STEER TEMPERAMENT INFLUENCES STRESS RESPONSIVENESS TO HANDLING TYPICAL IN BEEF CATTLE MANAGEMENT

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Background. The degree to which an animal reacts to novel or stressful situations is influenced by that individual's temperament, as animals with a poor temperament will be easily excited and exhibit a greater fear response. Biologically, this response can be assessed by measuring the stress hormones cortisol and epinephrine, both secreted from the adrenal glands. Stressful situations can often stem from human handling involved with common, seemingly harmless, management practices. Poor temperament negatively impacts multiple facets of cattle production, as temperamental cattle exhibit lower weight gains, produce tougher meat, yield increased amounts of bruise trim, and have a compromised immune system. Differences in the stress response associated with animal temperament may be of value in understanding the link between animal behavior and economic endpoints within the beef industry.

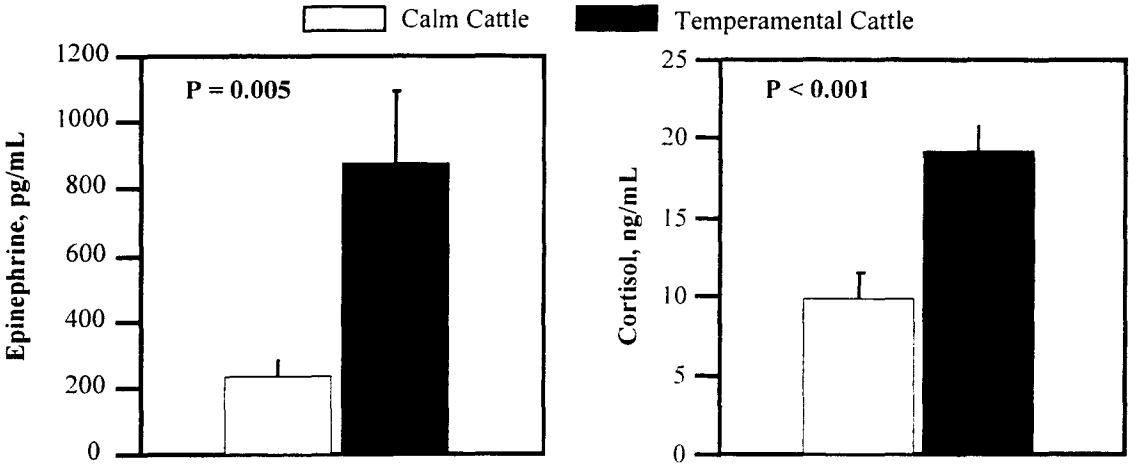
The objective of this study was to identify relationships between physiologic responses to handling, during typical management situations, and cattle temperament.

Research Findings. At the conclusion of their time on pasture, three groups, each of fifty crossbred beef steers were transported to South Texas commercial feedlots. Prior to shipping, temperament was assessed by measuring exit velocity (EV), which is the rate at which the steers exited the squeeze chute and traversed a fixed distance (1.83 m). The slowest ten percent from each of the three groups were deemed calm (C; EV = 1.11 ± 0.2 m/sec) and the fastest ten percent deemed temperamental (T; EV = 3.37 ± 0.2 m/sec). In order to measure endocrine parameters associated with a stress response, blood samples were obtained via tail-bleeding during management situations that are routine in a beef production scheme. These typical situations included prior to, and post-transportation (~ 650 miles) to the feedyard, during a routine weighing at d 70 of the feeding period, and on the day cattle were sent to slaughter. Plasma concentrations of cortisol and epinephrine were determined by immunoassay methods.

Temperament influenced the steers' stress response to handling during all of the points of data collection. Prior to shipment to the feedyard, both concentrations of cortisol and epinephrine were greater in the temperamental steers than in the calm ones. Specifically, serum concentrations of cortisol differed (P = 0.026) between the two temperament groups (C = 9.87 ± 1.1, T = 13.97 ± 1.2 ng/mL) and plasma concentrations of epinephrine were influenced (P = 0.017) by temperament (C = 86.8 ± 24.9, T = 534.1 ± 202.6 pg/mL). Upon arrival at the feedyard, temperament continued to have an impact on the steers' adrenal responsiveness to being

worked. Plasma concentration of epinephrine (C = 454.5 ± 136.1, T = 1845.9 ± 511.6 pg/mL) and serum concentrations of cortisol (C = 9.3 ± 1.7, T = 17.8 ± 3.1 ng/mL) were influenced ($P <$ 0.02) by temperament. The marked increase in epinephrine concentration in both the calm and temperamental steers, following the transportation, highlights the physiological consequences of shipping stress. Midway through the feeding period (d 70) temperament still influenced the stimulation of stress hormones induced by handling the steers (Figure 1). It is important to note that the original measure of exit velocity, taken prior to shipment to the feedlot, was still positively correlated with both serum concentration of cortisol (r = 0.62, $P < 0.001$) and plasma concentration of epinephrine (r = 0.79, $P < 0.001$). Such relationships , persisting seventy days into the feeding period, demonstrate the utility of exit velocity as an early objective method to identify temperamental calves. By the end of the feeding period the influence of temperament on stress responsiveness had lessened but was still apparent. Prior to shipment to the packer serum concentration of cortisol differed ($P = 0.06$) with steer temperament (C = 11.77 ± 1.8, T = 16.67 ± 1.8 ng/mL). Plasma concentration of epinephrine at this time point was only numerically higher in the temperamental steers than in the calm ones ($P = 0.10$; C = 140.7 ± 42.7, T = 414.4 ± 154.9 pg/mL). Habituation to the management practices may explain why there is less of a difference in stress responsiveness between the two temperament groups by the end of the feeding period within a herd.

Figure 1. Mean epinephrine and cortisol concentrations for temperament groups on d 70.



Application. As animal temperament is linked with stress physiology the benefits from decreasing numbers of temperamental animals within a herd may extend beyond behavior. These data show that increased physiological stress responses associated with temperament persist throughout the course of the typical beef steer's lifetime. With stress responsiveness having biological links to growth performance, immunological proficiency, and meat quality there may be financial gains to come from reducing the number of temperamental cattle within a herd.