Feed Additives for Beef Cattle Diets

Feed additives can effectively improve production levels, efficiency, and animal health. Feed additives are appropriate not only in cattle finishing operations, but also in cow-calf and stocker grazing operations. The primary effects of feed additives are increased feed efficiency and/or improved average daily gain. Some feed additives also reduce incidence of bloat, acidosis, or coccidiosis. Other feed additives suppress estrus, reduce liver abscesses, control foot rot problems, and control parasites.

Rumen Fermentation Modifiers

Ionophores

Antibiotics are tools to improve the health status of a beef animal. Antibiotics delivered through cattle feed can also benefit cattle productivity and efficiency. Ionophores are antimicrobial compounds that modify microbial fermentation in the rumen, allowing cattle to get more energy from the feed consumed. Ionophores inhibit or depress the growth of certain rumen microorganisms. This alters the rumen fermentation process in several ways:

- Ionophores improve feed efficiency by changing the types of fatty acids produced in the rumen. They increase feed energy capture during rumen fermentation while producing less methane. Animal performance improves because of increased energy retention during rumen fermentation.
- Ionophores decrease the breakdown of protein in the rumen. Monensin, for example, has a "protein sparing" effect by decreasing ammonia formation from protein. The decreased breakdown of protein in the rumen increases the protein going to the small intestine, where it can be better used by the animal. This has little effect on performance of feedlot cattle on high-grain diets, but it is important in growing cattle on high-roughage diets. Research with monensin suggests it works better for beef cattle on low-protein diets.
- Ionophores reduce the incidence of coccidiosis, acidosis, and bloat. Animal performance improves when these stressors are reduced.
- In addition to positive production impacts on cattle on high-grain diets, ionophores significantly improve daily gain and feed efficiency when fed to cattle on high-roughage diets. Fiber digestibility is generally not affected by ionophores in high-concentrate finishing diets. But feeding excessive levels of ionophores can reduce fiber digestion on high-forage diets. It is particularly important to use proper feeding levels of ionophores on forage-based diets common in Mississippi beef cattle operations.
- In general, ionophores enhance the absorption of nitrogen, magnesium, phosphorus, zinc, and selenium.

The benefits of including ionophores in beef cattle diets are well documented. Ionophores generally improve feed efficiency from 5 to 10 percent and improve rate of gain by 2 to 7 percent.

Monensin (Rumensin®) and lasalocid (Bovatec®) were two of the first commercially available ionophores. Laidlomycin propionate (Cattlyst®), bambermycin (Gainpro®), and virginiamycin (V-max®) are more recently approved performance-enhancing antibiotics for cattle. Ionophores are available in dry or liquid supplements. Feeding rates for various classes of beef cattle are listed on the labels. Ionophores are very toxic to horses and are not approved for use in several other species of livestock. While monensin is considered more toxic to horses than lasalocid, for example, it is not safe to allow horses to consume any feed containing ionophores.

Buffers

Buffers can be added to beef cattle diets to reduce fluctuations in rumen pH. Sodium bicarbonate is an example of a feed additive that buffers rumen pH. This helps reduce the incidence of acidosis when adapting cattle to high-grain diets or when feeding cattle concentrate feedstuffs such as wheat at high levels.

Yeast Cultures

Yeast cultures (for example, *Saccharomyces cerevisiae*) may improve feed efficiency, gain, and health in cattle. Yeast-based products affect dry matter intake, rumen pH, and nutrient digestibility. But some studies show no benefits from adding yeast cultures to beef cattle diets. Yeast cultures can be used in receiving diets of both low- and high-stress cattle.

Bloat Prevention Aid

Poloxalene can be fed to beef cattle to help prevent bloat on legume and other lush pasture. Poloxalene can be mixed with feed or offered in block form. For product effectiveness, cattle must consume adequate quantities of poloxalene. It is still important to use other bloat-prevention measures, such as filling cattle up on hay before turning them out onto lush pasture, to be safe when dealing with high bloat risk.

Nutrient Repartitioning Agent

Beta-agonist

Ractopamine hydrochloride (Optaflexx®) is a beta-agonist that redirects nutrients that would have become fat and synthesizes them into protein. This increases muscle fiber size and lean meat yield. Ractopamine hydrochloride is fed to cattle during the final 28–42 days of finishing to increase live weight gain, improve feed efficiency, and increase red meat yield. The pork industry uses ractopamine hydrochloride as Paylean® at a different dosage level from the beef industry.

Estrus Suppressant

MGA

Melengestrol acetate (MGA®) is a feed additive that suppresses estrus (heat or cyclic sexual activity) and improves gain and feed efficiency in beef females. Practical application of MGA® is in heifer estrus synchronization programs. Feedlots also use MGA in finishing diets to reduce heifer riding behavior and associated production losses. Melengestrol acetate is a synthetic progestin that elevates progesterone levels and inhibits heat and ovulation, similar to EAZI-BREED™ CIDR®s. These progestins jump-start estrus in some noncycling cattle, as well. CIDR®s are vaginal inserts; MGA® is administered through feed. Making sure heifers consume adequate amounts of MGA® and that the length of the feeding period and timing of breeding are appropriate is crucial for MGA® to be effective. Proper bunk space is needed for cattle to have adequate opportunity to feed. Reduced conception rates have been reported in heifers bred within 1–12 days after withdrawal of MGA®.

Animal Health Products

Fly Control

Oral larvicides are fed to cattle through a feed ration or mineral to kill fly larvae as they hatch in the manure. They are effective only when animals consume the proper amount of the active ingredient. Oral larvicides do not control migrating adult flies. Adult flies can still be a problem if a producer is using an oral larvicide but a neighbor is not practicing any fly control. Other common fly control feed additives are insect growth regulators that disrupt fly life cycles.

Worm Control

Many anthelmintics (dewormers) are available as feed additives. Anthelmintics are advantageous when handling animals is difficult. As with other feed additives, effectiveness of anthelmintics delivered through feed depends on cattle consuming adequate quantities of the product.

Antibiotics for Disease Control

Antibiotics can be used at continuous low levels for improvements in rate of gain and efficiency. Higher levels of antibiotics typically are needed for prevention and treatment of diseases or conditions such as scours, coccidiosis, shipping fever, anaplasmosis, foot rot, and liver abscesses. Chlorotetracycline, oxytetracycline, bacitracin, and tylosin are examples of antibiotics intended for specific disease prevention or treatment.

Mississippi BQA Feed Guidelines

The Mississippi Beef Quality Assurance (MS-BQA) program addresses feed additive use. With regard to feedstuffs and sources, it recommends the following:

- Producers maintain a record of pesticide (herbicides, insecticides) use that could cause a violative residue in grazing or feedlot cattle, as required by the Environmental Protection Agency (EPA).
- Producers implement a quality-control program for incoming feed ingredients that attempts to eliminate contamination resulting from molds, mycotoxins, and chemical contamination such as pesticides.
- Before use, producers submit for analysis by a qualified laboratory any feed ingredient suspected of contamination.
- No ruminant-derived protein sources be fed. To help prevent the establishment and amplification of bovine spongiform encephalopathy (BSE) through feed in the United States, the Food and Drug Administration (FDA) implemented a final rule that prohibits use of most mammalian

protein in feeds for ruminant animals. This rule, commonly referred to as the Ruminant Feed Ban, became effective August 4, 1997.

With respect to feed additives and medications, MS-BQA guidelines specify the following:

- Only FDA-approved medicated feed additives may be used in rations.
- All medicated feed additives must be used in accordance with the FDA-approved label. Extra-label drug use of feed additives is strictly prohibited. No one has the authority to adjust the dosage as labeled, including veterinarians.
- Producers need to ensure that all additives are withdrawn at the proper time to avoid violative residues.
- Medicated feed additives must be used in accordance with the FDA Current Good Manufacturing Practices (CGMPs) regulations. These CGMPs include a formula record of all medicated feed rations produced and production records of all batches of feed produced that contain medicated feed additives. Production records must include additives used, run dates, ration names or numbers, and amounts produced. Anyone producing an animal feed containing an animal drug must follow CGMPs. This includes large, multi-plant manufacturers and single-plant manufacturers, as well as on-farm mixing operations. The term "medicated feed" includes all medicated feed products intended to be a substantial source of nutrients in the diet of an animal. It includes products commonly referred to as supplements, concentrates, premix feeds, and base mixes, and it is not limited to complete feed intended to be the sole ration of the animal.

Producers must keep all records for at least 2 years from the date of transfer or sale of the cattle and must have trace-back capability.

Responsible Feed Additive Use

Medicated feed additive use is regulated by the FDA, while feed additives such as pesticides are controlled by the EPA. The list of approved feed additives changes frequently. Current information on approved feed additives is available from the Food Animal Residue Avoidance Databank (FARAD) or the FDA Approved Animal Drug Products (Animal Drugs@FDA) online database. These two sources are available online at **http://www.farad.org/** and **https://www.fda.gov/AnimalVeterinary/Products/ApprovedAnimalDrugProducts/**.

Responsible feed additive use is important. Store medicated feeds properly. Observe product expiration dates. Use feed additives only for their intended purposes. Follow label directions and pay attention to label warnings. Mix only combinations of feed additives that are approved on the labels. This applies both to individual feeds and to different feeds offered in the same pen or paddock.

Also avoid using different drugs in morning and afternoon feedings. To prevent an illegal drug combination, properly clean feed mixing equipment, feed delivery equipment, and feed bunks after medicated feed use and before switching to new medicated feeds. Feed additive residues can result in illegal drug combinations or feed additives offered to livestock for which they are not intended. Train ranch personnel on the principles of proper feed additive use.

Feed additives must be used at the dosage, for the class of cattle, and only with the approved combinations on the label. Some feed additives that are approved for use in confined cattle intended for slaughter are not approved for use in grazing cattle. In addition, many feed additives that may be used in stocker cattle are not approved for breeding cattle, so reading and following feed additive labels is critical. Time of administration and withdrawal periods, if required, must be followed, as well.

No one has the authority to use a feed additive in any manner inconsistent with label specifications. Extra-label use of a feed additive is prohibited by federal law. A veterinarian cannot adjust the dose of feed additive from the labeled values.

Feed additives typically are used in very small quantities. A label reading or decimal point error in calculating feed additive and other ingredient quantities to mix can put animal health at risk or result in illegal tissue or meat residues. Toxicity and end-product residue concerns make appropriate mixing, delivery, and consumption vital.

Some feed mixing equipment is not appropriate for mixing small quantities of feed ingredients. Review instructions for feed mixing capabilities provided by equipment manufacturers. A thorough and consistent mix is critical for achieving the benefits of feed additives and avoiding problems with feeding improper amounts of feed additives.

The feed industry offers a variety of premix products that make it convenient for cattle producers to use feed additives safely and effectively. Products may be mixed directly into feed. Feed additives are also commercially available as cubes, pellets, blocks, or loose minerals, depending on the specific feed additive.

For more information on feed additives for beef cattle diets, contact your local MSU Extension office.

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