Effects of Temperament and Animal Handling on Fertility

Applied Reproductive Strategies in Beef Cattle

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What is Temperament?

- Behavioral responses of cattle when exposed to human handling
- As cattle temperament worsens
  - Response to human contact becomes more agitated and/or aggressive
- Selection for temperament (docility)
  - Heritable trait – up to \( h^2 = 0.50 \)
  - Mainly for safety reasons
  - Productive implications not well 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
      - Better open the chute, otherwise buy another one

- 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**

\[
\text{Chute Score} = \text{Exit Velocity, m/s}
\]

- 1
- 2
- 3
- 4
- 5

Cooke et al. (2009)

How to assess temperament?

**Temperament type**

- Based on Temperament Score
  - Adequate temperament (TS ≤ 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 animals are more temperamental
- Breed type
  - Brahman animals are more temperamental
- HANDLING

Temperament x Production traits

**What’s the relationship?**

- Excitable temperament is a stress response

  - Reaction to factors that influence well-being
    - Psychologic stress – Fear
  - Failure to cope with human presence/handling
    - Become aggressive ➔ Stressed animal
    - Response not only behavioral!
    - Several detrimental effects on production

  - Stimulates several hormonal response
    - Epinephrine
    - Inflammatory processes
  - One culminates with cortisol production
    - Known as the stress hormone
    - Our area of research
  - Several studies confirmed that temperamental cattle have increased cortisol concentrations.
    - Cow-calf and feedlot scenarios

Temperament x Cortisol

**Brangus replacement heifers**

\[
\text{Blood Cortisol, ng/mL vs Temperament score}
\]

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

**Brangus mature cows**

<table>
<thead>
<tr>
<th>Temperament Score</th>
<th>Blood Cortisol (ng/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Cooke et al. (2009)

### Temperament x Cortisol

**Angus x Hereford mature cows**

<table>
<thead>
<tr>
<th>Temperament Score</th>
<th>Plasma cortisol (ng/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
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<tr>
<td>3</td>
<td></td>
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<tr>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Cooke et al. (2012)

### Effects of Stress Hormones

- Prepare the animal to fight the stressor!
  - Cortisol, in addition to other hormones
    - Epinephrine, norepinephrine, CRH, ACTH
  - “Fight or flight response”
    - Increased heart beat, respiration, metabolism
      - Requires a lot of nutrients
    - Detrimental effects on other aspects
      - Growth
      - Immune response
      - Reproduction

### How Temperament May Affect Cattle Reproduction?

### Temperament x Reproduction

- **Indirect effects?**
  - Reducing feed intake and nutritional status
    - Increased metabolism = Nutrient sink

- **Physiological effects?**
  - CRH – ACTH - cortisol axis
    - Impairs GnRH - LH/FSH - ovarian axis
    - Pregnancy maintenance

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

### Temperament x Reproduction

**Physiological effects**

- **Acclimated to human handling = calm temperament**

- **Mean (ng/mL)**
  - P < 0.01

- **Pulses/4h**
  - P < 0.01

adapted from Echternkamp, LVM.
Temperament x Reproduction

Physiological effects
- Cortisol infusion at h 0 to simulate stress of poor handling and disposition
- During the entire estrous cycle (beginning at ovulation)

Cooke and Cerri, 2010

PGF2α
CL
Regression

Temperament x Reproduction

Heifers pubertal by 12 mo of age

Cooke et al. (2009)

Temperament x Reproduction

Braford mature cows
Linear effect; P < 0.01, n = 400

Cooke et al. (2009)

Assessed at beginning of breeding season (90-d bull only)

Temperament score
Temperament x Reproduction

**Braford mature cows**

Assessed at beginning of breeding season (90-d bull only)

<table>
<thead>
<tr>
<th>Plasma cortisol, µg/dL</th>
<th>Probability of pregnancy, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>20</td>
<td>75</td>
</tr>
<tr>
<td>40</td>
<td>50</td>
</tr>
<tr>
<td>60</td>
<td>25</td>
</tr>
<tr>
<td>80</td>
<td>0</td>
</tr>
</tbody>
</table>

Linear effect; P < 0.01, n = 400

Cooke et al. (2009b)

**Nelore mature cows**

Assessed at fixed time AI

**Angus x Hereford mature cows**

Assessed at beginning of breeding season (FTAI + 50-d bull)

- **Calf weaning age**
  - Adequate (< 3): 201 days
  - Aggressive (> 3): 203 days
  - P = 0.45

- **Calf weaning BW**
  - Adequate (< 3): 545 lbs
  - Aggressive (> 3): 544 lbs
  - P = 0.71

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

Lbs of weaned calf per cow exposed

Temperament is a heritable trait

Calf temperament x Production
Angus x Hereford calves

Calf temperament assessed at weaning

P = 0.08
35 lbs difference; @ 160/cwt = US$ 56.00

Francisco et al. (2012)

P = 0.03

450
433
677
657

P = 0.05

814
798
1,309
1,280

P = 0.07

Francisco et al. (2012)
**Initial Conclusions**

- Excitable temperament is detrimental to:
  - Reproductive performance of females
  - Production efficiency of the calf crop
- But how?
  - Nutritional status was accounted in studies
  - Physiological effects (cortisol, what else?)
  - Genetic relationship
  - Still unknown… Future efforts
- Improve temperament of the cowherd
  - Benefit production in beef operations. But how?

**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

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**Acclimation of Heifers - UF**

- After the acclimation process

  ![Graph showing cortisol levels](Cooke et al. (2009))

  - Pre-acclimation vs. Post-acclimation
  - Plasma cortisol, ng/mL
  - Day of the study
  - Acclimated vs. Control
  - *P < 0.01*

**Acclimation of Heifers - UF**

- Puberty attainment during the study

  ![Graph showing puberty attainment](Cooke et al. (2009))

  - % of pubertal heifers
  - August, September, October, December
  - Acclimated vs. Control
  - *P < 0.01*

**Acclimation of Heifers - UF**

- Pregnancy during the breeding season

  ![Graph showing pregnancy](Cooke et al. (2009))

  - % of pregnant heifers
  - Week of the breeding season
  - Acclimated vs. Control
  - *P < 0.01*
Acclimation of Heifers - OSU

- After the acclimation process

Cooke et al. (2012)

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
  - Improve temperament of mature cowherd
    - Include temperament in selection/culling criteria
    - Overall positive effect in the herd = heritable trait
  - Proper cattle handling

Conclusions

- Excitable temperament is detrimental to:
  - Reproductive performance of females
  - Overall productivity of beef operations
    - Independent of breed type

- How?
  - Physiological + Genetic effects
  - Worse when cattle are not handled properly

- Improve temperament of the cowherd
  - Benefit production in beef operations
    - Selection for temperament / acclimation to handling

Thank you for your attention

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