

COMPARISON OF CARCASS COMPOSITION PREDICTED BY DUAL ENERGY X-RAY ABSORPTIOMETRY IN PRIME LAMBS AND YEARLING SHEEP

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Determination of carcass composition in farm animals using chemical analysis is precise but is laborious and uneconomical. A popular alternative is to use dissection (Hopkins 1994), but it is also laborious and bioimpedance has not in the past been any better than using carcass measures (Hopkins and Hegarty 1995). Prediction of body composition in humans using dual energy x-ray absorptiometry (DXA) has been commonly used for the last decade and is a potentially efficient alternative in large-scale experiments. The use of DXA for predicting sheep carcass composition in animals from the Australian Sheep Industry CRC resource flock at Cowra slaughtered at 8 months (lambs) and 14 months (yearling) of age was investigated. This is a subset of animals killed at 3, 8, 14 and 22 months of age. The differences in carcass composition between first-cross, second-cross and pure breeds consisting of Merino x Merino (MM), Border Leicester x Merino (BLM), Poll Dorset_{growth} x Merino (PDgM), Poll Dorset_{muscle} x Merino (PDmM) and Poll Dorset_{growth} x [Border Leicester x Merino] (PDgBLM) genotypes were compared on approximately 150 mixed sex animals at each age.

Right-side half carcasses were positioned with the cut surface down on the DXA table. They were scanned by DXA using a Hologic QDR 4500A fan beam X-ray bone densitometer and fat, lean, total tissue masses and bone mineral content were determined. Fifty-nine right side carcasses that were scanned using the DXA at 8 and 22 month ages (6/genotype) were ground and chemical composition of fat, lean (water + protein) and ash determined. The relationship between DXA derived and chemically determined values was drawn for fat, lean and bone mineral contents using simple linear regression. These equations were applied to determine the actual half-carcass chemical composition of animals slaughtered at prime lamb and yearling ages using the DXA derived values. Data were analysed using a REML procedure with genotype, sex, slaughter day, slaughter time and appropriate interactions as fixed effects. Sire and ewe were included as random effects.

Values for chemically determined carcass composition were strongly related to DXA-derived values. The relationships were best described by log-log transformations and the R^2 values were 0.990, 0.986 and 0.922 for lean, fat and ash. The predicted values for carcass fat, lean and ash are shown in Table 1. Carcass lean content was highest in MM, lowest in PDgBLM and BLM and intermediate in first cross PD groups while the fat content varied in the opposite direction to lean. Pure Merinos had lower ash% in lambs, but higher ash% in yearling than the first- and second-cross animals.

Table 1. Chemical composition of half carcasses in sheep of different genotypes predicted by DXA

Variable	MM	BLM	PDgM	PDmM	PDgBLM	Max-SED ^X	P-value ^Y
Lamb (8 months)							
Fat content (%)	19.7	22.8	21.7	21.1	25.0	1.07	***
Lean content (%)	77.3	73.9	75.0	75.9	71.9	1.05	***
Ash content (%)	2.94	3.27	3.33	3.05	3.07	0.13	+
Yearling (14 months)							
Fat content (%)	22.9	29.7	26.9	26.0	29.6	1.36	***
Lean content (%)	73.1	66.7	69.3	70.5	66.9	1.32	***
Ash content (%)	3.98	3.56	3.82	3.40	3.45	0.19	*

***P<0.001; *P<0.05; +P<0.1. ^XMax-SED = Maximum SED. ^YP-value = Breed P-value.

Carcass lean content decreased and fat content increased from lamb to yearling age and the rate of change was highest in animals that had Border Leicester blood. Bone mineral content measured as ash percent increased with the age of animal. Chemical composition of fat and lean in the carcass did not vary (P>0.1) between PDgM and PDmM groups at both ages. Carcasses were fatter when the dams were BLM ewes. The strong relationship between the DXA and chemical values demonstrate that DXA is an effective, non-destructive method for determining carcass composition.

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