Effects of Temperament on Reproductive and Physiological Responses of Beef Cows

Reinaldo F. Cooke, Alexandre Scarpa, Chad Mueller, Tim DelCurto, and David W. Bohnert

Synopsis

Excitable temperament is detrimental to reproductive performance of beef cows.

Summary

A total of 435 multiparous lactating Angus × Hereford cows, located at two different OSU research stations (Burns, n = 241; Union, n = 192) were sampled for blood and evaluated for body condition score (BCS) and temperament prior to the beginning of the breeding season. Temperament was assessed by chute score and chute exit velocity score, which were combined into a final temperament score (1 to 5 scale; 1 = calm temperament, 5 = excitable temperament). Cows were classified according to the final temperament score (≤ 3 = adequate temperament, > 3 = excitable temperament). Blood samples were analyzed for plasma concentrations of cortisol, haptoglobin, and ceruloplasmin. During the breeding season, cows were exposed to mature Angus bulls for a 50-day breeding season (1:18 bull to cow ratio). However, cows located at the Union station were also assigned to an estrus synchronization + timed-AI protocol prior to bull exposure. Pregnancy status was verified by detecting a fetus with rectal palpation approximately 180 days after the breeding season.

Plasma cortisol concentrations were greater (P < 0.01) in cows with excitable temperament compared with cohort with adequate temperament (19.7 vs. 15.1 ng/mL, respectively). No effects were detected (P > 0.15) for BCS and plasma concentrations of haptoglobin and ceruloplasmin. Pregnancy rates tended to be reduced (P = 0.10) in cows with excitable temperament compared with cohort with adequate temperament (89.3 vs. 94.0 % as pregnant cows divided by total exposed cows, respectively). Further, the probability of cows to become pregnant during the breeding season was affected quadratically (P = 0.05) by temperament score (91.4, 95.0, 94.3, 87.6, and 59.3% of pregnancy probability for temperament scores of 1 through 5, respectively).

Results from this study indicate that excitable temperament is detrimental to reproductive performance of B. taurus beef cows, independently of BCS and breeding system.

Introduction

The major objective of cow-calf operations is to produce one calf per cow annually. Therefore, management procedures targeted to enhance reproductive performance of the cowherd are required for optimal profitability of cow-calf operations. The development of such management strategies are based upon recognition of traits that...
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Affect reproductive function in cattle. Recently, we determined that behavioral and physiological measures associated with excitable temperament were detrimental to pregnancy rates of brood cows (Cooke et al., 2009). However, this evaluation was only performed in Brahman-crossbred cows, whereas B. taurus cows, which make up the majority of Oregon’s cowherd, also exhibit excitable temperament. Thus, our hypothesis was that reproductive performance of B. taurus cows is also influenced by temperament and the physiological events associated with this trait. Our objectives were to determine the effects of temperament, assessed at the beginning of the breeding season, on blood measurements and reproductive performance of B. taurus cows.

Materials and Methods

This experiment was conducted from April 2009 to April 2010 at the Eastern Oregon Agricultural Research Center – Burns and Union stations, in accordance with an approved Oregon State University Animal Care and Use Protocol.

A total of 435 multiparous lactating Angus × Hereford cows (Burns, n = 241; Union, n = 192) were sampled for blood and evaluated for body condition score (BCS) and temperament within 2 weeks prior to the beginning of the breeding season. Temperament was assessed by chute score and exit velocity. Chute score was assessed by a single technician based on a 5-point scale, where 1 = calm, no movement, and 5 = violent and continuous struggling. Exit velocity was assessed by determining the speed of the cow exiting the squeeze chute by measuring rate of travel over a 7-feet distance with an infrared sensor (FarmTek Inc., North Wylie, TX). Further, cows were divided in quintiles according to their exit velocity, and assigned a score from 1 to 5 (exit score; 1 = slowest cows; 5 = fastest cows). Individual temperament scores were calculated by averaging cow chute score and exit score (1 to 5 scale; 1 = calm temperament, 5 = excitable temperament). Cows were classified according to the final temperament score (≤ 3 = adequate temperament, > 3 = excitable temperament).

Blood samples were harvested for plasma (centrifuged at 2,400 × g for 30 min), and frozen at -80°C on the same day of collection. Concentrations of cortisol were determined using a bovine-specific ELISA kit (Endocrine Technologies Inc., Newark, CA, USA). Concentrations of ceruloplasmin and haptoglobin were determined according to procedures described by Arthington et al. (2008).

During the breeding season, cows were exposed to mature Angus bulls for a 50-day breeding period (1:18 bull to cow ratio). However, cows located at the Union station were also assigned to a estrus synchronization + timed-AI protocol prior to bull exposure. Pregnancy status was verified by via rectal palpation 180 days after the breeding season.

Effects of temperament on blood parameters and pregnancy rates were analyzed with the MIXED and GLIMMIX procedures of SAS (SAS Inst., Inc., Cary, NC), respectively. The model statements contained the effects of temperament (1 to 5, or adequate vs. excitable temperament), herd, and the interaction. Blood data were analyzed using cow(temperament class × herd) as the random variable. The probability of cows becoming pregnant during the breeding season was evaluated according to temperament with the LOGISTIC procedure of SAS. Significance was set at P ≤ 0.05 and tendencies were determined if P > 0.05 and P ≥ 0.10.

Results

During the study, temperament score of 5 was not detected in any of the animals evaluated, given that cows with temperament extremely excitable are normally culled from the herd. Plasma cortisol concentrations were greater (P < 0.01) in cohort with adequate temperament compared with cohort with adequate temperament (Figure 1). Similarly, cortisol concentrations increased as temperament score increased (Figure 2). These findings support previous data indicating that cattle with excitable temperaments experience elevated concentrations of cortisol during handling procedures, likely due to the stress of human handling (Cooke et al., 2009).

Figure 1. Plasma cortisol concentrations of cows classified according to temperament score (≤ 3 = adequate temperament, > 3 = excitable temperament). A temperament effect was detected (P < 0.01).
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Figure 1. Plasma cortisol concentrations of cows according to temperament score (1 to 5 scale; 1 = calm temperament, 5 = excitable temperament). Values bearing a different letter differ (P < 0.05).

Pregnancy rates tended to be reduced (P = 0.10) in cows with excitable temperament compared with cohort with adequate temperament (Figure 3). No temperament effects were detected (P > 0.26) for BCS and plasma concentrations of haptoglobin and ceruloplasmin (Table 1), therefore, temperament effects detected on pregnancy rates were not associated with cow nutritional or health status (Cooke et al., 2009). Further, the probability of cows to become pregnant was affected quadratically (P = 0.05) by temperament score (Figure 4).

Table 1. Effects of temperament (score or class), assessed at the beginning of the breeding season, on BCS and plasma concentrations of haptoglobin (450 nm × 100) and ceruloplasmin (mg/dL) in beef cows.

<table>
<thead>
<tr>
<th>Item</th>
<th>BCS</th>
<th>Haptoglobin</th>
<th>Ceruloplasmin</th>
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<td>Temp. score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4.7</td>
<td>7.1</td>
<td>11.8</td>
</tr>
<tr>
<td>2</td>
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<tr>
<td>3</td>
<td>4.6</td>
<td>6.8</td>
<td>12.1</td>
</tr>
<tr>
<td>4</td>
<td>4.6</td>
<td>6.9</td>
<td>12.5</td>
</tr>
<tr>
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<td>0.48</td>
<td>0.64</td>
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<tr>
<td>P-Value</td>
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<td>0.17</td>
<td>0.82</td>
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<tr>
<td>Temp. class</td>
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<td></td>
</tr>
<tr>
<td>Adequate</td>
<td>4.7</td>
<td>6.5</td>
<td>11.5</td>
</tr>
<tr>
<td>Excitable</td>
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<td>7.0</td>
<td>12.5</td>
</tr>
<tr>
<td>SEM</td>
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<td>0.42</td>
<td>0.58</td>
</tr>
<tr>
<td>P-Value</td>
<td>0.45</td>
<td>0.21</td>
<td>0.15</td>
</tr>
</tbody>
</table>

These results indicate that excitable temperament is detrimental to reproductive function of beef cows, independently of BCS and breeding system. Therefore, management strategies that improve temperament of the cowherd will benefit reproductive efficiency and consequent productivity of cow-calf operations.

Figure 3. Pregnancy rates (pregnant cows / total cows) according to temperament score (≤ 3 = adequate temperament, > 3 = excitable temperament) in beef cows. A tendency for a temperament class effect was detected (P = 0.10).

Conclusions

Temperament is detrimental to reproductive performance of B. taurus beef cows, independently of BCS and breeding system. Therefore, management strategies that improve temperament of the cowherd will benefit reproductive efficiency and consequent productivity of cow-calf operations.

Figure 4. Effects of temperament score (1 to 5 scale; 1 = calm temperament, 5 = excitable temperament) on the probability of beef cows to become pregnant. This statistical analysis simulated probability of pregnancy in cows with temperament score of 5. A quadratic effect was detected (P = 0.05).
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Literature Cited

