weight over time, to which a sine function was added to account for a seasonal oscillations in the residuals:

$$Y = A(1 - \text{EXP}(-k*t)) + d*\sin(0.0172*t + q)$$

Mean total body fat weights were 1.86 kg and 1.81 kg for the high and low energy groups, whilst mean muscle weights were 18.00 kg and 17.69 kg, for the two groups respectively. For total body fat and muscle weights the exponential model was first fitted on a within animal basis to the high and low energy groups and then the models re-run with the sine function included. For total body fat weight, the addition of the sine function was significant for both the high and low energy feeding groups ($P < 0.01$), with mean amplitudes of 0.69 kg and 0.94 kg and lag phase behind daylength of 14 and 15 weeks for the high and low energy groups respectively. For muscle weight, the addition of the sine function was also significant for both the high and low energy groups ($P < 0.1$ and 0.01 respectively), with mean amplitudes of 0.34 kg and 0.42 kg and lag phases of 15 and 12 weeks respectively.

The results indicate seasonal oscillations in both total body fat and muscle, with a greater oscillation in the former. There was little difference between nutrition groups in the amplitude of the oscillations. The oscillations in total body fat and muscle weight indicates changes in the energy stores of female deer over the seasons with the minimum values in spring and the maximum values in autumn. As oscillations were still evident when adjusted for empty body weight, the results indicate changing priorities for deposition of fat and muscle tissue according to the season. The mechanisms behind this phenomena remain unknown.

References

Thompson, J.M. & Kinghom, B.P. (1992) *Proc. Aust. Soc. Anim. Breed. Genetics.* **10**:560.