THE USE OF UREA FOR THE IN VIVO ESTIMATION OF TOTAL BODY WATER IN SHEEP

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A simple, cheap, accurate and non-contaminating method for determining the in vivo body water content of sheep would be useful in body composition studies. The urea dilution technique has been reported as a reliable and practical method for use in sheep (Meissner 1976) and in cattle (Koch and Preston 1979). However, data on sheep are limited and this report is concerned with evaluating the technique in sheep of different sizes and nutritional histories.

There were two treatments, namely: a weight-loss/weight gain group (WL) and a weight-constant/weight-gain group (WC). The experiment started with 9-month old Merino wethers which weighed 29.8±SD 1.5 kg. Food of the WL group was restricted for a steady weight loss and during 100 days their mean live weight fell to 19.6±SD 0.3 kg; these sheep were then fed ad libitum until they reached a mean live weight of 39.0±SD 0.5 kg. Food intake of the sheep in the WC group was restricted to hold them at constant live weight until the WL group had recovered initial live weight (catch-up) and then the WC group animals were fed ad libitum until they reached a mean live weight of 39.0±SD 0.2 kg. Six sheep were killed at the start, 8 of the WL group at the end of weight-loss, 8 of each group at catch-up, and 9 of the WL and 8 of the WC groups were killed at the final weight. At slaughter, total body water was determined on all sheep on the basis of fleece-free live weight. Urea space was estimated for each sheep 24 h before slaughter from a blood sample taken 12 min after urea injection.

When urea space (US) was used as the predictor of total body water (TBW) in linear equations, slaughter groups with different liveweight ranges had different positions but similar slopes, indicating that the common linear regression should not be used to predict TBW from US in the different slaughter groups. The best equation for predicting TBW from US, using pooled data from all sheep, was the following quadratic:

$$y = -2.7 + 4.09x - 0.081x^2 \quad (r^2 = 0.67)$$

where y = TBW(1) and x = US(1)

The predictive values of the individual linear equations were no better than the single quadratic from the pooled data.

When fleece free live weight was used as the predictor of TBW, there were no significant differences between slopes of any slaughter groups and the following linear equation gave the best estimate of TBW:

$$y = 0.44 + 0.630x \quad (r^2 = 0.94)$$

where y = TBW(1) and x = FFLW (kg)

The use of a quadratic equation did not improve prediction from FFLW nor did the use of a multiple regression equation including both FFLW and US as the predictors.

It is concluded that urea space estimates of total body water in sheep are not likely to be accurate enough for use in experimental work, in particular, when looking for compositional differences between sheep at the same live weight.

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