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Glucose profiles may explain breed differences in cold resistance in the new born lamb

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SUMMARY

Cold resistance has been investigated as a predictor of a lamb's ability to withstand cold, as exposure is a major cause of neonate mortality. Slee *et al.* (1980) identified breed differences in the ability of lambs to endure cooling when immersed in a water bath. However, the physiological mechanisms responsible for differences in cold resistance have yet to be elucidated. We hypothesised that lambs resistant to cold stress are capable of maintaining heat generation by redirecting nutrients away from general metabolism towards thermogenesis. We present preliminary metabolic data for two genotypes differing in cold resistance.

Eighteen Merino and 22 Border Leicester lambs were investigated 24 h after birth. Lambs were placed in a water bath where the temperature was decreased from 36 °C to 15 °C over 1 h. The lamb was removed when core body temperature reached 35 °C, and the time taken to reach this temperature was termed cold resistance. Blood samples were collected before immersion and every 15 min whilst in the bath and were analysed for glucose level (Haemocue, Medipak Australia). Tidal volume and breath gas concentration were used to estimate VCO₂, and thus metabolic rate (Labchart, ADInstruments Australia) at 15 min intervals before and during the water bath. Results were analysed using ASReml and sex, type of birth, age of dam and breed were fitted as fixed effects and birth weight as covariate.

Cold resistance differed between the genotypes (Merino, 51 ± 2.1 min to reach 35 °C; Border Leicester, 55 ± 1.9 min to reach 35 °C). Genotypes also differed in plasma glucose concentration but not VCO₂ (Fig. 1).

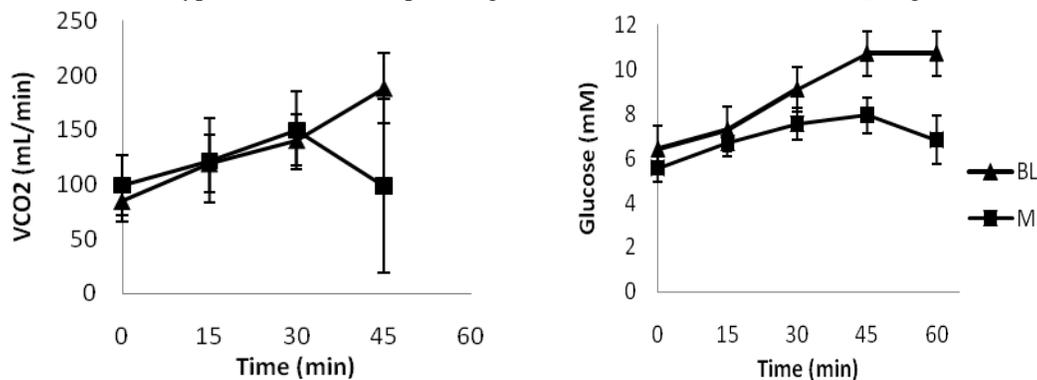


Figure 1. Change in VCO₂ (mL/min) and glucose concentration (mM) with time for Border Leicester (BL) and Merino (M) lambs immersed in a water bath that was cooled from 36 °C to 15 °C over 1 h. Values are presented as the least square mean ± SEM.

Although the design of the experiment was sensitive enough to distinguish variation in glucose between the two breeds, an increased number of animals may be required to detect a difference in metabolic rate. This, along with investigation of key metabolic hormones will be explored in future work.

REFERENCE

Slee J, Griffiths R and Samson D (1980). Hypothermia in newborn lambs induced by experimental immersion in a water bath and by natural exposure outdoors. *Research in Veterinary Science* **28**: 275–280.