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## G85-761 Feed Additives for Beef Cattle

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## Feed Additives for Beef Cattle

This NebGuide discusses feed additives, including how they work, feeding restrictions and feeding recommendations.

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One of the best methods to reduce feed costs is through the use of feed additives. Their primary effects are to improve feed efficiency and/or daily gain. Some feed additives have secondary benefits which include reducing the incidence of acidosis, coccidiosis, and grain bloat, while others suppress estrus, reduce liver abscesses, or control foot rot problems.

Feed additives can be divided into five general categories: 1) ionophores; 2) antibiotics; 3) estrus suppressants; 4) buffers; and 5) others. Each feed additive has its own characteristics and feeding limitations. Some are approved to be fed in combination with others. Using the proper level of feed additives is very important because too high a level will decrease animal performance, especially with cattle on low-quality roughages.

### IONOPHORES

Ionophores are a type of antibiotic that depresses or inhibits the growth of specific rumen microorganisms. This selective inhibition alters rumen fermentation in three major ways:

1. Ionophores improve the efficiency of energy metabolism by changing the types of volatile fatty acids produced in the rumen and decreasing energy lost during fermentation of the feed. Improved animal performance results from increased energy retention during fermentation in the rumen.
2. Ionophores decrease the breakdown of feed protein and may also decrease microbial protein synthesis. This has minimal effects on the performance of cattle on high-grain diets, but may have important implications with growing cattle fed high-roughage diets.
3. Ionophores may reduce the incidence of acidosis, grain bloat, and coccidiosis. Reducing these stresses should result in improved animal performance.

Ionophores include monensin, lasalocid, salinomycin, and narasin. At present, monensin (Rumensin™) and lasalocid (Bovatec™) are the only ionophores approved to be fed to beef cattle.

With high-grain diets, ionophores generally decrease feed intake, improve feed conversion, maintain or increase daily gain (*Tables I and II*), and do not affect carcass characteristics. When cattle in confinement (feedlot) are fed diets containing large proportions of roughage, ionophores improve daily gain and feed conversion. Feed intakes of animals fed high-roughage diets do not change if the proper level of ionophore is fed.

<b>Table I. Summary of ionophore trials with feedlot cattle (1979, 1980, 1981).</b>				
		<b>Percent improvement over negative control</b>		
	<b>No. of Trials</b>	<b>Gain</b>	<b>Intake</b>	<b>F/G</b>
Rumensin	53	+ 2.5	- 5.1	+ 7.2
Bovatec	17	+ 6.4	- 4.6	+ 9.9

Wagner, 1982 Oklahoma Cattle Feeders Seminar.

<b>Table II. Ionophore trials with feedlot cattle.</b>				
		<b>Percent improvement over negative control</b>		
	<b>No. of Trials</b>	<b>Gain</b>	<b>intake</b>	<b>F/G</b>
Salinomycin	5	+4.6	-1.7	+6.1
Narasin	6	-1.0	-12.5	+8.8

When starting cattle on feed, step-up programs have been shown to be useful. Feeding 10 grams per ton of Rumensin during the step-up period and then switching to 25 to 30 grams per ton of Rumensin when cattle are on feed improves daily gain, feed intake, and feed efficiency compared to starting cattle on 30 grams per ton of Rumensin. Because Bovatec does not reduce intake as much as Rumensin early in the feeding period, the response to a step-up program would probably be less. Cattle started on feed without ionophores will have more erratic feed intake patterns, and possibly more digestive problems.

Ionophores also decrease the breakdown of feed protein and thus increase the bypass of the protein to

the small intestine. This effect is maximized in growing rations when natural protein (no urea) is supplemented below the animal's requirement.

The level of ionophore is also important when cattle are consuming low-quality forage diets. Feeding too high a level decreases the number of cellulolytic bacteria present in the rumen, which can cause reduced fiber digestion. Also, when protein is slightly below the animal's requirement, the ionophore may reduce the breakdown of feed protein and a shortage of rumen nitrogen, needed by the rumen microbes for growth, results. This shortage of nitrogen results in reduced fiber digestion. Thus, the proper level of ionophore depends on the quality of the forage being fed.

The effects of ionophores and growth promoting implants are additive and should be routinely used together.

## **Rumensin**

Rumensin is marketed by Elanco Products Company, a Division of Eli Lilly and Company, for improved feed efficiency for beef cattle fed in confinement (feedlot) for slaughter, improved daily gain in cattle on pasture, and improved daily gain in replacement heifers. It is not cleared for use in cows, and is very toxic to horses and swine. Rumensin can be included in both dry and liquid supplements, and can be fed with either tylosin (Tylan™) or melengestrol acetate (MGA™).

### ***Finishing Cattle***

**Expected Growth Response:** 1 to 3 percent improvement in daily gain;  
6 to 8 percent improvement in feed efficiency.

**Level of Use:** 20 to 25 grams per ton of air dry ration or 200 to 250 milligrams per head per day.

**Required Withdrawal Time:** No withdrawal required.

### ***Growing Cattle***

**Expected Growth Response:** 5 to 15 percent improvement in daily gain;  
8 to 12 percent improvement in feed efficiency.

**Level of Use:** *Pasture*--100 to 150 milligrams per head per day or 300 to 400 milligrams every other day. *Corn silage rations*--150 to 200 milligrams per head per day.

## **Bovatec**

Bovatec is marketed by Hoffman-LaRoche, Inc. for improved rate of gain and feed efficiency for beef cattle fed in confinement (feedlot) for slaughter and improved rate of gain for cattle on pasture. It is not cleared for use in cows. Bovatec is less toxic than Rumensin, but is still not safe for horses and swine. It can be included in both dry and liquid supplements. Antibiotics and MGA are not cleared to be fed in conjunction with Bovatec.

### ***Finishing Cattle***

**Expected Growth Response:** 4 to 6 percent improvement in daily gain;  
6 to 8 percent improvement in feed efficiency.

**Level of Use:** 30 grams per ton of air dry ration or 300 milligrams per head per day.

**Required Withdrawal Time:** No withdrawal required.

## Growing Cattle

**Expected Growth Response:** 5 to 15 percent improvement in daily gain;  
8 to 12 percent improvement in feed efficiency.

**Level of Use:** *Low quality forage*--100 to 150 milligrams per head per day;  
*medium quality forage*--150 to 200 milligrams per head per day; *corn silage rations*--200 milligrams per head per day.

## ANTIBIOTICS

Antibiotics are primarily fed to finishing cattle for the control of liver abscesses. Antibiotics that are added to cattle rations include chlortetracycline, oxytetracycline, bacitracin, and tylosin. Severe liver abscesses may reduce gain and increase feed/gain by 10 percent (*Table III*). When fed high concentration rations, cattle that are borderline on subacute acidosis and have a few small liver abscesses gain faster and more efficiently than cattle that are not stressed and have no liver abscesses. However, managing to allow a slight amount of acidosis is difficult.

**Table III. Effect of liver abscesses.**

Liver score*	No.	Gain	DMI	F/G
0	362	2.63	18.55	6.94
A-	50	2.73	18.60	6.71
A	35	2.59	18.22	6.94
A+	60	2.32	17.88	7.63

\*Liver Abscess Score System:

**A -** denotes 1 or 2 very small abscesses or abscess scars.

**A** denotes 2 to 4 well-organized abscesses, generally under one inch in diameter.

**A +** denotes 1 or more large, active abscesses along with inflammation of liver tissue. Portions of the diaphragm are frequently adhered to the surface of the liver.

Brink and Lowry, 1985 Nebraska Beef Cattle Report.

Antibiotics may also reduce the incidence of grain bloat, but the data are limited. Antibiotics have been shown to improve gain and feed conversion in cattle, but this response may be primarily due to a reduction of liver abscesses.

Intermittent feeding of tetracyclines for a short period of time while other feed additives are removed from the ration avoids clearance problems with the combined use of additives. Cattle fed 1 gram per head daily for 3 out of 28 days or 400 milligrams per head daily for 7 out of 28 days have been shown to have similar performance as cattle fed antibiotics on a continuous basis.

## Chlortetracycline

Chlortetracycline is marketed by several companies under various trade names including Aureomycin™, Chlorachel™, Chloratel™, CLTC, and CTC. Chlortetracycline is approved for use in beef cattle at 70 to 100 mg per head daily to improve gain and feed efficiency, and to aid in preventing liver abscesses, reducing bacterial diarrhea, and preventing foot rot. It is approved at 350 mg per head daily as an aid in preventing bacterial pneumonia and shipping fever, reducing losses due to respiratory infection, and preventing anaplasmosis. It is not approved for use in liquid supplements.

## *Cattle*

**Expected Growth Response:** 3 to 5 percent improvement in daily gain and feed efficiency in finishing cattle.

**Level of Use:** 70 to 100 milligrams per head daily.

**Required Withdrawal Time:** No withdrawal required.

**Level of Use:** 350 milligrams per head daily.

**Required Withdrawal Time:** 48 hours prior to slaughter.

**Level of Use:** 350 milligrams per head daily and 350 milligrams per head daily of sulfamethazine.

**Required Withdrawal Time:** 7 days prior to slaughter.

## **Oxytetracycline**

Oxytetracycline is marketed by several companies under various trade names including Terramycin and Oxtc. It is approved for use in beef cattle at 75 mg per head daily to increase gain and improve feed efficiency, aid in reducing the incidence and severity of grain bloat, and to aid in reducing the incidence and severity of liver abscesses. Oxytetracycline is approved at 0.5 to 5.0 mg per pound of body weight daily to aid in preventing bacterial diarrhea, and at 0.5 to 2 grams per head daily for the prevention and treatment of shipping fever complex. It is not approved for use in liquid supplements.

## *Cattle*

**Expected Growth Response:** 3 to 5 percent improvement in daily gain and feed efficiency in finishing cattle.

**Level of Use:** 75 milligrams per head daily.

**Required Withdrawal Time:** No withdrawal required.

**Level of Use:** 2 grams per head daily and above.

**Required Withdrawal Time:** 5 days prior to slaughter.

**Level of Use:** 2 grams per head daily plus 1.4 grams neomycin base.

**Required Withdrawal Time:** 7 days prior to slaughter.

## **Bacitracin**

Bacitracin is marketed by several companies under various trade names including A.L. Zinc Bacitracin, Baciferm, Zinc Bacitracin Premix, and Zinc-Bacitracin. Bacitracin is approved for use in beef cattle at 35 to 70 mg per head daily to increase rate of gain and improve feed efficiency. It is not approved for use in liquid supplements.

## *Cattle*

**Expected Growth Response:** 1 to 5 percent improvement in daily gain and feed efficiency in finishing cattle.

**Level of Use:** 35 to 70 milligrams per head daily.

**Required Withdrawal Time:** No withdrawal required.

## **Tylosin**

Tylosin (Tylan™) is marketed by Elanco Products Company and is approved for use in beef cattle for reducing the incidence of liver abscesses. It is approved for use in both dry and liquid supplements, and can be fed in combination with Rumensin.

### ***Finishing Cattle***

**Expected Growth Response:** 3 to 5 percent improvement in gain and feed efficiency.

**Level of Use:** 8 to 10 grams per ton of air dry feed or 60 to 90 milligrams per head daily.

**Required Withdrawal Time:** No withdrawal required.

## **ESTRUS SUPPRESSANT IN HEIFERS - MGA**

Melengestrol acetate (MGA™) is marketed by TUCO, a division of Upjohn Company. MGA is a synthetic hormone similar in structure and activity to progesterone. It improves gain and feed efficiency of intact open heifers and suppresses estrus. The suppression of estrus reduces injuries due to riding, as well as reducing energy losses of the animals from riding and chasing. The reported response to MGA is variable and may depend on: 1) the age of the heifers being fed; 2) the number of sources of heifers fed together; 3) the amount of space per heifer; and/or 4) implant effects. MGA is approved for use in liquid supplements, and can be fed in combination with Rumensin.

### ***Beef Heifers***

**Expected Growth Response:** 3 to 7 percent improvement in gain and feed efficiency.

**Level of Use:** 0.25 to 0.50 milligrams per head daily.

**Required Withdrawal Time:** 48 hours prior to slaughter.

## **BUFFERS**

Buffers resist changes in rumen pH when acids are present. Large quantities of organic acids are produced in the rumen by microbial fermentation. Buffers have been used to reduce the incidence of acidosis on high grain diets or to improve fiber digestion in corn silage diets. Saliva is the principal source of rumen-buffering agents. Feed additives that are used as buffers include sodium bicarbonate, limestone, sodium bentonite, and magnesium oxide. Animal performance with buffers have been extremely variable.

### ***Beef Cattle***

**Expected Growth Response:** Negative 2 to 5 percent improvement in gain and feed efficiency.

**Level of Use:** *Sodium bicarbonate*--0.75 to 1.5 percent of ration dry matter.

*Limestone*--approximately 1 percent of ration dry matter (0.5 to 0.7 percent calcium in the ration).

*Sodium bentonite*--1 to 2 percent of ration dry matter. *Magnesium oxide*--0.5 to 0.75 percent of ration dry matter.

**Required Withdrawal Time:** No withdrawal required.

## **Sarsaponin**

Sarsaponin (Sevarin™) is classified as a natural product with plant origins and as such can be used in any kind of a feeding program without FDA clearance or restrictions. Sarsaponin's active ingredient and mode of action have not been identified. Sarsaponin is recommended to be fed in combination with

Bovatec or Rumensin and has been reported to improve gain and feed conversion. However, results at Nebraska have shown little or no benefit in feeding sarsaponin-ionophore combinations.

***Beef Cattle***

**Expected Growth Response:** 0 to 4 percent improvement in gain and feed efficiency.

**Level of Use:** 0.5 grams per head daily.

**Required Withdrawal Time:** No withdrawal required.

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