Just the Facts: Growth Promotants in Beef Cattle

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  – Today’s Speakers:
    • Dr. Glen Harris
    • Dr. Dean Pringle
    • Mr. Jary Douglas
    • Dr. Dennis Hancock
    • Dr. Lee Jones
    • Dr. Curt Lacy
  – Mr. Doug and Dr. Mary Ellen Hicks and ABAC Cattlemen’s Association
  – Dr. Lawton Stewart, Dr. Ronnie Silcox, and Mr. Jason Duggin
GROWTH PROMOTANTS

• Compounds that produce a physiological response that results in improved efficiency and/or performance in meat animals

• 2 Major Categories for Growing Cattle
  – Steroid Implants
  – Ionophores
What are Implants?

• Small pellets that contain growth stimulating compounds (usually steroids)
  – Approved and regulated by the FDA

• Implants work by causing an increase in the secretion of growth hormone and subsequent increase in muscle growth

• Available for cattle multiple stages of development
  – Nursing calves
  – Stocker cattle
  – Feedlot cattle
Overview of Implants

• Growth implants are widely used in the beef cattle industry
  – 70% to 80% of all feedlots

• In general they improve average daily gain by 5% to 15% and feed efficiency by 5% to 10%
  – One of the most economically justifiable practices available
    • Implanting generates a minimum of $10 return for every $1 invested
    • More revenue/$ invested than any other practice

• Cattle that are not implanted must sell at a premium to generate the same net profit as implanted cattle

• Technology only utilized by about 1/3 of cow/calf producers
Types of Implants

• Estrogenic vs Androgenic
  – Estrogenic – action is mediated by female hormonal pathways (estrodiol, progesterone)
  – Androgenic – action is mediated by male hormonal pathways (testosterone)

• Synthetic hormones
  – Zeranol (Ralgro) is estrogenic in action
  – Trenbolone acetate (TBA; Revalor®, Component®, Synovex H®) is androgenic in action
Only 1 FDA-approved location for implantation
Response Differences

• **Sex:** Steers > Heifers
  – Paradox: Greatest response observed with TBA in Heifers and with Estrogen in Steers
  – Implants are not approved for use with bulls

• **Maturity:** Growing > Finishing > Suckling

• **Gain:** Greatest response occurs when ADG greater than 1 lb. per day.
Implanting Nursing Calves

- All terminal calves should be implanted
- Implanted calves improved ADG during nursing by 4-6% increased WW by 14.5 – 29.6 lb
- Implants are effective for 90-120 days
  - When calf prices are high, implanting at birth and 90 days prior to weaning may be cost effective
  - Implant type will impact effectiveness of second implant (Zeranol > Estrodiol)
Implanting Nursing Calves

- Calves must have adequate condition to maximize effects of implanting
  - Maximal effect seen in calves nursing heavy milking cows or those that are creep fed
  - Most effective in spring-born calves that can be due to nutrient availability from sources other than the cow
  - Also effective in fall-born fed with adequate creep feed or access to cool season annuals
Implanting Stocker Cattle

- Stocker cattle respond with greater performance improvements than nursing calves
- Implanting stocker calves can improve ADG by 10 – 20 percent
- Can be implanted every 90 – 100 days dependent upon label restrictions
- Increasing nutrition will increase effectiveness
## Daily gain response to use of an implant, energy supplement, and ionophore

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Daily Gain, lb</th>
<th>Growth Response, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>1.22</td>
<td>------</td>
</tr>
<tr>
<td>Grain Supplement, 2lb/day</td>
<td>1.35</td>
<td>10.7</td>
</tr>
<tr>
<td>Compudose</td>
<td>1.39</td>
<td>13.9</td>
</tr>
<tr>
<td>Supplement + Rumensin</td>
<td>1.45</td>
<td>18.9</td>
</tr>
<tr>
<td>Compudose + Supplement + Rumensin</td>
<td>1.72</td>
<td>41.0</td>
</tr>
</tbody>
</table>

*aCompudose®  
*bRumensin®  
Adapted from Kuhl et al., 1997
Feedlot Implant Strategy

• Some feedlots prefer to change implants during the feeding period

• Most implants are effective for 70 to 100 days except for Compudose (140 to 170 days)

• Choice of implant may depend on various factors including length of time on feed
Risk Assessment

- STEROID RESIDUES! HOW DARE YOU?
- DR. OZ SAID MY 6 YR OLD WILL HAVE CHEST HAIR!!!

- Diethylstilbestrol (DES) was first implant introduced, but removed from market because residues were found in lab rats fed extreme doses of DES

- When DES residues were detected, they were found in liver tissue
  - If one consumed liver that contained high levels of DES, one would need to consume 5,500 lbs of liver daily to reach the daily therapeutic threshold (5 mg) for humans

- **Therapeutic threshold**-minimal concentration required to trigger a physiological response

- We need to be realistic in risk assessment
# Estrogen is Synthesized by Humans

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Estrogen Amounts (ng/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Children</td>
<td>40,000</td>
</tr>
<tr>
<td>Adult Man</td>
<td>100,000</td>
</tr>
<tr>
<td>Non-pregnant Woman</td>
<td>5,000,000</td>
</tr>
<tr>
<td>Pregnant Woman</td>
<td>90,000,000</td>
</tr>
</tbody>
</table>

Estrogen produced by Synovex-S Implant (120d) = 120,000 ng/d
Estrogen consumed from 1 lb of implanted beef = 11 ng
# ESTROGEN CONCENTRATION IN FOOD

<table>
<thead>
<tr>
<th>Food (500g≈1 lb)</th>
<th>Estrogen Amounts (ng)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-Implanted Beef</td>
<td>8</td>
</tr>
<tr>
<td>Implanted Beef</td>
<td>11</td>
</tr>
<tr>
<td>Beef from Pregnant Cow</td>
<td>700</td>
</tr>
<tr>
<td>Ice Cream</td>
<td>3,000</td>
</tr>
<tr>
<td>Cabbage</td>
<td>12,000</td>
</tr>
<tr>
<td>Eggs</td>
<td>17,500</td>
</tr>
<tr>
<td>Soybean Oil</td>
<td>1,000,000</td>
</tr>
</tbody>
</table>
WHAT ABOUT QUALITY?

Can be diminished if implanting schedule is not managed with growth stage
Ionophores
What makes a rumen work?

MICROBES

Energy
(Volatile Fatty Acids)

Acetate

Propionate
Cellulose is the major energy source for SE cattle = Increased Acetate Production
Ionophore Overview

• Antibiotics added to feed
  – Do not have a therapeutic function in humans
• Originally developed as coccidiostats for poultry
• Increase efficiency and gain in beef cattle
• Decrease incidence of bloat, acidosis, and cyclic feeding patterns
• Commonly marketed as monensin (Rumensin®), lasalocid (Bovatec®), and laidlomycin (Cattlyst®)
How Ionophores Work

• **Shift rumen fermentation patterns**
  - Propionate > Acetate and Butyrate
  - Propionate is more easily utilized for productive purposes by cattle

• **Decrease protein degradation in rumen**
  - Increase bypass protein

Ionophores interrupt ion flow across the cell membrane of gram-positive bacteria
Advantages of Ionophores

- Increased propionate and decreased acetate and methane improve efficiency and gain
  - 76% increase in propioniate
  - 30% decrease in methane production

- Decreasing gram-positive bacteria decreases incidence of acidosis and bloat
Common Ionophores

• **Rumensin®** (monensin)
  – Most popular
  – Used predominantly in feedlots, but will work in forage systems
  – Works by decreasing intake while maintaining gain
    • Subdues acidosis

• **Bovatec®** (lasalocid)
  – Used predominantly in forage-based systems, but will work in the feedlot
  – Increased gain while maintaining or increasing intake

• Both select for increased ruminal propionate production
Cost Benefits

• Ionophores vary in cost from $6.00 - $8.00/lb in its raw state.

• Rumensin® is most popular
  – 200mg/hd/day
  – $0.012/hd/day

• Research suggests that monensin yields 6-14% increase in ADG = 12:1 benefit to cost ratio (Hutjens, 1991)
Meat Quality Effects

• No known carcass detriments associated with use of ionophores

• Increasing propionate concentration increases gluconeogenesis
  – Glucose is primary precursor for marbling development (Smith and Crouse, 1984)
One of the oldest and most-respected performance test sales in the US!

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Georgia Cattlemen’s Association
P.O. Box 27368
Macon, GA 31221
478-474-0960
Sale day phone: 229-831-5416

The test center is located 14 miles northwest of Tifton on Georgia Hwy 125 or 12 miles east of I-75 (Exit 78) on Georgia Hwy 32 near Irwinville.

Auctioneer: Carroll T. Cannon GAL #249 229-881-0721

www.caes.uga.edu/commodities/animals/beef/index.html