Impact of different handling styles (good vs. aversive) on growth performance, behavior, and salivary cortisol concentrations in beef cattle

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Story in Brief

The study objective was to determine effects of aggressive handling on growth performance, behavior, and salivary cortisol concentrations in beef calves. Crossbred calves (689 ± 10.3 lb; 24 steers and 30 heifers) from a single herd were stratified by gender, body weight, and initial chute score, then allocated randomly to 1 of 6 pens. Each pen was assigned randomly to 1 of 2 handling treatments (good vs. adverse) applied on days 7, 35, 63, and 91. The objective of the good treatment was to handle calves quietly and gently to minimize stress. The objective of the adverse treatment was to move the calves rapidly and expose them to stressful stimuli. Body weight, exit velocity, and chute scores (based on 5 point subjective scale) were recorded and salivary samples for cortisol were collected from the same calves (pen) on days 0, 7, 35, 63, and 91. Pen scores (5 point subjective scale) were recorded on days 12, 42, and 87. Data were analyzed using a mixed model. Chute scores tended to be greater (more agitated) in the adverse treatment on day 7, but did not differ on subsequent days (treatment × day, P = 0.06). Salivary cortisol concentrations on day 63 were greater in cattle on the adverse treatment (treatment × day, P = 0.001). Body weight, exit velocity, and pen scores were not affected by treatment (P ≥ 0.24). While differences were observed, cattle appeared to acclimate to short-term adverse handling, and it did not dramatically affect performance or behavior of beef cattle.

Introduction

Animal welfare has become an important current issue. People have been demanding and working for reform in livestock management worldwide. There have been citizen petitions and legislative bills calling for changes in the husbandry of animals in the livestock industry. Research in this area has become increasingly important.

Treatment of livestock is also a concern of producers, not only to comply with guidelines for animal welfare legislation but to increase productivity. More recently, the effect of animal handling on cattle behavior and the quality of product is a point of interest in research. In studies conducted by Hanna et al. (2006), Breuer et al. (1997), and Seabrook (1984), negative handling reduced milk yield in dairy cattle by 6% to 13%. Likewise, a study in Australia by Petherick et al. (2009) determined that adverse treatment negatively impacted live weight gain if the treatment was extreme enough.

This study was designed to determine the impact of different handling styles—good vs. adverse—on growth performance, behavior, and salivary cortisol concentrations in growing beef cattle.

Materials and Methods

Single source, crossbred Angus calves (n = 54; BW = 689 ± 10 lb; 24 steers and 30 heifers) from the University of Arkansas System Division of Agriculture cow/calf unit, were used. Calves had been previously weighed and handled numerous times since birth. Animals were penned in groups of 9 of mixed sex, housed on 6, 6-acre mixed grass pastures, and supplemented with dried distiller’s grain (0.75% body weight per day basis). The amount of supplement was adjusted monthly based on recorded body weights. Water and a mineral supplement (Powell 4% Beef Mineral, Powell Feed and Milling Co. Inc, Green Forest, Ark.) were available ad libitum.

Initial Processing. The 92-d study began on February 16, 2011 (d -15). Cattle were weighed, and chute scores recorded, then stratified by gender, body weight, and chute score and allocated randomly to 1 of 6 pens. On d 0, all cattle were weighed and dewormed (Dectomax, Pfizer Animal Health, New York, N.Y.). Steers were implanted with Component TE-G (Ivy Animal Health, Inc., Overland Park, Kan.). Chute scores and exit velocity were recorded and an initial salivary sample was obtained. Cattle were sorted into assigned pens. Each pen was assigned randomly to 1 of 2 treatments (good or adverse handling). Calves in the good treatment groups were handled quietly with minimal stress and human interaction. This treatment involved moving calves from the pasture to the working facility as quietly as possible and with minimal prodding; a 15-min rest period where they were left alone in the holding pens, gentle handling through the chute, and a quiet environment inside the working facility. The goal of the adverse treatment groups was to work the calves in a manner that would maximize stress. This included moving the calves from the pasture to the holding pens as rapidly as possible, a 15-min period where they were exposed to extraneous noises and stimuli including an audible recording of distressed cattle noises and trains, slaming gates, ringing cow bells, banging on metal panels with rubber mallets, and prodding with livestock paddles. While being worked through the chute, cattle were exposed to loud talking and recorded sale barn noises, and cattle were aggressively prodded when they refused to move. These treatments were applied on d 7, 35, 63, and 91 of the study. Each treatment group was worked separately. Pens of cattle on the good treatment were worked first, returned to their pastures, and then the adverse treatment pens were brought to the working facility.

Measurements. On d 7, 35, 63, and 91 labor input was measured by recording 2 time intervals: the time it took to collect the calves from the pastures and the time it took to work calves through the chute. For the first factor, timing began when the handlers entered the pasture and stopped when the last calf exited the pasture, and for the second factor the amount of time between the pen of calves entering the working facility to the last calf exiting the restraining chute and re-entering the holding pen was recorded.

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Before entering the restraining chute each calf was weighed in a stanchion located behind the chute. While in the handling facility, a chute score was recorded to measure temperament. Each calf’s chute score was recorded by 2 people independently and was based on a subjective 5 point scale (1 = calm, 2 = restless shifting, 3 = constant shifting with occasional shaking of weight box, 4 = continuous vigorous movement and shaking of weight box, and 5 = rearing, twisting, or violently struggling). Exit velocity was recorded when calves exited the restraining chute by using motion detecting equipment (Polaris Wireless Timer; FarmTek, Inc.; Wilie, Texas). Two laser barriers were placed 5 ft and 12 ft from the front of the chute. As the initial and secondary lasers were interrupted by an animal moving past them the equipment recorded the time it took each calf to traverse 7 ft.

To measure salivary cortisol concentrations, saliva samples from the same 4 pre-selected calves per pen were collected while cattle were in the restraining chute. Saliva samples were collected using a single-use synthetic sponge (2” x 0.5” x 0.5”) held by a surgical clamp and inserted into the cheek. The sponge was then compressed within a syringe into a vial to collect approximately 2 mL of saliva sample. Samples were sealed and frozen at -10°F until analysis. Saliva was analyzed for cortisol using a commercially available enzyme linked immunoassay kit as described in the manufacturer’s instructions (Salimetrics, State College, Pa.).

On d 12, 42, and 87, subjective pen scores were recorded by an evaluator who scored the same 3 pre-selected calves per pen—selected randomly and marked by blue ear tags—upon initial approach in pasture and a second approach following a period of 5 min in the calves’ presence. Pen scores were based on a 5 point scale (1 = unalarmed when approached, 2 = slightly alarmed and trots away, 3 = moderately alarmed and moves away quickly, 4 = very alarmed and runs off or charges, 5 = very excited and aggressive towards evaluator).

All data were analyzed using a mixed model of SAS (SAS Inst. Inc., Cary, N.C.). Fixed effects were treatment, sex, day when appropriate, and all interactions. Random effect was replication, and the subject was pen.

**Results and Discussion**

A tendency for a treatment x day interaction (Fig. 1, P = 0.08) was observed for time to gather cattle from the pasture. Good treatment groups tended to be faster (P = 0.10) on d 7 and slower (P = 0.07) on d 35. Times did not differ (P ≥ 0.31) on either exit velocity or the final or any interim body weight and average daily gain (ADG). The final body weight of the cattle was 919 ± 29 lb and the ADG for the 92 d study was 2.48 ± 0.06 lb for the adverse vs. good treatments, respectively. The lack of treatment effect on performance is consistent with findings of Petherick et al. (2009) who observed that adverse handling (similar to ours) had only a temporary effect on liveweight gain. The concern among Hanna et al. (2009), as well as Hanna et al. (2006), was that handling methods used in their experiments were not extreme enough to produce the same results as previous studies. Based on the results for chute score, exit velocity, and cortisol concentrations, it appears the adverse handling in this study was not sufficient to produce responses as seen in previous studies. Results are also consistent with the findings of Burdick et al. (2009) that short-term exposure (acute stress) to elevated cortisol concentrations does not have an effect on health; whereas, a more prolonged exposure (chronic stress) would negatively impact productivity. Another concern among Hanna et al. (2006) and Petherick et al. (2009) was the predictability of the handlers’ treatment. As the chute scores suggest, calves may have become acclimated to our adverse treatment. Similar patterns were observed in Petherick et al. (2009), indicating that the cattle began to anticipate the patterns of the adverse handling and thus the novelty and aversion to repeated stressful stimuli is reduced over time.

**Implications**

Results from the calf chute scores observed in this study suggest that cattle can become acclimated to repeated stressors. However, adverse treatment elevated cortisol concentrations, a physiological indicator of stress, in calves. The lack of a treatment effect on body weight suggests acute and repeated adverse treatment may not affect production in growing beef calves, consistent with previous findings that short-term exposure to adverse handling has little to no lasting effect on calves. Possibilities for further research would be to test the effects of long-term exposure and variation in the types of handler behavior on cattle production.

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**Literature Cited**


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**Fig. 1.** Effect of handling style on time for handlers to collect the cattle and move them out of the pasture each work day. Effect of treatment × day (P = 0.08). Means within a day differ †P ≤ 0.10.

**Fig. 2.** Effect of handling style on time for cattle to be worked through the chute on each work day. Effect of day (P = 0.002), treatment × day (P = 0.02). Means within a day differ *P ≤ 0.05, †P ≤ 0.10.
Figure 3. Effect of handling style on subjective chute scores, 1 = calm to 5 = rearing, twisting, or violently struggling. Effects of day ($P < 0.001$), and treatment × day ($P = 0.06$). Means within a day differ **$P < 0.001$.

Fig. 3. Effect of handling style on subjective chute scores, 1 = calm to 5 = rearing, twisting, or violently struggling. Effects of day ($P < 0.001$), and treatment × day ($P = 0.06$). Means within a day differ **$P < 0.001$.

Figure 4. Effect of handling style on salivary cortisol concentrations. Effects of treatment ($P = 0.09$), day ($P < 0.001$), and treatment × day ($P < 0.001$). Means within a day differ **$P < 0.001$.

Fig. 4. Effect of handling style on salivary cortisol concentrations. Effects of treatment ($P = 0.09$), day ($P < 0.001$), and treatment × day ($P < 0.001$). Means within a day differ **$P < 0.001$. 