VARIATION IN PRODUCTION TRAITS AND PLASMA METABOLITES OF MERINO FIRST- AND SECOND-CROSS LAMBS DURING EARLY GROWTH

E.N. PONNAMPALAM[A], *F.R. DUNSHEA*[A], *D. SUSTER*[A], *D.L. HOPKINS*[B], *M.B. MCDONAGH*[A] *and R.D. WARNER*[A]

[A] Primary Industries Research Victoria - Werribee, 600 Sneydes Rd, Werribee, Vic 3030
[B] NSW Agriculture, Centre for Sheep Meat Development, PO Box 129, Cowra, NSW 2794

The rate of muscle and fat tissue development during the early post-natal growing stage influences an animal's muscle and fat content, which in turn may alter the adaptability of an animal to stress caused by hormonal changes (Lobley 1998; Wagenmakers 2000). The ability of an animal to handle stress may be related to its genetic background since fat and muscle tissue deposition varies with dam and sire type. Therefore, muscle development and quality may differ among genotypes due to variation in energy utilisation, which is controlled by the responses to homeostatic and stress hormones.

The present study utilised 152 lambs (~ 30 per group) born to Merino (MM**),** first-cross Merino [Merino x Poll Dorset (selected for muscling) - MPDm; Merino x Poll Dorset (selected for growth) - MPDg**;** Merino x Border Leicester - MBL] or second-cross Merino ((Merino x Border Leicester) x Poll Dorset; MBLPD) ewes randomly assigned to 2 consecutive days of slaughter across groups. All lambs were run under the same grazing conditions and were slaughtered at a commercial abattoir at 4 months of age at weaning. Blood samples were taken at slaughter, and carcass measurements at 3 days postmortem, for determination of plasma metabolite concentrations and carcass traits.

Table 1. Effect of genotype (see text) on blood metabolite concentration at slaughter and carcass traits.

	MM	MPDm	MPDg	MBL	MBLPD	SED	P-value
Half carcass wt (kg)	6.1^{x}	7.4^{y}	7.8^{y}	7.3^{y}	9.0^{z}	0.37	0.001
Carcass length (cm)	56.2^{x}	57.0^{xy}	58.5^{y}	57.4^{xy}	60.0^{z}	0.67	0.001
Fatness at LL site (mm)[A,B,C]	0.24 (1.7)	0.18 (1.5)	0.12 (1.3)	0.33 (2.1)	0.26 (1.8)	0.09	0.07
Loin muscle weight (g)[B]	415^{x}	465^{y}	459^{y}	416^{x}	456^{y}	20.8	0.007
Plasma glucose (mmol/L)	5.2	5.3	5.2	5.2	5.4	0.21	0.84
Plasma lactate (mmol/L)[C]	0.43 (2.7)	0.36 (2.3)	0.37 (2.3)	0.45 (2.8)	0.41 (2.6)	0.09	0.78

[A] Fat depth measured over the *m.longissimus lumborum* (LL) between 12th and 13th rib. [B] Means are adjusted using half carcass weight as a covariate. [C] Data were log transformed. Data are presented as the transformed means with the back-transformed means in parentheses below. Values in rows with the same superscript are not significantly different (P>0.05).

Half carcass weight (HCW) and carcass length were lowest in the Merino and highest in the second-cross with the first-cross lambs being intermediate (Table 1). There were no differences in carcass fatness (measured at LL site) among Merino, first- and second-crosses, when values were adjusted to HCW. Loin muscle weight (*m.longissimus*) was lower for MM and 1st cross MBL compared with other first- and second-crosses, when adjusted to a common HCW. Mating Border Leicester sires to Merino dams instead of Poll Dorset sires had no effect on HCW, but decreased loin muscle weight. Blood glucose and lactate concentrations at slaughter were not different between groups and were ~ 1.3 and 6 times higher than that observed for weaned lambs (E.N. Ponnampalam, unpublished data). These data indicate that at a similar body weight, 4 month old MPDm, MPDg and second cross lambs have more muscle and a similar fat content compared to MBL or MM lambs, based on the carcass measures used in this study. First-cross MPDm and MPDg lambs selected for muscle and growth, respectively, have similar amounts of muscle and fat in the carcass at this age. Further investigation is needed to understand the interactions between muscle and fat tissue development and responses to major homeostatic (insulin) and stress (adrenaline) hormones.

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Email: eric.ponnampalam@dpi.vic.gov.au