



# **Just the Facts: Growth Promotants in Beef Cattle**

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# Acknowledgements

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  - **Today's Speakers:**
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    - **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

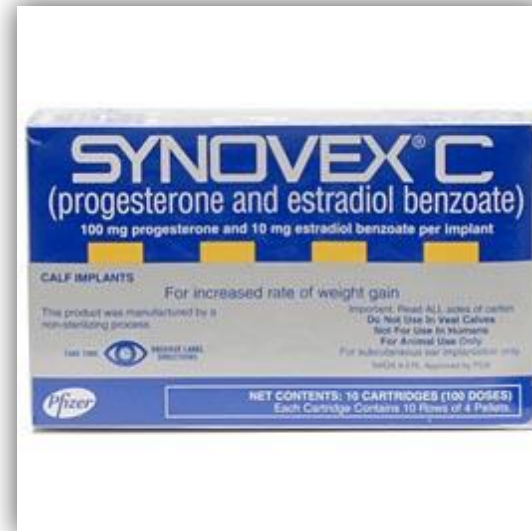
- **Compounds that produce a physiological response that results in improved efficiency and/or performance in meat animals**
- **2 Major Categories for Growing Cattle**
  - **Steroid Implants**
  - **Ionophores**

# STEROID IMPLANTS



# 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



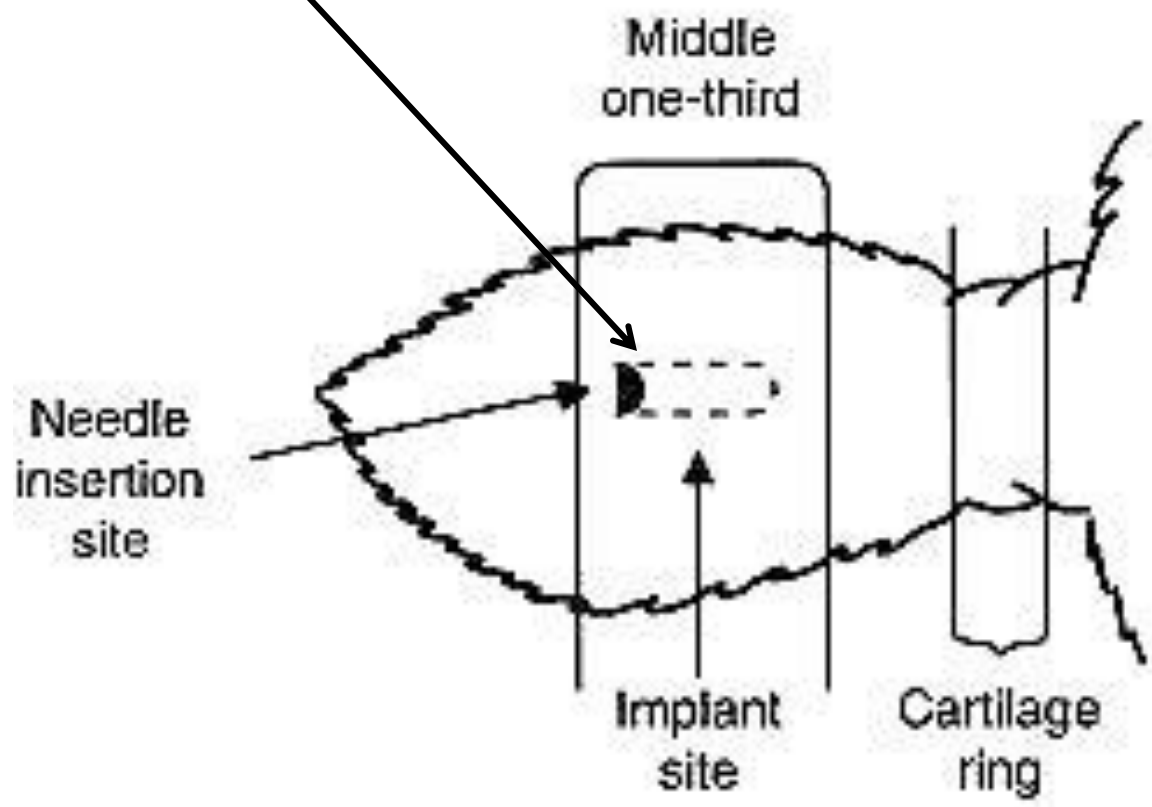
# Overview of Implants

- **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<sup>®</sup>, Component<sup>®</sup>, Synovex H<sup>®</sup>) 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

Treatment	Daily Gain, lb	Growth Response, %
Control	1.22	-----
Grain Supplement, 2lb/day	1.35	10.7
Compudose	1.39	13.9
Supplement + Rumensin	1.45	18.9
Compudose + Supplement + Rumensin	1.72	41.0

<sup>a</sup>Compudose<sup>®</sup>

<sup>b</sup>Rumensin<sup>®</sup>

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 does 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

Age Group	Estrogen Amounts (ng/d)
Children	40,000
Adult Man	100,000
Non-pregnant Woman	5,000,000
Pregnant Woman	90,000,000

Estrogen produced by Synovex-S Implant (120d) = 120,000 ng/d

Estrogen consumed from 1 lb of implanted beef = 11 ng

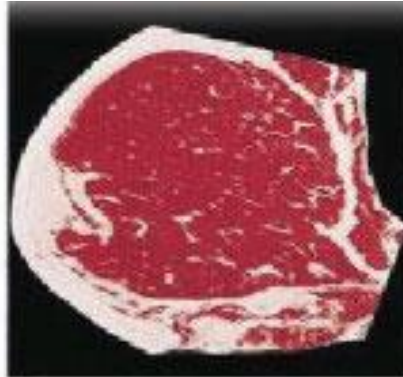
# ESTROGEN CONCENTRATION IN FOOD

Food (500g≈1 lb)	Estrogen Amounts (ng)
Non-Implanted Beef	8
Implanted Beef	11
Beef from Pregnant Cow	700
Ice Cream	3,000
Cabbage	12,000
Eggs	17,500
Soybean Oil	1,000,000

# WHAT ABOUT QUALITY?



*Moderately Abundant*



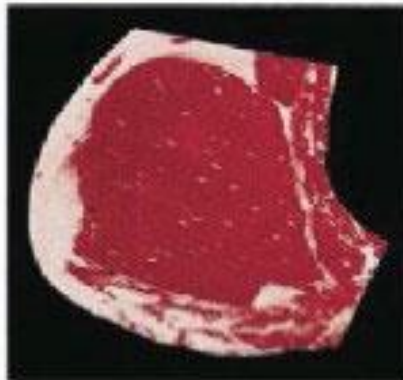
*Slightly Abundant*



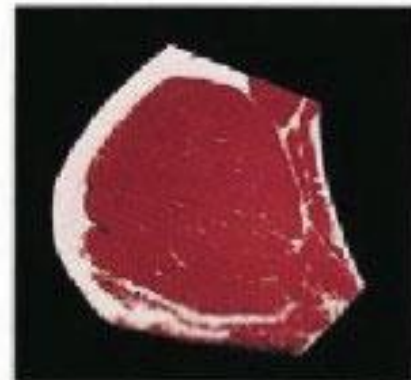
*Moderate*



*Modest*



*Small*



*Slight*

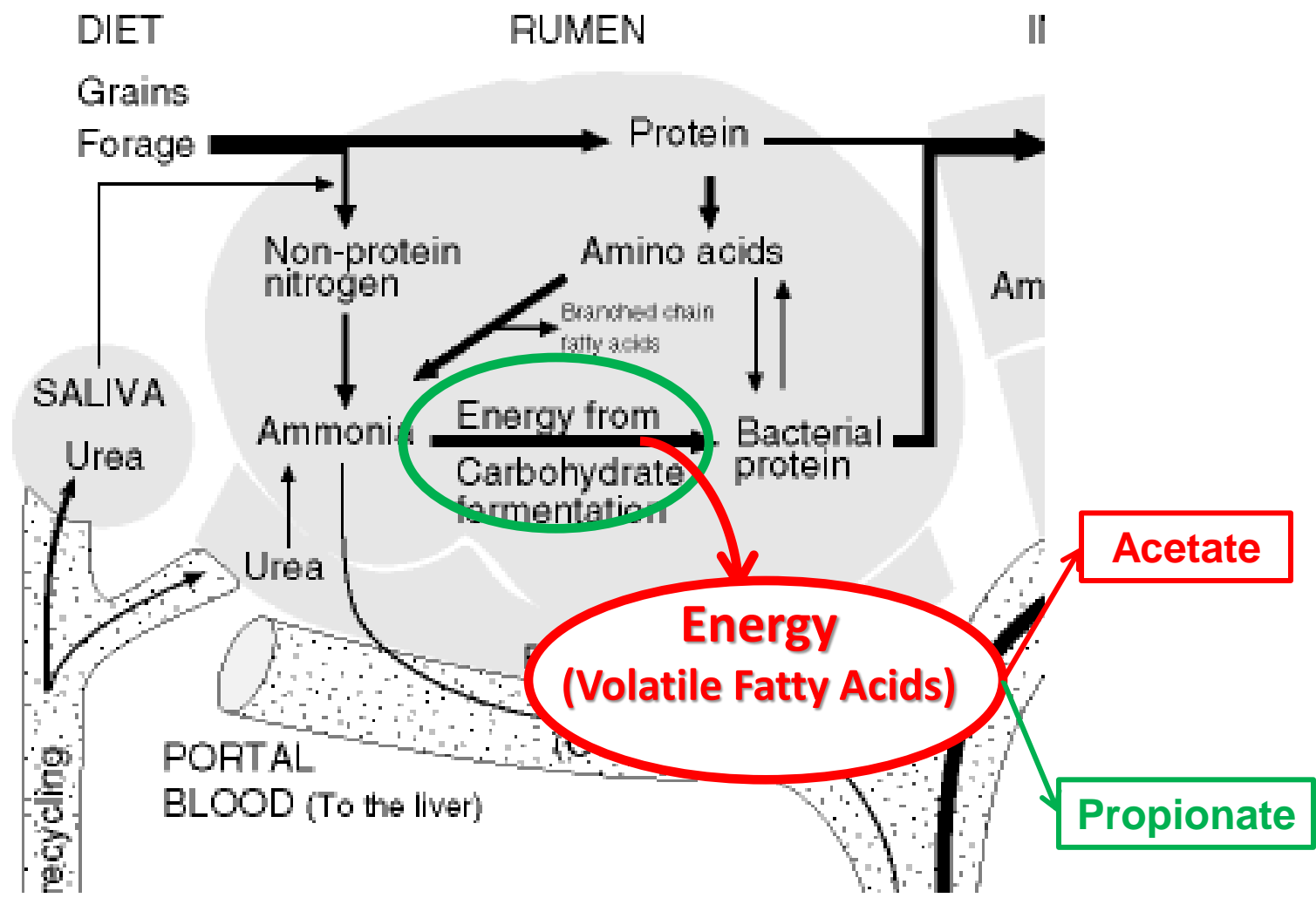
Can be diminished if implanting schedule is not managed with growth stage

# Ionophores



# What makes a rumen work?

## MICROBES

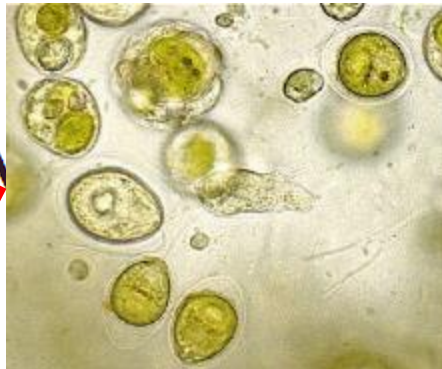


Cellulose is the major energy source for SE cattle = Increased Acetate Production

# RUMEN

Sources of Energy

↑ Propionate



SMALL  
INTESTINE E

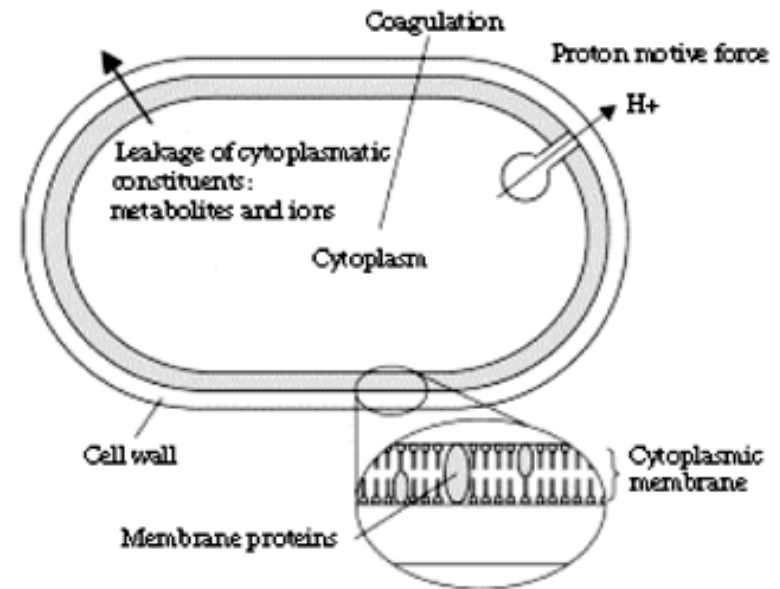
↑ Acetate

# 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 propionate
  - 30% decrease in methane production
- **Decreasing gram-positive bacteria decreases incidence of acidosis and bloat**

# Common Ionophores

- **Rumensin<sup>®</sup> (monensin)**
  - Most popular
  - Used predominantly in feedlots, but will work in forage systems
  - Works by decreasing intake while maintaining gain
    - Subdues acidosis
- **Bovatec<sup>®</sup> (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)**





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