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# Effects of restraint and isolation stress and epidural blockade on endocrine and blood metabolite status, muscle glycogen metabolism, and incidence of dark-cutting longissimus muscle of sheep

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# Abstract

Crossbred lambs (47.3 kg BW) were used to study the effects of restraint and isolation stress on endocrine status and blood metabolites, antemortem glycogenolysis, and incidence of the dark-cutting condition (DCC) in the longissimus muscle (LM) and to determine the role of muscle contraction in the formation of the DCC in sheep. Lambs were assigned randomly to three treatments: unstressed controls (C); a single 6-h period of restraint and isolation stress (RIS); and a single 6-h period of RIS following epidural blockade (RISEB) with lidocaine. Blood was collected immediately before lambs were subjected to RIS and RISEB and at 12-min intervals during the 6-h period. Serum concentrations of glucose, lactate, and insulin were higher ( $P < .01$ ) in RIS and RISEB lambs than in C lambs. Serum free fatty acid concentrations were higher ( $P < .01$ ) in stressed lambs only during the first 4 h of stress. Plasma epinephrine and Cortisol concentrations also were higher ( $P < .01$ ) in RIS and RISEB lambs than in C lambs. Lambs were slaughtered within 30 min after completion of stress. Immediately after stunning and at .75, 3, 6, 12, and 24 h postmortem, samples were removed from the LM in the hindsaddle and foresaddle for glycogen, lactate, and pH determinations. Muscle pH was elevated ( $P < .01$ ) by RIS and RISEB; ultimate pH exceeded 6.0. The LM from carcasses of RIS and RISEB lambs had lower ( $P < .01$ ) glycogen and lactate concentrations in both regions than the LM of C lambs. Subjecting sheep to a single 6-h period of RIS was an effective animal model to induce the DCC. Failure of the epidural blockade to inhibit antemortem glycogen metabolism and formation of the DCC indicates that muscle contraction was not requisite to those processes in sheep.

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