EFFECT OF PHENOTYPIC CHARACTERISTICS AND PRECONDITIONING GAIN ON FEEDLOT PERFORMANCE AND CARCASS CHARACTERISTICS OF BEEF CATTLE

Jesse D. Savell
University of Florida
Introduction

• Preconditioning
  – Prepare the calf for a later stage of production
  – Reduce the incidence of BRD
  – Transition period
  – Evaluate calves individually
Introduction

• Preconditioning has been shown to decrease feedlot morbidity and mortality by 6% and 0.7%, respectively. (Cole, 1985)

• Market premiums have been associated with preconditioning due to the improved health status of the calves. (Minert et al., 1988)
Introduction

• Factors affecting calf value
  – Weight
  – Sex
  – Brahman percentage
  – Condition Score
  – Color
  – Color Pattern

Are any of these factors really predictive of future performance?
Objectives

- Quantify the effect of preconditioning performance on feedlot performance and carcass characteristics.
Objectives

- Evaluate easily measurable and economically important traits on preconditioning performance, feedlot performance, and carcass characteristics.
  - Brahman percentage
  - Condition score
  - Color
  - Color pattern
Materials and Methods

• Calves were weaned from a South Florida cow/calf operation.

• Calves were processed on the day of weaning at a preconditioning yard in North Central Florida.
Materials and Methods

• During processing calves were...
  • Weighed individually
  • Identified electronically
  • Vaccinated
  • Fire branded
  • Sorted into uniform lots
– Calves were processed at 89 hd/hr
Materials and Methods

- Brahman percentage was estimated and categorized as:
  - 0 Brahman
  - 1/8 Brahman
  - 1/4 Brahman
  - 3/8 Brahman
Materials and Methods

• Condition scores were categorized as
  • Slightly Thin
  • Average
  • Slightly Fleshy
Materials and Methods

• Colors that were present were
  • Black
  • Red
  • Yellow
  • Grey
  • White
Materials and Methods

• Color pattern was categorized as
  • solid patterned
  • non-solid patterned

• Non-solid patterned calves included spotted and brindle calves.
Materials and Methods

• Calves were preconditioned for 43d (34-51d) on pasture.
• A commercial supplement was fed at 3% of live body weight.
• 1100 steers and 421 heifers that comprised the large weight class were shipped to a feedlot operation in Kansas.
Materials and Methods

• Calves were harvested at a commercial meat packing facility based on 1 of 4 criteria.
  • Target Backfat
  • Cost of Gain = Sale Price
  • Minimum Weight
  • Maximum Weight
Materials and Methods

- Hot Carcass Weight
- Quality Grade
  - Prime
  - Upper 2/3 Choice
  - Low Choice
  - Select
  - Standard
- Ribeye Area/cwt and Yield Grade were calculated using data collected at the packing plant.
Preconditioning ADG
Effect of Preconditioning ADG on Feedlot ADG

P=0.54
Effect of Preconditioning ADG on Feed Efficiency

P<0.05
As Preconditioning ADG increased by 1 lb, Cost of Gain decreased by 4.4 cents/lb. (P<0.05)
Effect of Preconditioning ADG on Hot Carcass Weight

As Preconditioning ADG increased by 1 lb, Hot Carcass Weight increased by 19.5 lbs. (P<0.0001)
Preconditioning ADG Summary

- Preconditioning ADG was not a good predictor of Feedlot ADG
- As Preconditioning ADG increased
  - Feed Efficiency improved for steers and heifers
  - Cost of Gain was reduced
  - Hot Carcass Weight increased
  - No effect on Quality Grade or Yield Grade was observed
Estimated Brahman Percentage
Effect of Brahman Percentage on Preconditioning ADG

P<0.05
Effect of Brahman Percentage on Feedlot ADG

As Brahman percentage increased by 1/8, Feedlot ADG decreased by 0.07 lb/d. (P<0.0001)
Effect of Brahman Percentage on Hot Carcass Weight

As Brahman Percentage increased by 1/8, Hot Carcass Weight decreased by 19.5 lbs. (P<0.0001)
Effect of Brahman Percentage on Quality Grade

P<0.01
Effect of Brahman Percentage on Ribeye Area

![Chart showing the effect of Brahman percentage on ribeye area. The chart displays the ribeye area in square inches for different Brahman percentages: 0, 1/8, 1/4, and 3/8. The ribeye area decreases as the Brahman percentage increases.](chartImage)
Effect of Brahman Percentage on Ribeye Area/cwt

P=0.47
Brahman Percentage Summary

• As Brahman percentage increased,
  – Preconditioning ADG increased
  – Feedlot ADG decreased
  – Hot Carcass Weight declined
  – Quality Grade declined
  – No difference in REA/cwt was observed
Condition Score
Condition Score
Effect of Condition Score on Preconditioning ADG

P=0.07
Effect of Condition Score on Feedlot ADG

- Slightly Thin: 2.67
- Average: 2.51
- Slightly Fleshy: 2.33

P<0.0001
Effect of Condition Score on Cost of Gain

![Bar graph showing the effect of condition score on cost of gain. The x-axis represents condition score with categories Slightly Thin, Average, and Slightly Fleshy. The y-axis represents cost of gain in dollars per pound (\$/lb). The graph indicates that the cost of gain decreases from Slightly Thin to Average to Slightly Fleshy.]

P<0.0001
Effect of Condition Score on Hot Carcass Weight

As Condition Score increased, HCW decreased by 13.4 lbs. (P<0.001)
Condition Score Summary

• As Condition Score increased,
  – Preconditioning ADG decreased
  – Feedlot ADG decreased
  – Cost of Gain increased
  – Hot carcass weight decreased
  – No differences in Quality Grade or Yield Grade were observed
Coat Color

• The results presented as effects of coat color should be interpreted as including the possible effects of the breed or breed combinations that may potentially produce those colors.
Effect of Coat Color on Preconditioning ADG

P<0.001
Effect of Coat Color on Feedlot ADG

![Bar chart showing the effect of coat color on feedlot ADG.](chart.png)

- **Black**: ADG of 2.51 lbs
- **Red**: ADG of 2.22 lbs
- **Yellow**: ADG of 2.53 lbs
- **Grey**: ADG of 2.58 lbs
- **White**: ADG of 2.47 lbs

*P<0.01*
Effect of Coat Color on Feed Efficiency

P<0.01
Effect of Coat Color on Days on Feed

P < 0.0001
Effect of Coat Color on Cost of Gain

P<0.01
Effect of Coat Color on Hot Carcass Weight

P<0.001
Effect of Coat Color on Quality Grade

P<0.01
Effect of Coat Color on Ribeye Area/cwt

P<0.05
Effect of Coat Color on Yield Grade

P<0.05
Coat Color Summary

• Red cattle had lower Feedlot ADG and Poorer Feed Efficiency resulting in increased Cost of Gain
• Black cattle had smaller Hot Carcass Weight and REA/cwt, higher Yield Grade, but increased Quality Grade
• Grey cattle had larger HCW, REA/cwt, similar Quality Grade, and had lower Yield Grade than Blacks
Color Pattern
Color Pattern

• Color Pattern had no effect on...
  – Preconditioning ADG
  – Feedlot ADG
  – Feed Efficiency
  – Days on Feed
  – Cost of Gain
  – Hot Carcass Weight
  – Quality Grade
  – Ribeye Area/cwt
  – Yield Grade
Questions?
Color Pattern Summary

- These results indicate that price discrimination on the basis of color pattern is unwarranted, due to the lack of differences observed in performance between solid and non-solid patterned calves.
Implications-Preconditioning ADG

• Preconditioning ADG was not a good predictor of feedlot ADG.
• A strong improvement in feed efficiency was observed as preconditioning performance increased, resulting in a lower cost of gain and heavier carcass weights with fewer days on feed.
Implications-Brahman %

- A genotype by environment interaction existed with Brahman influenced calves having greater gains during preconditioning but lower feedlot ADG.

- As Brahman percentage increased, hot carcass weight and quality grade declined indicating that some discount on the basis of carcass performance is merited.
Implications-Condition Score

• Condition score is a good predictor of preconditioning ADG and overall feedlot performance supporting industry discrimination against fleshy calves.
Implications-Color

• Red cattle had poorer feedlot performance.
• Grey cattle perform similarly to black cattle for quality grade, but had the advantage of heavier carcasses and lower yield grades.
• Price discrimination on the basis of color pattern does not appear to be warranted in cattle that are managed similarly.
Effect of Condition Score on Ribeye Area/cwt

- Slightly Thin: 1.70
- Average: 1.73
- Slightly Fleshy: 1.78

P<0.001
**Introduction**

- **Preconditioning**
  - Prepare the calf for a later stage of production
    - Reduce stress of weaning
    - Insure proper immunity
  - Reduce the incidence of BRD
  - Transition period
    - Nutritionally
    - Socially
    - Environmentally
Questions
As Preconditioning ADG increased by 1 lb, Days on Feed decreased by 3.3d.  (P<0.005)
Effect of Preconditioning ADG on Ribeye Area/100lb

As Preconditioning ADG increased by 1 kg, Ribeye Area/100lb decreased by 0.53 cm$^2$. (P<0.01)
Effect of Brahman Percentage on Yield Grade

P<0.05
Coat Color

**Breed of Sire**
- Angus
- Brangus
- Charolais
- Hereford
- Red Angus

**Dam Type**
- Angus
- Braford
- Brahman
- Brangus
- Charbray
- Charolais
Effect of Condition Score on Quality Grade

\[ a, b \text{ means within a category differ } P < 0.05. \]
Effect of Condition Score on Days on Feed

P=0.29
Effect of Brahman Percentage on Cost of Gain

P=0.55
Effect of Brahman Percentage on Feed Efficiency

![Graph showing the effect of Brahman percentage on feed efficiency. The graph displays the feed efficiency values for 0, 1/8, 1/4, and 3/8 Brahman percentages, with corresponding values of 6.88, 6.68, 6.70, and 6.66 respectively. The p-value is 0.90.]
Effect of Brahman Percentage on Days on Feed

P=0.68
Effect of Brahman Percentage on Feed Efficiency

a, b means within a category differ P<0.05.
Effect of Preconditioning ADG on Yield Grade

![Graph showing the effect of preconditioning ADG on yield grade. The x-axis represents Preconditioning ADG (lbs) ranging from -4 to 5, and the y-axis represents Yield Grade ranging from 0 to 4. The graph shows a downward trend with a P-value of 0.29.]
Effect of Preconditioning ADG on Quality Grade

P=0.24
Materials and Methods

<table>
<thead>
<tr>
<th>Arrival</th>
<th>Day 80</th>
<th>Day 140</th>
<th>Day 200</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Sold at Target Finish</td>
<td></td>
</tr>
<tr>
<td>Days on Feed</td>
<td></td>
<td>Sold at Mature Body Weight</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sold When ICOG Meets Sales Price</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fed Long Enough to Meet QG</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fed to Minimum Weight</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fed Longer When ICOG is Lower Than Sales Price</td>
<td></td>
</tr>
</tbody>
</table>
Materials and Methods

• At the feedlot calves were...
  • Individually weighed
  • Re-vaccinated
  • Implanted
  • Processed through ECM

– Calves were reprocessed every 60d until harvest and sorted on d 120, d 180, and d 240. Pens were closed out on d 300.
Materials and Methods

• The feedlot utilized the ACCU-TRAC Electronic Cattle Management (ECM) system to measure performance, predict optimal endpoint, and sort into outcome groups.

<table>
<thead>
<tr>
<th>Sequencing Station</th>
<th>Video Imaging</th>
<th>Weigh Station</th>
<th>Ultrasound Station</th>
<th>Processing Chute</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Automatic individual animal sequencing station</td>
<td>Automatic measuring of external dimensions</td>
<td>Automatic integrated electronic scales</td>
<td>Ultrasound measurements of internal tissue characteristics</td>
<td>Individual animal processing and sort selection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Alley to Sort Pens</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>6</td>
</tr>
</tbody>
</table>
Materials and Methods

- Hair shedding characteristics were determined according to Thrift et al. (1994) and were classified as
  - Shed
  - Partial Shed
  - Non-Shed
Implications

• Although calves that have not shed their coat may by challenged in Florida, significant improvements in feedlot performance can be observed in temperate climates.

• Hair shedding characteristics do not appear to be predictive of carcass traits.
Hair Shedding Characteristics
Effect of Hair Shedding on Preconditioning ADG

- Shed: 0.94
- Partial Shed: 0.93
- Non-Shed: 0.73

P=0.25
Effect of Hair Shedding on Feedlot ADG

![Bar Chart]

a, b means within a category differ P<0.05.
Effect of Hair Shedding on Feed Efficiency

P<0.05
Effect of Hair Shedding on Days on Feed

![Bar chart showing days on feed for different hair shedding categories.](chart)

- Shed: 239 days
- Partial Shed: 239 days
- Non-Shed: 222 days

Significance: P<0.01
Effect of Hair Shedding on Cost of Gain

![Bar chart showing the cost of gain for different levels of hair shedding.](chart.png)

- Shed: $0.62
- Partial Shed: $0.62
- Non-Shed: $0.59

P<0.05
Hair Shedding

• Hair Shedding had no effect on any of the carcass traits measured in this study
Hair Shedding Summary

• Non-Shed calves had
  – Better Feed Efficiency
  – Fewer Days on Feed
  – Lower Cost of Gain

• Hair Shedding Characteristics had no effect on
  – Hot Carcass Weight
  – Quality Grade
  – Ribeye Area/100kg
  – Yield Grade
List of References


Weaning Weight
Effect of Hair Shed on Hot Carcass Weight

P=0.74
Effect of Hair Shed on Quality Grade

![Bar chart showing adjusted quality grades for different levels of hair shedding: Shed 3.38, Partial Shed 3.30, Non-Shed 3.37.]

P = 0.44
Effect of Hair Shed on Ribeye Area/100kg

![Bar chart showing the effect of hair shedding on ribeye area.](chart.png)

- Shed: 25.3 cm²/100kg
- Partial Shed: 25.1 cm²/100kg
- Non-Shed: 24.9 cm²/100kg

P = 0.40
Effect of Hair Shed on Yield Grade

P=0.35
Effect of Weaning Weight on Preconditioning ADG

![Graph showing the effect of weaning weight on preconditioning ADG. The x-axis represents weaning weight (kg), and the y-axis represents PCADG (kg). The graph shows a downward trend as weaning weight increases.]
Weaning Weight

• Preconditioning ADG decreased by 0.45 kg/d as Weaning weight increased by 100 kg.
Effect of Weaning Weight on Feedlot ADG
Effect of Weaning Weight on Feed Efficiency
Effect of Weaning Weight on Days on Feed
Effect of Weaning Weight on Cost of Gain

The graph shows the relationship between weaning weight and the cost of gain (TCOG). As weaning weight increases, the cost of gain decreases. The data points range from 180 kg to 337.5 kg, with corresponding TCOG values ranging from $1.50/kg to $1.00/kg.
Weaning Weight

• Weaning Weight had no effect on
  – Feedlot ADG
  – Cost of Gain

• There was an interaction between Weaning Weight and Sex for Feed Efficiency

• Days on Feed decreased by 23.7 kg as Weaning Weight increased by 100 kg.
Effect of Weaning Weight on Hot Carcass Weight
Effect of Weaning Weight on Quality Grade

![Graph showing the relationship between adjusted quality grade and weaning weight (kg).]
Effect of Weaning Weight on Ribeye Area
Effect of Weaning Weight on Ribeye Area/100kg
Effect of Weaning Weight on Yield Grade
Weaning Weight

• Hot Carcass Weight increased by 56.6 kg as Weaning Weight increased by 100 kg.
• Weaning Weight had no effect on Quality Grade
• Ribeye Area increased by 2.93 cm$^2$ as Weaning Weight increased by 100 kg.
• Ribeye Area/100kg decreased by 3.94 cm$^2$ as Weaning Weight increased by 100 kg.
• Yield Grade increased by 1/3 of a grade as Weaning Weight increased by 100 kg.
Sex
Effect of Sex on Preconditioning ADG

![Graph showing the comparison of PCADG (kg) between Heifers and Steers](image)

- **Heifers**: 0.40 kg
- **Steers**: 0.38 kg
Sex

- Sex had no effect on Preconditioning ADG
Effect of Sex on Feedlot ADG
Effect of Sex on Feed Efficiency

- Interaction between Sex and PCADG for FE
- Interaction between Sex and WW for FE
Effect of Sex on Days on Feed

![Bar chart showing the comparison between Heifers and Steers in days on feed.
- Days on Feed: Heifers have 223 days, Steers have 245 days.
- The bars are labeled with 'a' and 'b' indicating different groups or conditions.
]
Effect of Sex on Cost of Gain

- **Heifers**: $1.42
- **Steers**: $1.29
Sex

- An interaction was discovered between Sex and Coat Shedding Characteristics for Feedlot ADG
- Interactions between Sex and PCADG and Sex and WW were discussed previously
- Heifers were fed for fewer DOF than Steers
- Steers had lower Cost of Gain than Heifers
Effect of Sex on Hot Carcass Weight

![Bar chart showing the comparison of hot carcass weight between Heifers and Steers. The chart indicates that Steers have a higher hot carcass weight than Heifers.](image)
Effect of Sex on Quality Grade

• Interaction between Sex and Condition Score presented earlier
Effect of Sex on Ribeye Area

- Interaction between sex and condition score for REA discussed earlier
Effect of Sex on Ribeye Area/100kg

The graph shows the comparison of ribeye area (cm²/100kg) between Heifers and Steers. The ribeye area for Heifers is 25.8 cm²/100kg, and for Steers, it is 24.4 cm²/100kg.
Effect of Sex on Yield Grade

![Bar graph showing the yield grade for heifers and steers.](image-url)
Sex

- Steers had 21 kg heavier carcasses than Heifers
- Interaction sex by Condition for AQG
- Interaction sex by condition for REA
- Steers had smaller Rea/100kg than Heifers
- Sex had no effect on YG
Color Pattern
Effect of Color Pattern on Preconditioning ADG

![Bar chart showing the effect of color pattern on PCADG (kg). Solid color pattern has a PCADG of 0.36 kg, and non-solid color pattern has a PCADG of 0.42 kg.](image)
Color Pattern

- Color Pattern had no effect on Preconditioning ADG
Effect of Color Pattern on Feedlot ADG

![Graph showing the effect of color pattern on feedlot ADG.

- Solid color pattern: 1.12 kg
- Non-solid color pattern: 1.09 kg]
Effect of Color Pattern on Feed Efficiency

![Bar chart showing the effect of color pattern on feed efficiency. The chart compares solid and non-solid color patterns, with solid having a feed efficiency of 6.69 and non-solid having 6.77.]
Effect of Color Pattern on Days on Feed

![Bar graph showing the comparison of days on feed between solid and non-solid color patterns. The solid pattern has 232 days on feed, while the non-solid pattern has 235 days on feed.](image-url)
Effect of Color Pattern on Cost of Gain

![Bar chart showing the total cost of gain for different color patterns. The chart compares the cost for solid versus non-solid patterns. The cost is shown as $1.34 for the solid pattern and $1.36 for the non-solid pattern.](chart.png)
Color Pattern

• Color Pattern had no effect on any parameters measured in the feedlot phase.
Effect of Color Pattern on Hot Carcass Weight

![Bar graph showing the comparison of hot carcass weight between solid and non-solid color patterns. The graph indicates that the hot carcass weight for solid color is 339 kg, while for non-solid color it is 337 kg.]
Effect of Color Pattern on Quality Grade

![Bar chart showing adjusted quality grade for solid and non-solid color patterns. The solid color pattern has an average grade of 3.38, while the non-solid color pattern has an average grade of 3.32.](image)
Effect of Color Pattern on Ribeye Area

The bar graph shows the ribeye area in cm² for solid and non-solid color patterns. The average ribeye area for the solid pattern is 85.7 cm², while for the non-solid pattern, it is 84.2 cm².
Effect of Color Pattern on Ribeye Area/100kg

![Bar chart showing the effect of color pattern on ribeye area/100kg. The chart compares solid and non-solid color patterns, with the solid pattern showing an area of 25.2 cm²/100kg and the non-solid pattern showing an area of 25.0 cm²/100kg.](chart.png)
Effect of Color Pattern on Yield Grade

![Bar chart showing the comparison of yield grade between Solid and Non-Solid color patterns. The yield grade for Solid color pattern is 2.80, and for Non-Solid color pattern is 2.78.]
Color Pattern

• Color Pattern had no effect on any parameters measured at the carcass level
Effect of Preconditioning ADG on Ribeye Area
Effect of Brahman Percentage on Ribeye Area

![Graph showing the effect of Brahman percentage on ribeye area. The x-axis represents Brahman percentage (0, 1/8, 1/4, 3/8) and the y-axis represents ribeye area (in cm²). The graph indicates a downward trend with increasing Brahman percentage.]
Effect of Condition Score on Ribeye Area
Effect of Condition Score on Ribeye Area

![Graph showing the effect of condition score on ribeye area. The x-axis represents different condition scores: Slightly Thin, Average, and Slightly Fleshy. The y-axis represents ribeye area in cm². The graph compares Shed, Partial Shed, and Non-Shed conditions.]
Effect of Coat Color on Ribeye Area

- Black: 80.1
- Red: 86.0
- Yellow: 85.4
- Grey: 86.5
- White: 86.6

Note: Different letters indicate significant differences.