Impacts of temperament on reproductive performance of *Bos indicus* and *B. taurus* beef females

Applied Reproductive Strategies in Beef Cattle

Reinaldo F. Cooke
Oregon State University – EOARC, Burns

What is Temperament?

- Behavioral responses of cattle when exposed to human handling
- As cattle temperament worsens:
  - Response to human contact becomes more excitable
- Selection for temperament (docility):
  - Heritable trait - Up to $h^2 = 0.50$
  - Mainly for safety reasons
  - Productive implications being established

How to assess temperament?

- Chute Score
  - Cattle are individually restrained in the chute
  - Scored in 1-5 scale according to behavior
    1. Calm with no movement
    2. Restless movement
    3. Frequent movement with vocalization
    4. Constant movement, vocalization, shaking of chute
    5. Violent and continuous struggling

- Exit Velocity or Score
  - Speed of cattle after it leaves the chute
  - Methods for measurement
    - Electronic
      - Establish distance to be traveled by the animal (feet)
      - Measure time (chronometer, infrared sensor in seconds)
      - Classify animals according to speed (feet/second)
    - Visual
      1. Walks away from the chute
      2. Trots away from the chute
      3. Runs away from the chute
How to assess temperament?
Chute Score and Exit Velocity

- Use scores individually
- Average both scores = Temperament Score

**Temperament Score**

- $n = 430$
- $r = 0.60$
- $P < 0.01$

Cooke et al. (2010)

How to assess temperament?
Temperament type

- Based on Temperament Score
  - Adequate temperament (TS $\leq 3$)
  - Excitable temperament (TS $> 3$)

- Maintain "some" temperament in the herd
  - Without impairing safety and productive traits
  - Cow-calf systems
    - Pairs survive challenges of extensive environments
    - Feedlot systems
      - Competition for bunk space

Factors that affect temperament

- Sex
  - Females are more temperamental

- Age
  - Young animals are more temperamental

- Production system
  - Range cattle are more temperamental

- Breed type
  - Greatest source of variation
  - *Bos indicus* cattle are more temperamental

Temperament x Production
What's the relationship?

- Reducing feed intake and nutritional status?
- Physiological effects?
  - Fear-related stress responses
    - Including CRH – ACTH - cortisol axis
      - Impact several metabolic processes
      - Imperative for optimal cattle performance

- Genetic effects?
  - Relationship among behavioral and reproductive traits is still unknown – deserves investigation

Temperament x Cortisol

**Brangus/Braford replacement heifers**

- $n = 74$
- $r = 0.58$
- $P < 0.01$

Cooke et al. (2009)

Temperament x Cortisol

**Brangus/Braford mature cows**

- $n = 488$
- $r = 0.49$
- $P < 0.01$

Cooke et al. (2009)
**Temperament x Cortisol**

Angus x Hereford mature cows

![Plasma cortisol, ng/mL vs Temperament Score](Cooke et al., 2012)

- **P** < 0.01
- n = 450

**Temperament x Cortisol**

Nelore (Bos indicus) mature cows

![Plasma cortisol, ng/mL vs Temperament Score](Cooke et al., 2015)

- **P** < 0.01
- n = 955

**Temperament x Reproduction**

Physiological effects

- Acclimated to human handling = calm temperament
- **P** < 0.01

![Plasma LH, Mean (ng/mL) and Pulses/4h](adapted from Cooke et al., 2009)

- Acclimated vs Non-acclimated
- Adapted from Echternkamp (1984)

**Temperament x Reproduction**

- Heifers pubertal by 12 mo of age
- **P** < 0.05

![Pubertal vs Non-pubertal](adapted from Cooke et al., 2009)

- Temperament Score (1 to 5)

**Temperament x Reproduction**

Braford mature cows

- Probability of pregnancy, %
- **P** < 0.01, n = 400

![Assessed at beginning of breeding season (90-d bull only)](Cooke et al., 2009)
Temperament x Reproduction
Braford mature cows
Assessed at beginning of breeding season (90-d bull only)

Linear effect; P < 0.01, n = 400

Plasma cortisol, ng/mL

Temperament x Reproduction
Nelore mature cows
Assessed at fixed time AI

Temperament x Reproduction
Nelore mature cows
Assessed at fixed time AI

Temperament x Reproduction
Angus x Hereford mature cows
Assessed at beginning of breeding season (FTAI + 50-d bull)

Temperament x Reproduction
Angus x Hereford mature cows
Assessed at beginning of breeding season (FTAI + 50-d bull)

Cooke et al. (2009)

Cooke et al. (2010)

Cooke et al. (2011)

Cooke et al. (2012)
Temperament x Reproduction
Angus x Hereford mature cows

**Calf weaning BW**

- Adequate (≤ 3): 248 kg
- Excitable (> 3): 247 kg

**Kg of weaned calf per cow exposed to breeding**

- Adequate (≤ 3): 223 kg of weaned calf/cow
- Excitable (> 3): 207 kg of weaned calf/cow

Temperament x Reproduction
Nelore mature cows

Assessed at 1st fixed time AI, followed by resynch/clean-up bulls

<table>
<thead>
<tr>
<th>Item</th>
<th>Excitable (n = 227)</th>
<th>Adequate (n = 726)</th>
<th>SEM</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCS</td>
<td>5.33</td>
<td>5.34</td>
<td>0.06</td>
<td>0.91</td>
</tr>
<tr>
<td>BW, kg</td>
<td>427</td>
<td>431</td>
<td>3</td>
<td>0.28</td>
</tr>
<tr>
<td>Age, mo</td>
<td>96.1</td>
<td>100.2</td>
<td>2.6</td>
<td>0.27</td>
</tr>
<tr>
<td>Days post-partum</td>
<td>51.3</td>
<td>51.4</td>
<td>0.4</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Pregnancy rate, %

- First AI, %: 41.0 vs. 47.2, P = 0.50
- Second AI, %: 39.2 vs. 43.1, P = 0.56
- Bull breeding, %: 93.7 vs. 96.1, P = 0.46
- Final, %: 78.3 vs. 76.0, P = 0.23
- Calving rate, %: 74.9 vs. 74.9, P = 0.92
- Pregnancy loss, %: 11.4 vs. 5.4, P = 0.08

**Probability of pregnancy, %**

Linear effect: P = 0.01, n = 953

**Hair cortisol, pg/mg**

- Excitable (n = 227)
- Adequate (n = 726)

- No relationship with plasma cortisol at 1st AI
- Overall cortisol concentrations previous 14-21 d
- Cattle not handled daily...
Temperament x Reproduction

• Excitable temperament is detrimental to:
  – Reproductive performance of females
    • Independent of breed
• But how?
  – Nutritional status was accounted in studies
  – Physiological effects (cortisol, what else?)
    • Cortisol = during handling / 1st AI…
    • Bull breeding? Pregnancy loss? Cattle not handled…
    – Genetic relationship? Still unknown
• Improve temperament of the cowherd
  – Benefit production in cow-calf operations

Temperament x Reproduction

• Strategies to improve herd temperament
  – Imperative to enhance beef production efficiency
  – Temperament as selection/culling criteria
    • Selection of sires
    • Culling aggressive and unproductive females
    • Maintain “some” temperament in the herd
  – Adequate handling of cattle
    • Aggressive and docile animals

Acclimation of young cattle to human interaction

Improving Temperament

• Acclimate cattle to human handling
  – Research studies conducted at UF and EOARC
• Grazing heifers
  – UF = Brangus/Braford
  – OSU = Angus x Hereford
  – Exposed or not to acclimation after weaning
    • 4 weeks total
  – Brought to the cowpens 3x/week
    • Exposed to common handling procedures
  – Growth, temperament, and reproduction

Acclimation of Heifers - UF

• After the acclimation process

Plasma cortisol, ng/mL

Pre-acclimation | Post-acclimation
--- | ---
Acclimated | Control
P < 0.01

Chute Score, 1-5 scale

Pre-acclimation | Post-acclimation
--- | ---
Acclimated | Control
P < 0.01

Cooke et al. (2009)
Acclimation of Heifers - UF
• Puberty attainment during the study
  - Cooke et al. (2009)
  - % of pubertal heifers
  - Acclimated vs. Control
  - P < 0.01

Acclimation of Heifers - UF
• Pregnancy during the breeding season
  - Cooke et al. (2009)
  - % of pregnant heifers
  - Acclimated vs. Control
  - P < 0.01

Acclimation of Heifers - OSU
• After the acclimation process
  - Cooke et al. (2012)
  - Plasma cortisol, ng/mL
  - Pre-acclimation vs. Post-acclimation
  - P < 0.01

Acclimation of Heifers - OSU
• After the acclimation process
  - Cooke et al. (2012)
  - % of pubertal heifers
  - Acclimated vs. Control

Acclimation of Heifers
• Acclimation of heifers to human handling
  - Decreased cortisol concentrations
  - Hastened reproductive development
  - Independent of breed type
• Effects on mature cows?
  - No positive effects detected
  - Cows often on extensive conditions
  - Improve temperament of mature cowherd
  - Include temperament in selection/culling criteria
Conclusions

- Excitable temperament is detrimental to:
  - Reproductive performance of females
  - Overall productivity of beef operations
    - Independent of breed type
- How?
  - Physiological + Genetic effects
    - Additional research needed
- Improve temperament of the cowherd
  - Benefit production in beef operations
    - Selection for temperament/acclimation to handling

Thank you for your attention

Oregon State University
Eastern Oregon Agricultural Research Center, Burns