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Evaluation of body condition in pregnant rabbit does by ultrasound scanner

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RIASSUNTO – Stima dello stato di ingrassamento di coniglie gravide tramite ecografo – *Scopo del lavoro è stato studiare le variazioni delle condizioni corporee di coniglie sottoposte a due diversi ritmi riproduttivi (fisso - IA 11 d dal parto; alternato - IA 1 e 27 d dal parto) e valutare l'efficacia di un ecografo per la stima in vivo delle loro riserve adipose (retroscapolari, perirenali e totali). Il ritmo riproduttivo fisso ha determinato la presenza di un ridotto deposito di grasso in entrambi i siti. La misurazione con l'ecografo sembra essere accurata e discriminare lo stato delle riserve adipose, ma in presenza di spessori di grasso esigui la capacità di previsione dell'apparecchio scende drasticamente.*

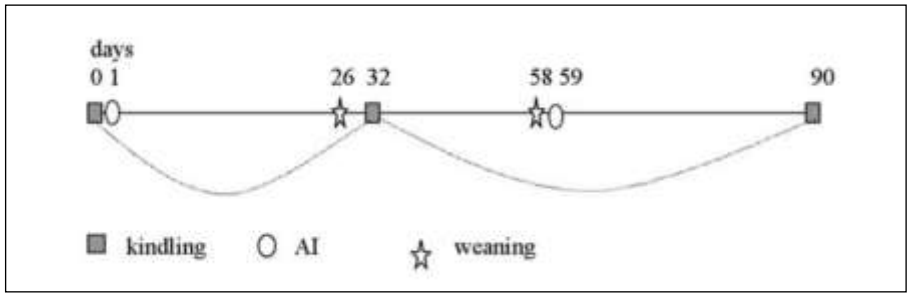
KEY WORDS: rabbit does, body condition, ultrasound scanner.

INTRODUCTION – Knowledge of animal body composition is necessary in nutritional study, and during the last two decades many efforts have been made to find non-destructive methods to predict in vivo body composition in different species (Fortune-Lamothe *et al.*, 2002). A good technique for measuring body composition should be accurate, easily utilisable, inexpensive, applicable to a wide range of ages and to live animal with minimal perturbation of behaviour. Lactation in rabbit does determines a large energetic expenditure, and many authors (Xiccato *et al.*, 1999) reported that does reduced their body fat depots, mainly represented by retro-scapular and perirenal fat (Pascual *et al.*, 2000). The aim of this study was to evaluate the accuracy of an ultrasound scanner in evaluating in vivo body condition of rabbit does under different two reproductive rhythms.

MATERIAL AND METHODS – One hundred young New Zealand White rabbit does were submitted to artificial insemination (AI) for at least 6 consecutive cycles. Does were first inseminated at 4.5 months of age and successively inseminated according to the following protocol: fixed reproductive rhythm (AI 11 days after kindling) or alternating rhythm (AI 1 and 27 days after kindling, alternatively) (Figure 1). At 24 hours from the birth the number of suckling pups was adjusted to 8 per litter, and pups were weaned at 26 d. Two days after the last (6^{th} or 7^{th}) AI 50 does were submitted to ultrasound scanning (model SSD-500, ALOKA) of the scapular and perirenal regions (3 cm ahead the 2^{nd} - 3^{rd} lumbar vertebrae) after an accurate shaving of the part by a razor-blade. Perirenal fat thickness (PFT) and scapular fat thickness (SFT) were directly measured and the mean of two measures (left and right) was performed. Immediately after, does were slaughtered and the fat depots were accurately excised and weighed.

Data were analysed by a linear model and by several regression models, to evaluate the effect of the reproductive rhythm (fixed or alternate) and to estimate the total fat weight (SAS/GLM, 1990). The method used to validate the regression model splits the data into two sets: the first (40 animals) used to develop the estimation model and the second (10 animals) used to validate the model.

Figure 1. Scheme of alternate reproductive protocol.



RESULT AND CONCLUSIONS – In Table 1 was shown the effect of reproductive rhythm on the status of the fat depots. Although the fat thickness was higher in the scapular region its weight was higher in the perirenal ones. Such findings can be explained considering the different surface covered by two depots, since in rabbit the perirenal fat area is more diffused. According to Pascual *et al.* (2000), the large variation in the weight of the perirenal fat confirms its suitability for estimating changes in body condition. However, in our trial also the scapular fat showed a fair variability, according to the reproductive rhythm applied. Considering that a large depletion of body fat represents a detrimental aspect for the reproductive activity, does of the alternate group always showed a better body condition compared to the fixed ones.

Table 1. Effect of reproductive rhythm on body condition of does.

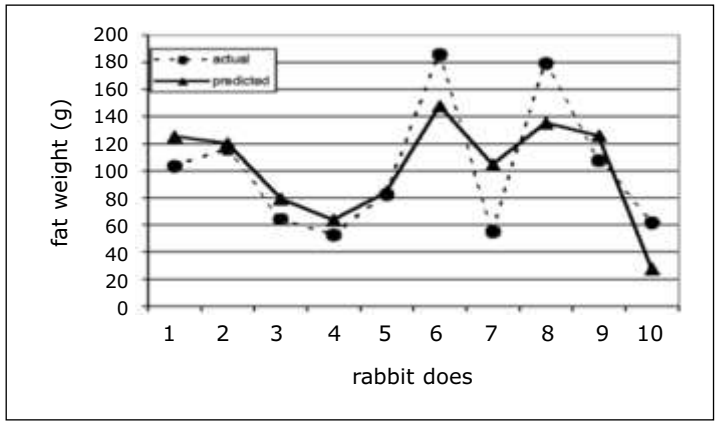
Remating interval		Fixed	Alternate	SDE
Scapular fat thickness	cm	1.12A	2.06B	0.42
Perirenal fat thickness	cm	1.15a	1.24b	0.29
Scapular fat weight	g	4.50A	22.26B	8.52
Perirenal fat weight	g	5.64A	65.70B	39.25
Total fat	g	10.14A	87.96B	42.25
Live weight	g	4027	4088	495

A, B: P< 0.01; a, b: P<0.05

The ultrasound measurements were enough accurate and fit well the status of fat depots. The total fat weight was strongly correlated with the PFT value (R^2 0.56; RSD 36.1), and the contemporary addition of live weight and SFT further improve the prediction (R^2 0.67; RSD 30.8). The validation group showed that the prediction fit well the actual value (Figure 2) and the accuracy was around 70.69.

Results suggest that ultrasound PFT measurements may be an accurate method for studying changes in body condition of female rabbits and that the contemporary addition of SFT and live weight can increase its suitability. The main limitation of the ultrasound technique was the thickness of the fat: if it was less or around 1 cm the prediction performance was drastically reduced (R^2 0.38; accuracy 44.8).

Figure 2. Total fat weight estimation (validation).



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