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## BEHAVIORAL AND PHYSIOLOGICAL EFFECTS OF FREEZE OR HOT-IRON BRANDING ON CROSSBRED CATTLE

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**Background.** Hot-iron branding is a tool used to permanently identify livestock and is thought to have been in practice since biblical times. In 1966, freeze-branding was introduced as a painless alternative to hot-iron branding. However, freeze branding often seems to elicit a strong avoidance response by the animal being branded. To address concerns about which method was more painful, the following study was conducted. Twenty-seven crossbred calves (1/2 Simmental, 1/4 Hereford, 1/4 Brahman) averaging  $257 \pm 11$  d of age were either hot-iron branded (H), freeze branded (F), or were sham branded (S). Calves were blocked for temperament, weight, and sex and randomly assigned to day and order in which treatments were applied. To reduce stress from handling at treatment time, each calf was herded through the squeeze chute daily for 5 d prior to the experiment. Jugular cannulae were inserted in each calf 1 d prior to application of treatment. Blood samples and heart rate measures were obtained at -5, -3, 0, .5, 1, 3, 5, 10, 15, and 20 min after application of the treatments.

**Research Findings.** Mean concentrations of plasma epinephrine (EPI) tended to be greater for H calves at time .5 than for either S or F calves (Figure 1;  $P=.10$ ). To account for individual differences, pre-branding heart rates and hormone concentrations were subtracted from subsequent samples and were also used to calculate a percentage change for each subsequent sample. Analyses of subtracted values found that EPI concentrations were greater for H calves at .5 min post-branding than either S or F calves ( $P=.007$ ). No other differences were found for the subtracted analyses. Analyses of percentage data also found that H calves had greater EPI at .5 min post-branding than either S or F calves ( $P=.027$ ). Only three animals vocalized during branding, 1 H calf and 2 F calves. Despite the 5 d acclimation period, handling and restraint elevated plasma cortisol concentrations (Figure 2) and heart rate; no differences were detected for these measures. Because restraint elevated physiological indicators of stress, possible treatment differences could have been masked.

**Implications.** Freeze branding is often proposed as a painless alternative to hot-iron branding, although there are no scientific data to support that suggestion. Calves tried to avoid both freeze and hot-iron branding, but only hot-iron branding resulted in an epinephrine release that indicates a greater acute pain sensation. Freeze branding should be considered as an alternative to hot-iron branding as a possible method to reduce pain and to eliminate scar damage which decreases the hide value. Increased expense, time required to perform the procedure, difficulty in procuring a suitable coolant in remote areas, and the initial poor visibility of the brand, will likely continue to limit the use of freeze branding.

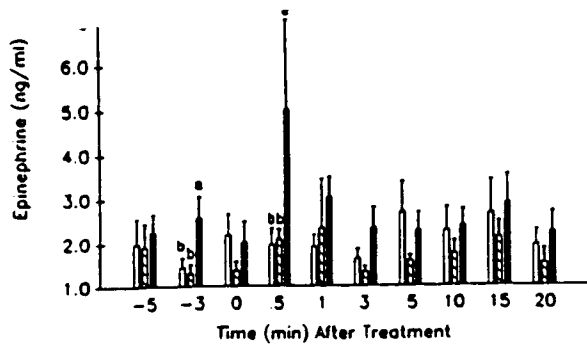


Figure 1. Mean ( $\pm$  SE) plasma epinephrine concentrations in response to treatment. Treatments were administered at time 0. Bars with different letters at time -3 differ ( $P = .07$ ). Bars with different letters at time .5 differ ( $P = .10$ ).

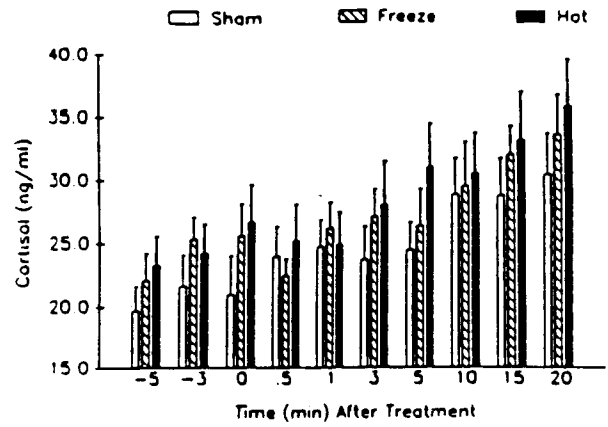


Figure 2. Mean ( $\pm$  SE) plasma cortisol concentrations in response to treatment. Treatments were administered at time 0.