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Abstract

Differences in Thermoregulatory Responses between Dorper and Second Cross Lambs to Heat Stress Challenges †

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Abstract: We compared the thermotolerance of Dorper (D) and second cross (SC) (Poll Dorset x Merino/Border Leicester) lambs by assessing physiological and biochemical responses. After acclimatization, 4–5 month old lambs of each breed were exposed to either thermo-neutral (18 °C–21 °C, 40%–50% RH, n = 12/group) or cyclic heat stress (HS) (28 °C–40 °C; 40%–60% RH, n = 12/group) for 2 weeks in climatic chambers. The HS involved exposure to temperatures of 38 °C–40 °C between 0800 and 17.00 h daily; otherwise the temperature was maintained at 28 °C. Elevated temperature increased rectal temperature ($p < 0.01$), respiration rate ($p < 0.01$) and skin temperature ($p < 0.01$) in both breeds, (data for 12.00 and 16.00 h pooled), but to a lesser extent in D than in SC lambs ($p < 0.01$). The HS increased ($p < 0.01$) water intake to a greater extent in SC than in D lambs and HS reduced ($p < 0.05$) food intake in SC lambs but not in D lambs. There were no treatment effects on blood glucose and lactate levels in either breed. Significant effects of breed ($p < 0.01$) and treatment ($p < 0.01$) were observed in blood creatinine levels, being higher in SC lambs. Higher pH ($p < 0.01$) and lower pCO_2 ($p < 0.01$) were recorded under HS in both breeds. Among blood electrolytes, Cl^-, Na^+ and base excess were significantly (all $p < 0.01$) reduced under HS, with no breed differences. In conclusion, the attenuated physiological responses to HS in Dorper lambs indicates better adaptation of this breed to high environmental temperature.

Keywords: adaptability; physiological responses; thermotolerance

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