

Cattle Producer's Handbook

Reproduction Section

465

Temperament and Reproduction in Beef Females

Reinaldo Cooke, Oregon State University, Eastern Oregon Agriculture Research Center, Burns

For more than a century, the word “temperament” has been used to define the fear-related behavioral responses of cattle when exposed to human handling (Fordyce et al. 1988). As cattle temperament worsens, their response to human contact or any other handling procedure becomes more excitable. Within the beef cattle industry, producers select cattle for temperament primarily for safety reasons. However, recent studies demonstrate that cattle temperament may also have productive and economic implications to beef operations.

Is Excitable Temperament a Stress Response?

“Stress response” is defined as the reaction of cattle to internal and external factors that affect their well being, and animals that are unable to cope with these factors are classified as “stressed.” Examples are extreme temperatures, diseases, and injuries. Based on this concept, the agitated and/or aggressive responses expressed by cattle with excitable temperament when exposed to human handling can be attributed to their fear and consequent inability to cope with this situation; therefore, classified as a stress response. In addition to altered behavior, temperamental cattle may also experience changes in their body physiology, and the hormones produced during this fear-related stress reaction influence several aspects, such as growth, health, and reproduction.

One of the main hormones produced during a stress response is cortisol. Several studies reported that blood cortisol concentrations are greater in temperamental cattle compared to calm cattle (Table 1). This outcome validates that excitable temperament can be classified as a stress response and is one of the reasons why cortisol is commonly considered paramount to the behavioral stress response.

Table 1. Blood cortisol concentrations of cattle with calm or excitable temperament.¹

Item	Adequate	Excitable
<i>Bos indicus</i>		
Steers	16.7	19.6
<i>B. indicus</i> × <i>B. taurus</i>		
Heifers	45.5	57.9
Cows	30.7	42.4
<i>B. taurus</i>		
Heifers	32.1	41.8
Cows	17.8	22.7

¹Cooke et al. 2009ab, Cooke et al. 2012a, and Francisco et al. 2012.

Assessment of Temperament in Beef Cattle

Cattle temperament can be visually evaluated by many methods, which can be categorized into non-restrained and restrained techniques (Burrow and Corbet 2000). Within the non-restrained techniques, cattle temperament is evaluated by their fear or aggressive response to man when they are free to move within the evaluation area. Examples of these techniques are chute exit velocity and pen score.

Exit velocity evaluates the speed of an individual animal immediately after it leaves the squeeze chute by measuring the time required for the animal to travel a pre-determined distance. This assessment can be expressed in actual speed measures (i.e., feet/second), or in a 1-5 scale, where 1 is the slowest and 5 is the fastest animal.

The pen score evaluates the behavioral response of an individual animal when it enters a small pen and interacts with a person standing inside the pen. Typically in a 1-5 scale, the pen score increases as the animal response becomes more aggressive toward the person.

The restrained techniques evaluate cattle temperament when these are physically restricted, such as in the squeeze chute. An example of the restrained techniques is the chute score, also denominated crush score. Cattle are individually restrained in the chute and scored in a 1-5 scale according to its behavior:

- 1 = calm with no movement,
- 2 = restless movements,
- 3 = frequent movement with vocalization,
- 4 = constant movement, vocalization, shaking of the chute, and
- 5 = violent and continuous struggling.

This measurement can be taken with cattle that are squeezed or not in the chute. However, squeezed animals may not express their real temperament.

Other methods to assess cattle temperament have also been reported; however, chute score, exit velocity, and pen score have been shown to be repeatable within animals and relatively simple to carry out during handling procedures. Additionally, these techniques are typically related to each other and with blood cortisol concentrations, indicating that these three measurements can similarly assess cattle temperament and denote the amount of behavioral stress that the animal is experiencing (Fig. 1).

To further increase the accuracy in temperament evaluation, producers can utilize more than one technique and combine the results into an overall temperament score. This score typically relates better with blood cortisol concentrations compared to individual techniques (Fig. 2).

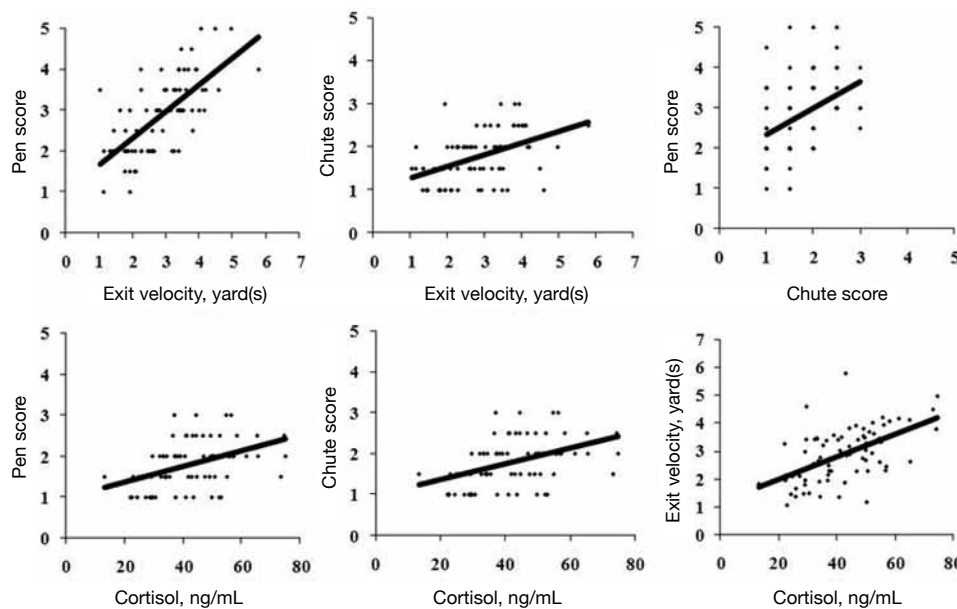


Fig. 1. Relationship among measurements of temperament and blood cortisol concentrations in beef heifers. Adapted from Cooke et al. 2009b.

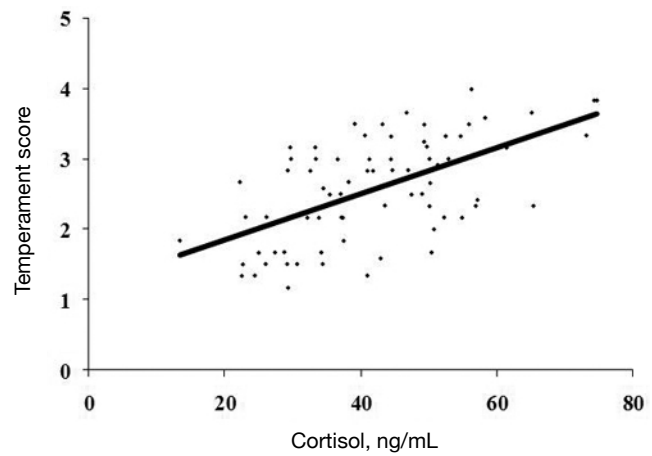


Fig. 2. Relationship between temperament score (1 = calm; 5 = excitable temperament) and blood cortisol concentrations in beef heifers. Adapted from Cooke et al. 2009b.

Factors That Influence Temperament in Beef Cattle

Cattle temperament is influenced by several factors, such as sex, age, and horn status (Fordyce et al. 1988, Voisinet et al. 1997). However, none of these characteristics has been shown to affect cattle temperament as much as production system and breed type (Table 2). Cattle reared in extensive systems, such as the range cow-calf operations in the western states, are expected to have more excitable temperament compared to cattle reared in intensive operations because of less frequent interaction with humans (Fordyce et al. 1985).

Further, cattle with high Brahman influence have more excitable temperament compared to *B. taurus* cattle (Fordyce et al. 1988, Voisinet et al. 1997). There-

fore, cattle reared on extensive production systems, particularly if they have Brahman-influence, are potentially difficult to control and handle, which can pose significant management, economic, and productivity problems.

Temperament and Reproduction in Beef Females

Excitable temperament is detrimental to the nutritional status of cattle, given that temperamental cattle have decreased feed intake compared to calm cohorts (Brown et al. 2004, Nkrumah et al. 2007). In addition, cattle with excitable

Table 2. Factors that affect cattle temperament.¹

Item	Method of assessment ²	Mean
Sex		
Male	Temperament score;	2.7
Female	1 to 5 scale	3.0
Age		
< 2 years	Exit velocity score;	3.1
> 2 years	1 to 5 scale	2.8
Horn status		
Horned	Exit velocity score;	2.7
Polled	1 to 5 scale	3.0
Breed type		
Brahman x Hereford	Temperament score;	3.6
Brahman x Angus	1 to 5 scale	3.8
Angus		1.7
Simmental x Angus		1.8
Human interaction		
Frequent	Crush score;	1.5
Infrequent	1 to 7 scale	2.1

¹Adapted from Voisinet et al. 1997, Fordyce et al. 1985 and 1988, and Cooke et al. 2009a.

²As score increases, exit velocity increases, and crush/temperament becomes more excitable.

temperament also have altered metabolism and partitioning of nutrients in order to sustain the behavioral stress response, which results in further decreases in nutrient availability to support body functions (Cooke et al. 2009a, Cooke et al. 2009b). Nutritional status largely determines reproductive performance in cattle; therefore, excitable temperament may indirectly impair reproduction in beef heifers and cows by decreasing nutritional balance.

Also, the hormones produced during a stress response, particularly cortisol, directly disrupt the physiological mechanisms that regulate reproduction in beef females, such as ovulation, conception, and establishment of pregnancy. As an example, cows with calm temperament have reduced cortisol and greater blood concentrations of luteinizing hormone—the hormone required for puberty establishment and ovulation—compared to temperamental cows. Accordingly, it was recently demonstrated that beef heifers with calm temperament reached puberty sooner than temperamental cohorts (Table 3). Brahman-influenced cows with excitable temperament had decreased chances of becoming pregnant during the breeding season compared to calm cohorts (Fig. 3).

Similar relationships were detected when blood cortisol concentrations were evaluated against puberty or pregnancy instead

Table 3. Post-weaning temperament scores (1 = calm; 5 = excitable temperament) and blood cortisol concentrations of replacement heifers that attained or not puberty by 12 months of age.¹

Item	Non-pubertal	Pubertal
Temperament score	2.7	2.3
Cortisol, ng/mL	50.0	39.7

¹Adapted from Cooke et al. 2009b.

Table 4. Reproductive performance of Angus x Hereford beef cows according to temperament.¹

Item	Adequate	Excitable
Pregnancy rate, %	94.6	88.7
Calving rate, %	91.8.0	85.0
Weaning rate, %	89.9	83.9
Calf weaning BW, lb	545	543
lbs of calf weaned/cow exposed to breeding	490	455

¹Adapted from Cooke et al. 2012.

of temperament in those heifers and cows (Table 3 and Fig. 3).

In addition, Angus × Hereford cows with excitable temperament had reduced pregnancy rate, calving rate, weaning rate, and pounds of calf weaned/cow exposed compared to cows with adequate temperament (Table 4), indicating that excitable temperament not only impairs reproductive performance, but also overall production efficiency in cow-calf systems.

Therefore, management strategies that improve the overall temperament of the herd are imperative for optimal productivity of cow-calf operations (Plasse et al. 1970, Cooke et al. 2009a).

Improving Temperament of Beef Cattle

One alternative to improve temperament and consequently benefit reproduction in beef females is to adapt them to human handling. Early studies reported that cattle accustomed to human handling had calmer temperament, reduced blood cortisol concentrations,

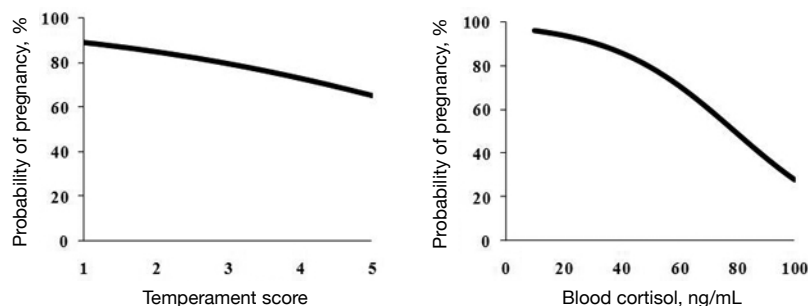


Fig. 3. Probability of beef cows to become pregnant according to temperament score (1 = calm; 5 = excitable temperament) and blood cortisol concentrations assessed at the beginning of the breeding season. Adapted from Cooke et al. 2009a.

Table 5. Effects of acclimation to human handling on temperament, cortisol, and reproduction of replacement heifers.^{1,2}

Item	Acclimated	Non-acclimated
<i>Brahman-influenced heifers</i>		
Chute score, 1 to 5 scale	1.4	1.9
Cortisol, ng/mL	37.8	50.5
% of pubertal heifers by 12 months of age	65	39
% of pregnant heifers 30 days into breeding season	50	32
<i>Angus x Hereford heifers</i>		
Exit velocity, feet/second	7.0	8.6
Cortisol, ng/mL	26.1	32.8
% of pubertal heifers by 12 months of age	59.6	37.8

¹Acclimated heifers were exposed to a handling process three times weekly for 4 weeks after weaning. Control heifers remained undisturbed on pasture.

²Adapted from Cooke et al. 2009b and Cooke et al. 2012.

and increased LH concentrations compared to non-acclimated cattle (Crookshank et al. 1979, Echtenkamp 1984, Fordyce et al. 1985). Further, replacement heifers exposed to an acclimation process to human handling for 4 weeks after weaning had improved temperament, reduced cortisol, and reached puberty and became pregnant earlier compared to non-acclimated cohorts (Table 5). However, no beneficial effects on temperament and reproduction were detected when mature cows were exposed to acclimation to human handling (Cooke et al. 2009a).

Therefore, adapting beef females to human interaction early in their productive lives may be an alternative to improve their temperament and consequently hasten their reproductive development. Further, including temperament in culling/selection criteria might be the most appropriate alternative to improve the overall temperament and consequent reproductive performance of the adult cowherd.

Conclusions

In summary, excitable temperament is a fear-related behavioral response that has detrimental effects on reproductive function of beef heifers and cows. Temperament is even a greater concern in extensive beef operations, particularly if they contain Brahman-influenced cattle. Temperament influences cattle reproduction indirectly by decreasing nutritional status, and directly by altering the physiological mechanism required for ovulation and conception.

Beef producers can evaluate cattle temperament by visual assessments that can be conducted during

common handling procedures, such as assessing chute score when cattle have to be handled for vaccination or weaning. Depending on the outcomes, producers can adopt management strategies to improve the overall temperament of the cowherd. Examples are acclimation to human handling and consideration of temperament in selection/culling decisions, which will bring benefits to the reproductive performance and consequent productivity of cow-calf operations containing temperamental cattle.

Literature Cited

- Brown, E. G., G. E. Carstens, J. T. Fox, M. B. White, T. W. Welsh Jr., R. D. Randel, and J. W. Holloway. 2004. Relationships between temperament and performance traits of growing calves. *In: 2004 Beef cattle research in Texas*. Available at: http://animalscience.tamu.edu/ansc/beef/bcrt/2004/brown_erin.pdf. Accessed May 2009.
- Burrow, H. M., and N. J. Corbet. 2000. Genetic and environmental factors affecting temperament of zebu and zebu-derived beef cattle grazed at pasture in the tropics. *Aust. J. Ag. Res.* 51:155-162.
- Cooke, R. F., J. D. Arthington, D. B. Araujo, and G. C. Lamb. 2009a. Effects of acclimation to human interaction on performance, temperament, physiological responses, and pregnancy rates of Brahman-crossbred cows. *J. Anim. Sci.* 87:4125-4132.
- Cooke, R. F., J. D. Arthington, B. R. Austin, and J. V. Yelich. 2009b. Effects of acclimation to handling on performance, reproductive, and physiological responses of Brahman-crossbred heifers. *J. Anim. Sci.* 87:3403-3412.
- Cooke, R. F., D. W. Bohnert, B. I. Cappellozza, C. J. Mueller, and T. DelCurto. 2012. Effects of temperament and acclimation to handling on reproductive performance of *Bos taurus* beef females. *J. Anim. Sci.* 90:3547-3555.
- Crookshank, H. R., M. H. Elissalde, R. G. White, D. C. Clanton, and H. E. Smalley. 1979. Effect of transportation and handling of calves upon blood serum composition. *J. Anim. Sci.* 48:430-435.
- Echtenkamp, S. E. 1984. Relationship between LH and cortisol in acutely stressed beef cows. *Theriogenology* 22:305-311.
- Fordyce, G., M. E. Goddard, R. Tyler, G. Williams, and M. A. Toleman. 1985. Temperament and bruising of *Bos indicus* cross cattle. *Aust. J. Exp. Ag.*, 25:283-288.
- Fordyce, G. E., R. M. Dodt, and J. R. Wythes. 1988. Cattle temperaments in extensive beef herds in northern Queensland. 1. Factors affecting temperament. *Aust. J. Exp. Ag.* 28:683.
- Francisco, C. L., A. M. Jorge, F. D. Rezende, A. Schmidek, J. M. B. Benatti, M. H. Faria, E. Oba, and R. F. Cooke. 2012. Effects of temperament on physiological responses, feedlot performance, and carcass characteristics of Nelore steers. *J. Anim. Sci.* 90 (E-Suppl. 3):427 (Abstr.).
- Nkrumah, J. D., D. H. Crews Jr., J. A. Basarab, M. A. Price, E. K. Okine, Z. Wang, C. Li, and S. S. Moore. 2007. Ge-

netic and phenotypic relationships of feeding behavior and temperament with performance, feed efficiency, ultrasound, and carcass merit of beef cattle. *J. Anim. Sci.* 85:2382-2390.

Plasse, D., A. C. Warnick, and M. Koger. 1970. Reproductive behavior of *Bos indicus* females in a subtropical environment. IV. Length of estrous cycle, duration of es-

trus, time of ovulation, fertilization, and embryo survival in grade Brahman heifers. *J. Anim. Sci.* 30:63-72.

Voisinet, B. D., T. Grandin, J. D. Tatum, S. F. O'Connor, and J. J. Struthers. 1997. Feedlot cattle with calm temperaments have higher average daily gains than cattle with excitable temperaments. *J Anim Sci.* 75:892-896.



©2016

Issued in furtherance of cooperative extension work in agriculture and home economics, Acts of May 8 and June 30, 1914, by the Cooperative Extension Systems at the University of Arizona, University of California, Colorado State University, University of Hawaii, University of Idaho, Montana State University, University of Nevada/Reno, New Mexico State University, Oregon State University, Utah State University, Washington State University and University of Wyoming, and the U.S. Department of Agriculture cooperating. The Cooperative Extension System provides equal opportunity in education and employment on the basis of race, color, religion, national origin, gender, age, disability, or status as a Vietnam-era veteran, as required by state and federal laws.

Fourth edition; December 2016 Reprint