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## Nutritional impact on muscle glycogen metabolism in lambs selected for muscling

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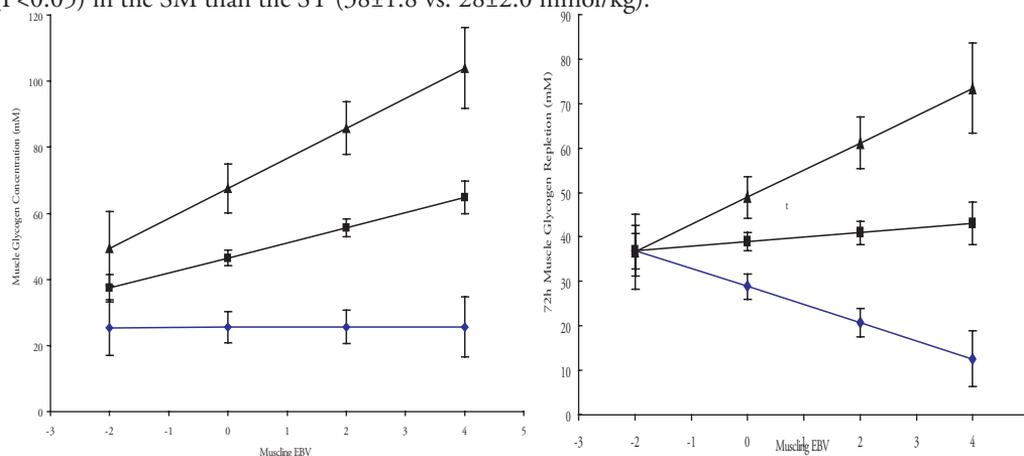
Australian Sheep Industry CRC

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Selection of sires based on estimated breeding values (EBVs) for muscling, is an option available for Australian sheep meat producers. Wegner et al. (2000) showed that selection for muscling in cattle increased the expression of fast glycolytic type IIB fibres. This may lead to increased depletion of muscle glycogen pre-slaughter and can result in poor quality, dark cutting meat. Exercise can be used for the controlled depletion of muscle glycogen, allowing subsequent rates of glycogen repletion to be measured (Gardner et al. 1998). In this study the effect of selection for muscling on muscle glycogen metabolism following exercise was investigated in lambs fed at varying levels of metabolisable energy (ME) intake.

The experimental flock consisted of progeny from Merino ewes crossed with 17 Merino (M) or Poll Dorset (PD) sires selected within breed for either high or low yearling eye muscle development EBV. At 10 weeks of age the lambs were randomly allocated within sire groups to either a low energy chaff diet (ME 8.25 MJ/kg and CP 12.7%) or a high energy concentrate diet (ME 11.65 MJ/kg and CP 16.64%). Six weeks later an exercise challenge was imposed consisting of 4x15 minute exercise sessions at a steady trot (8 km/hr – approx. 70% VO<sub>2</sub> max), with 15 minutes rest between sessions. Biopsies of the *m. semimembranosus* (SM) and *m. semitendinosus* (ST) were taken pre-exercise and immediately, 36hr and 72hr post-exercise.

Selection for high muscling EBV increased both basal muscle glycogen concentration and 72 hr glycogen repletion ( $P < 0.05$ ), but only at the higher levels of ME intake (Fig. 1a and 1b). There was no effect of muscling EBV on glycogen depletion ( $P > 0.05$ ). Glycogen repletion at 72 hr was higher ( $P < 0.05$ ) in the SM than the ST ( $38 \pm 1.8$  vs.  $28 \pm 2.0$  mmol/kg).



**Figs 1 a and 1b.** Effect of Selection for Muscling & Dietary Energy Intake on Muscle Glycogen Concentration (1a: ▲ 13.2 MJ/Day, ■ 7.5 MJ/Day, ◆ 2 MJ/Day; 1b ▲ 13.2 MJ/Day, ■ 7.5 MJ/Day, ◆ 2 MJ/Day).

Sires selected for high muscling EBVs will produce progeny with increased muscle glycogen concentration, and faster rates of glycogen repletion post stress, given adequate nutrition. The faster rates of post exercise glycogen repletion in the SM supports the assertion that if given access to adequate nutrition, the more oxidative muscle types of animals exposed to stress will be less prone to dark cutting.

Gardner, G. E., Pethick, D. W. and Smith, G., 1998. Effect of Chromium Chelavite supplementation on the metabolism of glycogen and lipid in adult Merino sheep. *Australian Journal of Agricultural Research* 49(1), 137–145.

Wegner, J., Albrecht, E., Fiedler, I., Teuscher, F., Papstein H.-J., and Ender, K., 2000. Growth and breed related changes of muscle fibre characteristics in cattle. *Journal of Animal Science* 78(6), 1485–1496.