Supplementation Management of Growing and Finishing Cattle

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The nutritional management of feeder cattle is an extremely broad and all encompassing subject. Consequently, this report will be confined to a brief summary of some of the major factors of current interest and concern to both cattlemen and feed manufacturers, with particular reference to feed additives, protein sources and recommended cattle management techniques.

Management of New Cattle

The feeding and management of cattle during the first few weeks following arrival can have a profound effect on their performance, sickness, death loss and ultimate profitability. Ideally, the cattle should have been weaned, bunk broken and vaccinated 2-3 weeks prior to shipment. Such preconditioning programs have been around for several years and are gaining increased popularity in a number of states. These programs have been shown to markedly reduce transit stress, health problems and getting cattle started on feed. From a practical standpoint, however, most feeder cattle have not been properly conditioned prior to shipment. So, the cattle feeder continues to be plagued with the task of getting cattle off to an economical start.

Research and field experience have consistently shown that processing cattle within 24-48 hours after arrival is far preferable to waiting until the cattle "straighten out." Even stressed cattle should be promptly vaccinated, wormed, implanted and castrated or dehorned if necessary (Davis and Caley, 1977).

One of the major problems with new cattle is that feed intake is drastically reduced during the first couple of weeks after arrival. This is especially true of freshly weaned calves and long hauled, highly stressed cattle. Hutcheson (1981) found that the dry matter intake of such cattle was only .5-1.5% of their body weight during the first week and 1.5-2.5% during the second week. Thus, these cattle are not consuming enough energy, protein and other important nutrients to perform properly and avoid illness. Receiving rations, therefore, need to be of high quality and amply supplemented with critical nutrients to bolster the nutritional well being of newly arrived cattle (Embry, 1977).

Potassium Supplementation: Research at the Texas A & M Amarillo Station (Hutcheson, 1981) has shown improved cattle performance and reduced sickness by adding potassium to the receiving ration in order to improve the electrolytic balance of stressed feeder cattle. These studies indicate that the potassium level in the ration dry matter should be from 1.2-1.5% for the first two weeks after arrival. Table 1 illustrates the results of one of these trials with highly stressed calves, showing a reduction in mortality and improved performance. While all trials have not been consistent, increasing the potassium level in the starter ration appears to be a prudent nutritional practice for receiving cattle.

TABLE 1. Potassium Supplementation of Receiving Rations[1/]

	Potassium Level in Diet	
Item	.9%	1.4%
Initial Payweight, lb.	445	443
Avg. Daily Gain, lb.	1.36	1.64
Avg. Daily Intake, lb.	11.6	11.4
Feed/Gain, lb.	8.5	7.0
Calves Treated, %	34.4	30.8
Avg. Days Treated	5.9	6.2
Death Loss, %	7.5	1.1

[1/]Hutcheson, 1981. Northwest Kansas Stocker-Feeder Conference.

While commercial sources of potassium are available, a simple way to increase the potassium content of receiving rations is to incorporate feedstuffs which are naturally high in this nutrient such as alfalfa hay or dehydrated pellets. Once normal intake levels have been achieved, .6-.8% dietary potassium levels appear adequate for maximum cattle performance.

Antibiotic Feeding: An area of extensive research over the last 30 years has been the feeding of high levels of broad spectrum antibiotics for 2-4 weeks after arrival to help prevent bacterial pnemonia and shipping fever, and improve cattle performance. Several common feed antibiotics have proven effective for this purpose (Riley, 1981), including oxytetracycline, chlortetracycline and oxytetracycline-sulfament (AS—700). Table 2 (Elliot *et al.,* 1968) shows a summary of 27 research trials illustrating the benefit of high level antibiotic feeding for improving calf performance and reducing sickness. Similarly, South Dakota workers (Embry, 1977) reported 23 trials in which cattle gains were improved 14-27% during the first 28 days by feeding various antibiotics.

Table 3 depicts the results of a recent Ft. Hays trial

TABLE 2. Summary of 27 Trials with Aureo S-700 for Starting Cattle[1/]

Item	Control	Antibiotic	Benefit
No. Cattle	712	721	
Avg. Initial Wt., lb.	438	435	
Avg. Daily Gain, lb.	1.89	2.33	+23%
Daily Feed Intake, lb.	14.8	14.8	
Feed/Gain, lb.	7.8	6.4	−19%
No. Cattle Treated	162	75	−54%

[1/]Elliot et al., 1968.

TABLE 3. Response of Calves to Additives in the Starting Ration[1/]

Item	Control	AS-700	Sarsaponin	As-700 + Sarsaponin	Probios	Phenothiazine
No. Steers	72	71	72	71	71	71
Initial Payweight, lb.	435.5	432.6	433.6	439.9	434.6	441.4
Avg. 28 Day Gain, lb.	10.3	17.4	12.6	21.0	8.8	10.4
Daily DM. Intake, lb.	9.1	10.1	8.7	10.1	9.2	9.0
% Treated For:						
Shipping Fever	11.2	4.0	5.4	4.6	9.2	10.8
Bloat	4.2	2.7	4.8	3.6	7.1	7.0

[1/]Brethour, 1982. Ft. Hays Roundup Report 417.

(Brethour, 1982) comparing several different additives in the starting ration. The antibiotic (AS-700) consistently improved gain and feed intake, while reducing the number of cattle treated for sickness.

As mentioned earlier, several different antibiotics are available for feeding to new cattle. Each is highly effective, so the important point is to feed the product at a sufficiently high level to insure at or near therapeutic levels of the active ingredient in order to provide bacteriostatic protection to the cattle during the period of stress.

Probiotics: A relatively new concept in receiving cattle management is the dosing of cattle with probiotics in an effort to restore normal intestinal flora conditions. The Ft. Hays trial reported in Table 3 showed no benefit from treating calves with 15 grams of lactobacillus paste on arrival, plus feeding 5 grams of Probios per head per day. Research at the Garden City Station with stressed calves given probiotics has given variable results. Based on three trials involving 598 calves from Texas and Tennessee, these workers (Davis and Caley, 1977) concluded that probiotics did not improve gain or feed efficiency, but appeared to reduce sickness and death loss somewhat.

Texas research (Hutcheson, 1981) with highly stressed, long hauled cattle has shown more positive results in terms of animal performance, and reducing sickness and mortality by the use of probiotics. Thus, it appears that the possible benefits of these products depend upon the degree of stress and gastrointestinal dysfunction of the cattle. This is an area in need of additional research because of variability in product contents and bacterial viability as well as the lack of definitive knowledge regarding mode of action and dependable benefits. Similar inconsistencies have been found with probiotics fed to swine (Pollmann, 1981).

Deworming: While the use of worming agents is a routine practice in feedlots, some producers still fail to use them. Table 4 illustrates the benefits observed from worming calves in 4 trials at the Garden City Station (Davis and Caley, 1979) involving 963 cattle. These calves came from southeast Kansas, Oklahoma, Texas and Tennessee. Source of the cattle is important in determining the possible advantage to worming because of its reflection of likely worm bunden. For example, Brethour (Table 3) found no significant effect of worming calves from northern Nebraska with phenothiazine. Riley *et al.* (1974) observed an 11 lb. weight gain advantage during the finishing period with cattle of unspecified origin given either Tramisol or Thibenzole. On balance, most studies and field experiences indicate an economical benefit to routine worming of feeder cattle unless cattle history and/or fecal egg counts indicate otherwise.

TABLE 4. Effect of Deworming on Performance of Stressed Calves[1/]

Item	Improvement From Deworming[2/]
Daily Gain	19.2%
Feed Intake	3.0%
Feed Efficiency	11.1%
Sickness	11.9%
Cost of Gain	9.8%

[1/]Davis and Caley, 1979. Garden City Cattle Feeder's Day Rep. 357.
[2/]Average response from Tramisol injectable, bolus and pellets, and Thibenzole bolus.

Rumensin and Bovatec for Growing and Finishing Cattle

One of the most important advances in cattle feeding in the last quarter century was the development and FDA clearance of monensin (Rumensin) several years ago. Very recently, a similar compound, lasalocid (Bovatec), was approved for feedlot cattle. The two products have many similarities (Nagaraja and Bartley, 1982; Laudert, 1982; Wagner, 1982). Both compounds are polyether antibiotics produced through fermentation of different strains of *Streptomyces*. Both feed additives alter rumen fermentation, enhancing propionate production, and thereby improve feed usage and cattle performance. In addition, both products are effective ruminant coccidiostats, help to prevent lactic acidosis and aid in the control of feedlot bloat (Kuhl *et al.,* 1980; Lomas, 1982; Nagaraja and Bartley, 1982), although these virtues are not included in their label claims.

Since both compounds are effective and economical to use, the logical question posed by cattle feeders and feed manufacturers alike is the comparative feedlot performance of the two additives. While field trials will continue for some time, two excellent summaries of their relative effectiveness to date are available (Laudert, 1982; Wagner, 1982).

Research indicates that the relative superiority of Rumensin and Bovatec depends upon the energy or

roughage level of the ration. Table 5 summarizes the results of 5 experiment station trials comparing the two products in high roughage growing rations. Both compounds produced nearly identical gain and feed conversion responses with this type of diet.

TABLE 5. Effect of Rumensin and Bovatec on Performance of Growing Cattle—5 Trial Summary[1/]

Treatment	Daily Gain lb.	Benefit %	Feed DM/Gain lb.	Benefit %
Control	2.06	——	8.41	——
Rumensin	2.14	+3.9	7.76	−7.7
Bovatec	2.14	+3.9	7.67	−8.8

[1/]Adapted from Laudert, 982. Scott County Beef Cattle Conference.

In contrast, the relative efficacy of Rumensin and Bovatec appear to separate somewhat when fed in high concentrate finishing rations. Table 6 displays the average daily gain and feed conversion responses of the two compounds from 10 research trials (Laudert, 1982). Bovatec fed cattle gained about 5% faster and about 4% more efficiently than those fed Rumensin when both products were mixed at 30 grams per ton of air-dried feed. It should be noted that the cattle in these trials were placed directly on the full dosage (30 grams/ton) of the two products from day 1. It has been well established that introducing Rumensin to cattle in a step-up feeding schedule will improve its performance response due to a lessening of initial feed intake depression when cattle are gradually exposed to this feed additive. Bovatec fed cattle do not appear to require a step-up program for optimum response to the feed additive, an apparent difference in drug palatability or biological activity (Kuhl *et al.,* 1980; Nagaraja and Bartley, 1982; Wagner, 1982).

Rumensin is labelled for use at 5-30 grams/ton to improve feed efficiency in feedlot cattle, while Bovatec is cleared at 10-30 grams/ton for this purpose and at 25-30 grams/ton of air-dried feed for both improved gain and feed conversion. Research summaries (Lomas, 1982; Laudert, 1982) strongly indicate that the maximum approved level (30 grams/ton) of Bovatec will consistently produce more economical performance responses than lower levels.

Currently, Rumensin-Tylan is the only approved antibiotic combination for use in the same supplement to improve both cattle performance and control liver abscesses. With Bovatec, the only present recourse is to use a high level intermittent antibiotic feeding program. Such feeding programs have been shown to be beneficial and effective (Riley, 1981).

TABLE 6. Effect of Rumensin and Bovatec fed at 30 Grams/Ton to Finishing Cattle—10 Trial Summary[1/]

Treatment	Daily Gain lb.	Benefit %	Feed DM/Gain lb.	Benefit %
Control	2.86	——	8.14	——
Rumensin	2.91	+1.6	7.83	−3.8
Bovatec	3.08	+7.7	7.48	−8.1

[1/]Laudert, 1982. Scott County Beef Cattle Conference.

Sarsaponin For Feedlot Cattle

Sarsaponin is a registered feed flavoring agent produced from an extract of the desert Yucca plant. It is not classified as a feed additive (drug), so FDA approval has not been required. Sarsaponin is cleared for use in any feeding program and can be incorporated into any supplement. The active ingredient(s) is thought to be plant steriod in nature.

Sarsaponin was first tested at Colorado State University in 1977. Since then, a number of university and feed industry trials have substantiated a small, but consistent, improvement in weight gain and feed efficiency of feedlot cattle. Table 7 shows a summary of the results of 14 high concentrate feeding trials compiled by Laudert (1981). Several grain processing methods have been examined in combination with Sarsaponin. It appears that a greater response is achieved with the flavoring agent when used with dry rolled grain, as compared with more highly processed grains. Research has not shown sarsaponin to be effective when used with high roughage rations (Laudert, 1981; Brethour, 1982).

TABLE 7. Effect of Sarsaponin on Feedlot Performance[1/]

Processed Gain	No. Trials	Average Daily Gain, lb. Control	Sarsaponin	% Change	Feed/Gain, lb. Control	Sarsaponin	% Change
Dry Rolled Corn	7	2.72	2.85	+4.8	8.55	8.19	−4.2
Steam Flaked Corn	5	3.19	3.29	+3.1	6.99	6.75	−3.4
High Moisture Corn	1	3.40	3.48	+2.4	6.15	6.05	−1.6
Steam Flaked Milo	1	2.67	2.71	+1.5	6.52	6.39	−2.0

[1/]Laudert, 1981. Kansas Focus on Feedlots.

The suggested feeding rate is 0.5 gram per head daily, starting cattle at 0.3 grams daily and increasing to the 0.5 gram level after 1-2 weeks. There is no withdrawal period prior to slaughter (Laudert, 1981).

While there is substantial research evidence in support of improved feedlot performance with sarsaponin, it is disconcerning that the active ingredient(s) necessary for definitive quality control and their biological activity in the animal are not better understood.

Effect of Protein Source on Performance of Growing and Finishing Cattle

The relative value of various supplemental nitrogen sources for growing and finishing cattle has received considerable attention in recent years. The concept of slowly degraded proteins which escape or "by-pass" microbial degradation to ammonia in the rumen, and are instead digested and absorbed as amino acids in the small intestine is an important step toward improving the protein efficiency of ruminant animals. Berger (1981) presented an excellent review of this subject at a recent Formula Feed Conference.

Unfortunately, a shortcoming of much of the bypass protein literature has been the predominant use of very low protein basal diets as pointed out by Berger (1981). Consequently, the supplemental protein sources evaluated contributed an unusually large proportion of the total protein makeup of the test rations. This experimental ration design is understandable in terms of producing a more easily quantifiable experimental effect. The shortcoming appears to surface when the results of such trials are extrapolated to practical rations being used in the field. In addition, marginally protein deficient rations have been typically used in these studies (Berger, 1981), a practice nutritionists obviously attempt to avoid in the field. Thus, the marked increase in protein efficiency observed with certain high-bypass proteins in research trials may overrate their true value in practical cattle rations.

In addition, recent work (Nagaraja and Bartley, 1982; Bartley, 1982) indicate that feed additives such as Rumensin and Bovatec inhibit microbial protein synthesis as well as inhibit deamination in the rumen. Bartley (1982) suggests that these feed additives could improve the utilization of various protein sources by changing the site of protein digestion digestion in the digestive tract. Consequently, the widespread use of these additives in cattle feeding may pose the need for reevaluation of earlier bypass protein research.

A recent South Dakota trial (Whittington *et al.,* 1982) compared two commercially available protein sources varying in "bypass" capability (Table 8). The supplements containing Rumensin were fed to exotic-cross calves on a high corn silage growing ration. The "high bypass" supplement contained meat and bone meal, dehydrated alfalfa and urea, while the "all natural" supplement consisted of soybean and sunflower meals.

Average daily gain, feed intake, and feed conversion were not significantly different between protein sources. Consequently, relative economics of the supplements, rather than differences in cattle performance would appear to determine the choice of supplement from this trial. Additional applied research of this nature is needed to evaluate protein sources for growing cattle.

The effect of supplemental protein source with feedlot cattle consuming high grain diets has been evaluated by Schindler and Farlin (1980). Table 9 shows the feedlot performance of 264 cattle fed either urea, corn gluten meal, or a 50:50 combination of urea and corn gluten meal—a slowly degraded protein source. No differences due to supplemental protein source were shown. Similarly, these researchers compared urea vs. bloodmeal as protein sources with Rumensin to finishing cattle with no significant differences in feedlot performance.

Davis (1982) recently summarized several years' research at the Garden City Station comparing urea with either soybean, cottonseed or a urea-cottonseed meal combination

TABLE 8. Effect of Supplemental Protein Source on Growing Performance of Steer Calves[1/]

Item	"High Bypass" (55-25%)	"All Natural" (35%)
No. Steers	36	36
Initial Wt., lb.	577	577
Final Wt., lb.	810	802
Avg. Daily Gain, lb.	2.22	2.14
Avg. Daily DM Intake, lb.:		
Corn Silage	12.73	12.69
Shelled Corn	1.80	1.80
Supplement	.90	1.35
Total	15.43	15.84
Feed DM/Gain, lb.	6.94	7.39

[1/]Whittington et al., 1982. South Dakota Cattle Feeders Day Report 82-4. No significant differences.

TABLE 9. Effect of Supplemental Protein Source in High Concentrate Finishing Rations[1/]

Item	Urea	Corn Gluten Meal	Urea & Corn Gluten Meal
No. Head	88	88	88
Initial Wt., lb.	583	581	590
Avg. Daily Gain, lb.	2.68	2.64	2.62
Daily DM Intake, lb.	18.9	19.3	19.1
Feed/Gain, lb.	7.16	7.44	7.17

[1/]Schindler and Farlin, 1980. Nebraska Beef Cattle Rep. 80-218.

as protein sources in high moisture corn finishing rations containing Rumensin. The results of these trials are illustrated in Table 10. No differences in performance due to protein source were observed. Hanke *et al.* (1981) reported similar results comparing urea vs. soybean meal in high moisture corn finishing rations.

Extensive protein supplementation research conducted with high moisture grains prior to the advent of Rumensin fairly consistently observed 3-5% lower performance when urea was used as the sole supplemental nitrogen

TABLE 10. Effect of Supplemental Protein Source on Feedlot Performance of Cattle Fed High Moisture Corn and Rumensin[1/]

Suppl. Protein	No. Trials	No. Steers	Daily Gain lb.	Daily Intake lb. —Dry Basis—	Feed/Gain lb. —Dry Basis—
Urea	2	75	2.33	18.6	8.10
Soybean Meal		75	2.36	18.9	8.08
Urea	2	65	3.08	18.6	6.09
Cottonseed Meal		65	2.93	18.6	6.35
Urea	2	70	2.62	17.8	6.81
CSM + Urea		70	2.72	19.0	6.98
Overall Average:					
Urea	6	210	2.68	18.4	7.00
Natural Protein		210	2.67	18.8	7.14

[1/]Davis, 1982. Garden City Cattle Feeders Day Report 416.

source. This is associated with the relatively high protein solubility in fermented grains. Davis (1982) suggested that the comparable performance achieved with urea vs. natural protein sources in his trials was attributable to feeding Rumensin, due to its effect on increasing ruminal starch digestion and decreasing microbial-protein degradation, in agreement with the work of Bartley and Nagaraja (1982) and Nagaraja and Bartley (1982) with both Rumensin and Bovatec.

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