Anim. Prod. 1989, **49**: 327-329

0003-3561/89/82680327$02·00

A NOTE ON THE USE OF A LUMBAR JOINT AS A PREDICTOR OF BODY FAT DEPOTS IN ARAGONESA EWES WITH DIFFERENT BODY CONDITION SCORES

R. DELFA, A. TEIXEIRA† AND F. COLOMER-ROCHER

Department of Animal Production, Servicio de Investigación Agraria de la Diputación General de Aragón, Apartado 727 Zaragoza, Spain

The lumbar joint, which is handled to assess body condition scores, was taken from 52 adult Rasa Aragonesa ewes with body condition scores between 1·5 and 4·5 and dissected into muscle, bone, subcutaneous and intermuscular fat. The subcutaneous fat in the lumbar joint was highly correlated with total fat in the body (r=0·97), confirming the value of this region for assessing body condition in Rasa Aragonesa ewes.

JEFFERIES (1961) described a system of scoring the body condition of sheep in which each of six grades is defined in terms of palpable characteristics in the lumbar region. This author proposed the lumbar region for assessing body condition because the loin is the latest part of the growing animal to develop. It is the last to put on fat and the first to lose it. Body condition of sheep can be assessed by feeling the spinal column, in particular the lumbar processes. The aim of this study was to define the composition of a joint taken from the lumbar region (lumbar joint) as a predictor of the various fat depots of Aragonesa ewes.

The study involved the 52 dissected carcasses as described by Teixeira, Delfa and Colomer-Rocher (1989). A joint (Figure 1) taken from the lumbar region, which is palpated to assess body condition score (BCS), was dissected into muscle, bone, subcutaneous and intermuscular fat. The joint was cut between 3rd and 4th and 6th and 7th lumbar vertebrae with the ventral cut being at a distance from the medial line equal to the length of the cut. The fat thickness (measurement C), and the width and depth of *m. longissimus dorsi* (measurements A and B, respectively) were measured on the cut between 3rd and 4th lumbar vertebrae.

Correlation and regression analyses between subcutaneous fat and subcutaneous plus intermuscular fat in the lumbar joint (LSF and TLF respectively) and individual fat depots of the ewes, were calculated in order to assess the value of the lumbar joint as a predictor of the total body fat and various fat depots: omental, mesenteric, subcutaneous, intermuscular and kidney and pelvic fat.

No significant differences ($P < 0·05$) were found between body condition classes (Table 1) for *m. longissimus dorsi* length, suggesting the lumbar joint is well defined anatomically. There were significant differences in the measurements B and C between ewes in the different condition scores ($P < 0·01$). The ewes in poor body condition had less subcutaneous and intermuscular fat in the lumbar joint (Table 1) than the ewes with good body condition. There was some variation in the bone weight between body condition classes, which probably results from the difficulty of splitting the carcass down the centre of the vertebral column.

Correlation coefficients between the weights of individual fat depots in the whole carcass and LSF or TLF are given in Table 2. All

† Present address: Instituto Politecnico de Braganca, Apartado 38, Braganca, Portugal.

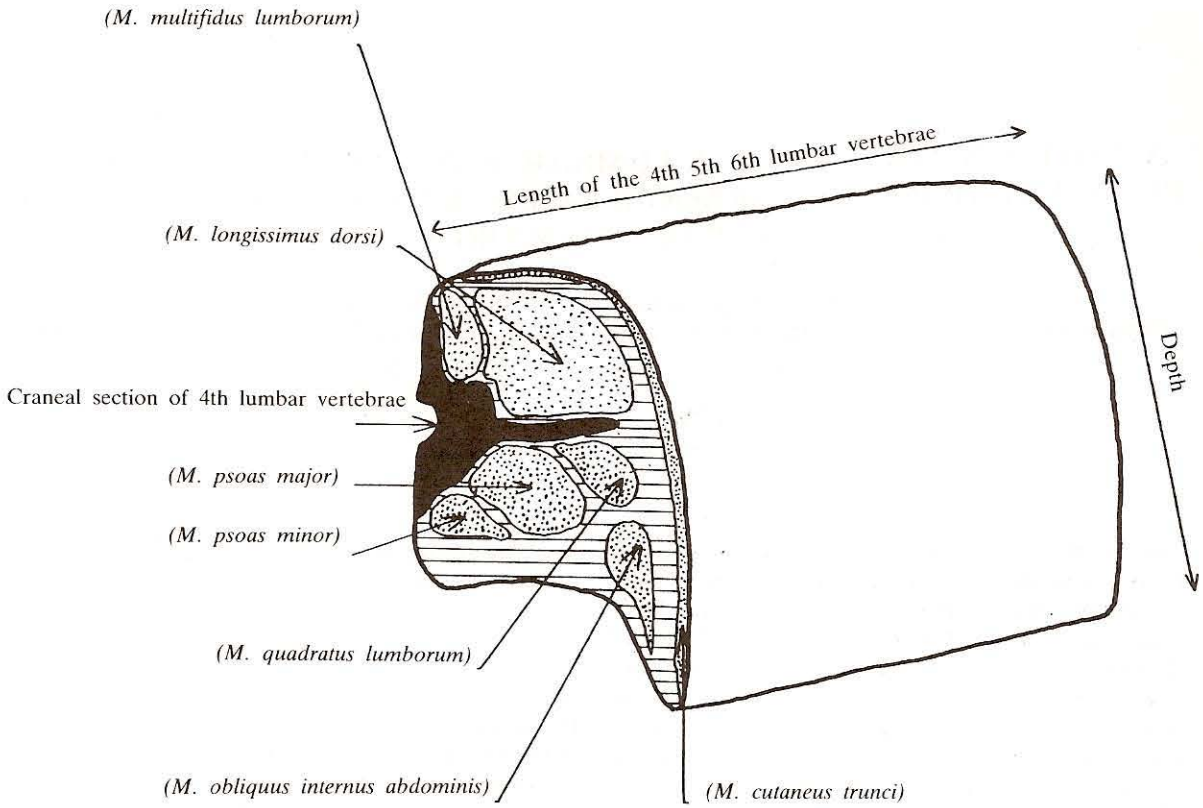

FIG. 1. Diagram showing definition of the lumbar joint.

TABLE 1

Measurements and composition of lumbar joint in ewes of different body condition score (BCS)

	Length (mm)		A† (mm)		B† (mm)		C† (mm)		Weight (g)		Muscle (g)		Bone (g)		Subcutaneous fat (g)		Intermuscular fat (g)	
BCS group	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.	Mean	s.d.
1·5 to 1·75 (no.=8)	112^{A}	6	60^{AB}	12	18^{A}	5	$0·3^{a}$	0·5	220^{a}	52·4	164^{A}	40·8	42^{AB}	12·5	3^{a}	2·3	7^{a}	4·1
2·0 to 2·25 (no.=8)	106^{A}	8	53^{B}	6	17^{A}	3	$1·7^{a}$	2·3	226^{a}	39·3	166^{A}	35·5	36^{B}	5·0	7^{a}	4·7	14^{b}	4·0
2·5 to 2·75 (no.=8)	112^{A}	4	66^{A}	7	23^{B}	2	$3·8^{b}$	2·5	342^{b}	38·7	211^{B}	27·9	54^{AC}	19·7	43^{b}	14·2	29^{Ac}	8·6
3·0 to 3·25 (no.=8)	110^{A}	3	68^{A}	5	30^{C}	3	$3·6^{b}$	1·5	367^{b}	56·8	236^{BC}	30·9	56^{AC}	12·9	44^{b}	17·3	25^{Ac}	11·8
3·5 to 3·75 (no.=8)	114^{A}	6	69^{A}	9	30^{C}	5	$7·3^{c}$	2·5	459^{Ac}	82·9	255^{CD}	48·2	59^{AC}	26·5	100^{c}	45·4	40^{Bc}	13·9
4·0 to 4·50 (no.=12)	112^{A}	5	66^{A}	6	31^{C}	3	$14·4^{d}$	5·1	575^{Bc}	103·1	287^{D}	40·6	49^{AC}	19·5	186^{d}	54·1	50^{d}	19·0

[a,b,c] Means with different superscripts differ significantly at $P < 0·05$ (lower case) and at $P < 0·01$ (upper case).
† A = width of muscle *m. longissimus dorsi*; B = depth of muscle *m. longissimus dorsi*; C = fat thickness above B.

TABLE 3

Regression relationships for fat depot weights on total fat weight in the lumbar joint (g) and for subcutaneous fat weight in the carcass on subcutaneous fat weight in the lumbar joint (g)

Equation	Dependent variable	Logarithmic				
		a	*b*	s.e. of *b*	*r*	Residual s.d.
1	Omental fat (g)	1·3	0·9	0·05	0·94	0·17
2	Mesenteric fat (g)	1·83	0·57	0·04	0·90	0·14
3	Kidney and pelvic fat (g)	1·11	0·96	0·04	0·96	0·15
4	Total body fat (g)	−0·64	0·76	0·03	0·97	0·09
5	Intermuscular fat (g)	1·91	0·59	0·02	0·96	0·15
		Linear				
6	Subcutaneous fat (g)	42·7	14·7	0·54	0·97	293·7

TABLE 2

Correlation coefficients between body condition score, total body fat, individual fat depots of the ewes and subcutaneous or subcutaneous plus intermuscular fat in lumbar joint

	Subcutaneous fat	Total fat
Body condition score	0·93	0·93†
Omental fat	0·89	0·94†
Mesenteric fat	0·86	0·90†
Kidney and pelvic fat	0·91	0·92†
Subcutaneous fat	0·97	0·95
Intermuscular fat	0·95	0·96†
Total body fat	0·97	0·97

† Computed after $\log_{10}$ transformation.

coefficients were highly significant ($P < 0{\cdot}001$). Of the variation in weight of fat depots proportionately 0·82 to 0·94 was accounted for by variation in total fat in the lumbar joint. Regressions between the fat depots in the carcass and total fat in the lumbar joint equations 1 to 5 and regression between subcutaneous fat in the carcass and subcutaneous fat in the lumbar joint equation 6 are given in Table 3. These equations indicate that the total fat in the lumbar joint is a good predictor of all fat depots. The LSF is a better predictor of total subcutaneous fat than the total fat in this joint.

The *m. longissimus dorsi* depth (B) and fat thickness (C) were highly correlated with body condition score. This suggests that body condition assessment by palpation assesses the muscle depth and degree of subcutaneous cover, agreeing with the statements of Jefferies (1961) and Russel, Doney and Gunn (1969). TLF was highly correlated with both total and individual fat depots in the body, confirming the value of this region for assessing body condition in the Aragonesa breed.

ACKNOWLEDGEMENTS

This work has been supported by DGA, INIA and IAMZ. The authors gratefully acknowledge to Dr Timothy Treacher from Institute of Grassland and Animal Production and to Dr Norman Casey from Pretoria University, for their helpful advice during the progress of this work and for the revision of the manuscript.

REFERENCES

JEFFERIES, B. C. 1961. Body condition scoring and its use in management. *Tasmanian Journal of Agriculture* **32:** 19-21.

RUSSEL, A. J. F., DONEY, J. M. and GUNN, R. G. 1969. Subjective assessment of body fat in live sheep. *Journal of Agricultural Science, Cambridge* **72:** 451-454.

TEIXEIRA, A., DELFA, R. and COLOMER-ROCHER, F. 1989. Relationships between fat depots and body condition score or tail fatness in Rasa Aragonesa breed. *Animal Production* **49:** 275-280.

(*Received* 4 *March* 1988—*Accepted* 12 *May* 1989)