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Tools for Optimizing Feedlot Production

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There are a number of techniques and strategies available to help cattle producers maximize the feedlot production of both traditional and Holstein steers. This publication was written with the goal of helping producers 1) understand current feedlot management techniques; and 2) become familar with products available to enhance feedlot performance.

Feed additives are compounds added to an animal's diet for reasons other than supplying nutrients. Therefore, an antibiotic is a feed additive, since its purpose does not include supplying nutrients, while urea is not an additive because it provides protein. A few compounds play a dual role. Some additives, designed to stimulate production, are physically implanted in an animal rather than added to its feed.

For the most part, additives are used in cattle feeding because they enhance production or reduce morbidity or disease. They act in different ways—some modify microbial metabolism in the rumen, others act to depress subclinical problems (in which there are no visible disease symptoms) caused by microorganisms; and still others alter an animal's metabolism to improve growth efficiency or increase the lean:fat ratio of the carcass.

The benefits of using additives in cattle production include improved efficiency, reduced morbidity and leaner carcasses. All of these benefits lower production costs and improve the profit potential for cattle feeders, while allowing them to price their cattle more competitively in the marketplace.

Additives pose potential risk to the producer, cattle and consumer if they are used improperly. Approved additives have been thoroughly researched and their safety is assured when they are used as approved by the Food and Drug Administration (FDA).

The responsibility for proper use of additives rests with the cattle feeder. All additives have complete instructions that must be read and followed to the letter. Dosage levels, times, administration sites and withdrawal periods, if required, must be followed. When additives are used as directed, a cattle feeder can assure the safety of the beef produced as required by several state beef safety assurance programs. Proper use of additives is a must if the consumer is to purchase beef with complete confidence in its wholesomeness.

Implanting feedlot cattle

Approximately 90% of all feedlot cattle in the United States receive growth-promoting implants. Proper use of implants results in a 5–15% increase in growth rate, along with improvements in feed conversion, and a shift in composition toward more muscle (leanness) and less fat. It has been estimated that use of implants results in an increase of 733,867,000 lbs/year and a feed savings of 2,913,977 tons/year in U.S. beef production. Growth-promoting implants reduce the cost of beef production by $50–$80 per steer and return

Table 1. Anabolic implant agents approved* for use in feedlot cattle.

Product	Type of cattle	Dose and compound	Anabolic response time
Compudose	steers	24 mg estradiol	200 days
Finaplix-S	steers	140 mg trenbolone acetate	70-90
Finaplix-H	heifers	200 mg trenbolone acetate	70-90
Ralgro	calves, steers heifers	36 mg zeranol	70-100
Magnum	steers	72 mg zeranol	70-90
Implus-C	calves	10 mg estradiol benzoate 100 mg progesterone	80-120
Implus-H	heifers	20 mg estradiol benzoate 200 mg testosterone propionate	80-120
Implus-S	steers	20 mg estradiol benzoate 200 mg progesterone	80-120
Synovex-C	calves	10 mg estradiol benzoate 100 mg progesterone	80-120
Synovex-H	heifers	20 mg estradiol benzoate 200 mg testosterone propionate	80-120
Synovex-S	calves	20 mg estradiol benzoate 200 mg progesterone	80-120
Synovex-Plus	steers	28 mg estradiol benzoate 200 mg tenbolone acetate	70-90
Revalor-S	steers	120 mg trenbolone acetate 24 mg estradiol 17 - beta	70-90

*Approved as of January 1, 1996

$10–$15 to the beef producer for each dollar invested. Beef producers who fail to use implants put themselves at an economic disadvantage unless they have developed a niche market for “organic” or “natural” products which may be sold at a premium. Implants differ in hormone content and effectiveness. Selection of appropriate implant/reimplant strategies must consider cattle gender and type, nutrition, management and marketing.

Understanding the technology

Use of implants in growing beef cattle and finishing systems should be thought of as hormonal growth promotion, not application of some “magic” treatment that improves performance. Implants differ in the type of hormone used, potency and action. Selection of appropriate implant/reimplant strategies must consider cattle gender and type, nutrition, management and marketing. Thus, strategic implantation programs should be carefully designed.

Strategic implant programs should match available resources (cattle, feed, labor and management) to specific market goals. In some cases, feeding to less than 50% choice grade while avoiding yield grade 4 carcasses is the preferred objective. In other cases, feeding to 90% choice grade and accepting some 4s is appropriate. Implant strategies might be dramatically different in these situations. With very large framed cattle, avoiding heavy carcass discounts may be a goal that dictates the choice of implant, while feeders of small or medium framed cattle have more options.

Understanding how implants work helps to explain the benefits, risks and proper strategies involved in their use. Decades ago, observation of differences in growth rate and muscularity between the sexes led researchers to investigate whether hormonal treatment of growing cattle could improve productivity. This research led to the development of androgenic (male hormone) and estrogenic (female hormone) implants. Table 1 lists the products that are currently approved for feedlot use in the U.S., their chemical components and the classes of cattle for which their use is approved.

What are growth implants?

Growth implants fall into two main categories, each containing natural and synthetic versions. They are:

Estrogenic (using a female hormone)
- Natural - estradiol (E)
- Synthetic - zeranol

Androgenic (using a male hormone)
- Natural - testosterone (T)
- Synthetic - trenbolone Acetate (TBA)

Strategic implant programs for traditional steers

Which estrogenic implant should be used?

1) Over the past few years, research has shown that 20 mg of estradiol (E) induces more growth in finishing cattle than 36 mg of the synthetic zeranol.

2) Zeranol is an excellent choice for lightweight calves, grazing or backgrounding cattle and other situations where moderate growth is desired. Additionally, 36 mg of zeranol has specific applications for Holstein steers and feedlot heifers.

3) Some implants have a greater level of estradiol (24 mg vs 20 mg) that is released over a longer period of time. These implants are excellent for low labor operations because of a 200-day activity.

Should trenbolone acetate (TBA) be included?

1) TBA, used in combination with estradiol (TBA+E) is the most effective growth promoter available to cattle feeders.

2) Fat thickness of exotic breed cattle is often reduced while fat thickness of British cattle is often unaffected by TBA+E.

3) In many cases E alone, followed by TBA+E, is nearly as effective as consecutive TBA+E implants.

4) Administering E, followed by TBA+E, typically results in slightly less growth than two TBA+E implants, but also diminishes quality grade to a lesser degree.

5) TBA+E has been shown to reduce either the average quality grade, percentage of choice cattle or both, in comparison to nonimplanted or E-implanted cattle. If the goal is to deliver a high percentage of choice cattle, then TBA+E should be carefully considered.

Table 2. Anti-bacterial compounds approved[a] for use as low-level additives in feedlot cattle diets to enhance weight gain and feed efficiency.

Compound	Use level	Withdrawal time
Bacitracin Zinc	35–70 mg/hd/d	None
Chlortetracycline, CTC or Aureomycin	70 mg/hd/d	None
Oxytetracucline, [b] OTC or Terramycin	75 mg /hd/d	None
Sulfamethazine plus Chlortetracycline	350 mg/hd/d 350 mg/hd/d	Feed for 28 d in the presence of respiratory disease (shipping fever); discontinue 7 d prior to slaughter

[a] As of 8/1/90.

[b] Can be fed with Lasalocid (see table 5).

Strategic implant programs for Holstein steers

1) TBA+E should not be used in high silage, moderate growth rate finishing programs. If steers are fed diets containing less than 80% concentrate, they will not grow rapidly enough to maintain the muscle growth TBA+E promotes, or produce fat at a sufficient rate to attain choice marbling.

2) Holstein steers on high forage diets should be given only estrogen implants. The source of the estrogen is relatively unimportant.

3) Holstein steers that are fed high concentrate rations seem to respond to TBA+E in most cases.

4) The most efficient, effective program would be to implant steers with estrogen when they weigh 200–300 lbs (calves do not seem able to respond to implants administered at birth), again with estrogen at 500–600 lbs, and then with TBA+E 95 days prior to slaughter.

5) If cattle are not eating well, due to genetics, acidosis, weather or facility stress, or for any other reason, the final implant should be estrogen alone.

Strategic implanting program for heifers

1) Heifers can be implanted with estradiol, testosterone, trenbolone or zeranol, or with combinations of these hormones.

2) It is relatively clear that implanting with TBA+T results in maximal growth. The improvement over the use of either implant alone is more than sufficient to pay for the added cost of the second implant.

Antibiotics and sulfa drugs

General use antibiotics and sulfas are classified as antibacterial compounds because they limit the growth of certain bacteria, many of which cause clinical sickness or subclinical reductions in health and performance of cattle. They are generally approved for use at low-level, continuous or periodic addition to the diet to enhance production efficiency or for the treatment of a clinical problem. Because the

Table 3. Anti-bacterial compounds approveda to reduce the incidence of liver abscesses in feedlot cattle.

Compound	Use level	Withdrawal time
Bacitracin Methylene Disalicylate	70 mg/hd/d	None
	or	
	250 mg/hd/d for 5 d; repeat every 30 d	None
Chlortetracycline CTC or Aureomycin	70 mg/hd/d	None
Oxytetracycline, OTC or Terramycin[b]	75 mg/hd/d	None
Tylosin[c]	60-90 mg/hd/d	None

[a] As of 8/1/90.
[b] Can be fed with Lasalocid (see table 5).
[c] Can be fed with Monensin (see table 5).

response to this category of feed additive depends on the conditions in which they are administered, including subclinical conditions that reduce performance, it is impossible to state the actual response and therefore, the financial return that may be derived from the use of antibacterial feed additives.

Feedlot performance

Table 2 lists the antibacterial compounds approved as low-level additives for feedlot cattle diets to enhance gain and feed efficiency.

Liver abscesses

Additionally, antibacterial compounds used to reduce the incidence of liver abscesses in feedlot cattle are listed in table 3. Liver abscesses can be prevalent in cattle fed diets low in roughage and by management factors that result in wide swings in feed intake.

Other uses

Antibacterial compounds are also used to reduce the incidence of respiratory diseases (such as shipping fever and pneumonia), diarrhea, anaplasmosis and foot rot. These uses are listed in table 4.

Safety

Antibiotics are found throughout the natural world. Many are routinely produced by organisms found in soil and other places. Therefore, people and animals have been exposed to antibiotics for centuries. Their use in livestock production has resulted in healthier animals. The majority of safety concerns about the use of antibiotics in animal production, especially in continuous low-level use, is based on the postulated development of bacterial resistance and the genetic transfer of this resistance (R-factors) to more virulent organisms, making antibiotic therapy less effective in people and animals. In over 35 years of use in livestock production, this form of resistance has not resulted in any risk to people or animals.

Table 4. Anti-bacterial compounds approved[a] as aids in reducing the incidence of disease conditions in feedlot cattle.

Compound	Use level	Claim	Withdrawal time
Chlortetracycline	70-100 mg/hd/d	diarrhea	None
CTC or Aureomycin	350 mg/hd/d[b]	footrot pneumonia, shipping fever	48 hrs prior to slaughter
	0.5 mg/lb body wt/d (feed for 60 d)	anaplasmosis	48 hrs prior to slaughter
Neomycin base[c]	35-140 g/ton fed[d]	enteritis	7 d prior to slaughter fed at 1.4 when g/hd/d or more
Oxytetracycline, OTC or Terramycin	0.1-5.0 mg/lb body wt/d[e]	diarrhea	5 d before slaughter when fed at 2 mg/lb body wt/d

[a] As of 8/1/90.
[b] Can be fed with sulfamethazine (see table 2).
[c] Neomycin sulfate equivalent to 70% Neomycin base.
[d] Can be fed with Oxytetracyline (see this table).
[e] Can be fed with Neomycin (see this table).

Table 5. Ionophores approveda for use as feed additives in feedlot cattle.

Compound	Use level	Withdrawal time
Lasalocid or Bovatec	10-30 g/ton of complete feed[b]; do not feed more than 360 mg/hd/d	None
Monensin or Rumensin	5-30 g/ton of complete feed[c]; do not feed more than 360 mg/hd/d	None

[a] As of 8/1/90.
[b] Can be fed with Oxytetracyline (see table 2 and 3) or MGA.
[c] Can be fed with Tylosin (see table 3).

Future

New antibiotics are being developed while current scientific thinking is leading towards a distinction between antibiotics that are more suitable for use in people or in animals. Several of these new antibiotics improve production efficiency and/or decrease subclinical problems such as liver abscesses. As long as the subclinical presence of bacteria reduce the performance of feedlot cattle, use of antibacterial compounds will provide benefits.

Ionophores

Ionophores are unique (polyether) antibiotics that selectively affect certain microorganisms by altering the passage of ions through cell membranes. While they were used originally as coccidiostats (discussed in the following section) primarily in poultry, they enhance feed efficiency in cattle by altering the microbial fermentation of feed in the rumen towards a greater proportion of propionic acid (one of the volatile fatty acids) and decrease the degradation of protein. When ionophores are

used, feed efficiency increases as the level of roughage in the diet increases. On high concentrate, feedlot-type diets, ionophores provide other subtle benefits; namely, a modulation of feed intake that decreases problems from bloat and acidosis. Ionophores improve the potential return to cattle feeders of up to $12/head (table 5).

Safety

Ionophores in higher than approved levels can be toxic. Horses are especially susceptible to ionophore toxicity and therefore, should not be allowed to eat cattle feed or supplements containing ionophores.

Future

Several new ionophores have been tested in cattle and have been found to be effective in improving feed efficiency. Some of these are currently under review by the FDA.

Coccidiostats

Coccidia are protozoal organisms that invade and destroy the intestinal mucosa of cattle. They are generally present in most animals at harmless numbers and, therefore, do not materially affect the performance and health of cattle. At times, however, their number can increase to the point that irritation of the gastrointestinal tract becomes severe enough to produce bloody feces and scouring. The stress of shipment, diet changes, weather changes and perhaps other management factors can cause an episode of clinical coccidiosis. Interpretation of fecal coccidia counts is difficult since a clinical problem can be present with low fecal counts. The following two additives are used for the reduction and treatment of coccidiosis in feedlot cattle.

Amprolium

As an aid in the prevention of coccidiosis, amprolium is fed at a rate of 227 mg/100 lb body weight per day for 21 days. To treat coccidiosis, twice this amount (454 mg) is fed for 5 days generally followed by the prevention level (227 mg) for 16 additional days. Amprolium must be withdrawn 24 hours before slaughter.

Decoquinate (Deccox)

For the prevention of coccidiosis, decoquinate is fed at a rate of 22.7 mg/100 lb body weight per day for at least 28 days. There is no withdrawal period for decoquinate.

Future developments

There are currently new anabolics, antibiotics, ionophores and parasiticides under development. New delivery processes are also being studied that will give more even drug pay-out for longer periods of time. Compounds are being researched that will have new, beneficial effects in feedlot cattle; repartitioning agents that promote leaner carcasses are but one example. As these new developments are approved and used in the feedlot industry, they will help to reduce the cost of producing beef which in turn will keep beef more competitive in the market place.

Cattle feeders have the responsibility of properly using these compounds for their intended purposes. When used correctly, the safety of beef can be assured.

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