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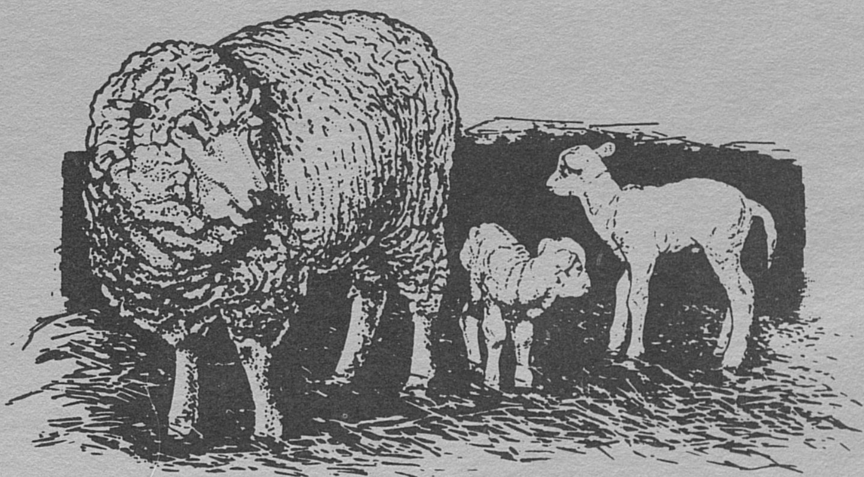
Proceedings



May 25, 1978

PROGRESS REPORT 233

UNIVERSITY OF KENTUCKY • COLLEGE OF AGRICULTURE

AGRICULTURAL EXPERIMENT STATION

DEPARTMENT OF ANIMAL SCIENCES • LEXINGTON

FOREWORD

Leaders in the sheep industry are optimistic about the contributions of lamb and wool production to Kentucky's growing agricultural industry.

Wool price trends have turned upward after several years of extremely tough competition from synthetic fibers. With continued pressures on energy supplies and the increased costs of fossil fuels, there is reason to believe that the natural fibers, including wool, produced from renewable resources will be in a more competitive position in the future and should return greater profits to the wool producers.

Sheep fit well into an overall land utilization program and, particularly, with the forage production potential of Kentucky farms. Choice slaughter lambs can be produced on the legume-grass mixture adaptable to our soils, which is an efficient use of all land classes.

University of Kentucky College of Agriculture Research and Extension Specialists are cooperating with producers to improve the productivity and marketing of wool and lambs. Tele-o-auction systems of marketing finished lambs have recently been implemented in the state. Research efforts include cross-breeding with Finnsheep to increase ewe productivity and combine this increased ewe productivity with meat-type breeds to produce heavier lambs. Marketing lambs at heavier weights, 130 to 140 lb rather than the traditional 90 to 100 lb, also offers opportunities for greater productivity per ewe kept or per acre of land.

This report includes brief reports on some of the current research activities and management practices, and is presented for the benefit of Kentucky sheep producers.

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Sheeprofit Day: May 25, 1978 – Proceedings

GROWTH OF NEWBORN LAMBS TREATED WITH LACTO-CILL^{tm} FEED FORTIFIER[1]

D. G. Ely and W. P. Deweese

During the winter of 1975-76, many lambs born to ewes in the University of Kentucky flock experienced severe scouring during the first 48 hours after birth, of which much resulted from extensive *E. coli* microorganism buildup in the intestinal tract. Oral administration of the microorganism *Lactobacillus acidophilus* (Lacto-Cill^{tm}) has been shown to reduce scours in newborn calves and lambs by producing a more "balanced" intestinal microflora population, thus preventing the one-sided buildup of *E. coli.* This study was initiated to determine if the incidence of lamb scours encountered in the previous year could be reduced and, if so, how growth of lambs from birth to 28 days was affected when Lacto-Cill^{tm} was administered.

All lambs used in the study were born between Jan. 1 and Feb. 20, 1977. All ewes received a daily ration of 0.68 kg alfalfa hay and 0.68 kg shelled corn plus corn silage and trace mineral salt *ad libitum.* Each lamb was identified and weighed within 6 hours following birth and then, they received one of the following treatments: (1) no Lacto-Cill^{tm} (control); (2) a 2-cc dose of Lacto-Cill^{tm} when birth weight was taken; or (3) a 2-cc dose of Lacto-Cill^{tm} when birth weight was taken plus an additional 2-cc dose approximately 24 hours later. Identification of any lambs showing scours during the first 7 days after birth was recorded. Individual lamb weights were also taken at 7 and/or 28 days of age. All lambs received a 90% ground corn, 10% soybean meal and 1% aureomycin creep feed from birth to 28 days.

Table 1 shows the growth of twin Hampshire lambs treated with Lacto-Cill^{tm}. All ewes and lambs were housed in one pen regardless of treatment administered to the lamb. Although daily gains

Table 1.–Growth of Twin Hampshire Lambs Treated with Lacto-Cill^{tm}

	Treatment		
Item	Control	1	2
No. of lambs	14	14	11
Av. birth wt., kg	4.5	4.6	4.4
28-day wt., kg	11.0	11.3	11.2
Total gain, birth to 28 days, kg	6.5	6.7	6.8
ADG, birth to 28 days, g	232	239	253
Lambs with scours, %	0	0	0

were slightly greater in treatments 1 and 2, differences were not statistically significant. No incidence of scours was found in any of the lambs. Table 2 shows growth of twin Polled Dorset lambs. All ewes and lambs were housed in one pen regardless of treatment administered to the lamb. As was the case with the Hampshires, daily gains to 28 days favored the administration of Lacto-Cill^{tm}. No evidence of scours was found.

[1]Product provided by Creative Research Laboratories, Fremont, Neb. 68025.

Table 2.—Growth of Twin Polled Dorset Lambs Treated with Lacto-Cill^{tm}

Item	Control	Treatment 1	Treatment 2
No. of lambs	10	10	8
Av. birth wt., kg	3.5	3.8	3.9
28-day wt., kg	8.0	9.6	9.4
Total gain, birth to 28 days, kg	4.5	5.8	5.5
ADG, birth to 28 days, g	161	207	196
Lambs with scours, %	0	0	0

Both single and twin crossbred lambs were available for data summarization. In contrast to the Hampshires and Dorsets, lambs receiving the different Lacto-Cill^{tm} treatments were housed with their dams in different pens so there were two replicate pens of each treatment. Both singles and twins were in each pen. Growth of twins is summarized in Table 3. No treatment differences were found for daily gain from birth to 7 days. However, in contrast to the findings for the twin Hampshires (Table 1) and Dorsets (Table 2), control and treatment 1 lambs gained fastest from 7 to 28 days. Also, the incidence of scours was lowest in the control group. The growth of single, crossbred lambs is presented in Table 4. There was a trend for control lambs to perform equal to or superior to those treated with Lacto-Cill^{tm}. However, the incidence of scours was reduced with Lacto-Cill^{tm}. The effect of Lacto-Cill^{tm} in reducing scours may be more pronounced in singles than in twins because of the greater milk consumption per lamb.

Table 3.—Growth of Twin, 3/4 Suffolk 1/4 Rambouillet Lambs Treated with Lacto-Cill^{tm}

Item	Control	Treatment 1	Treatment 2
No. of lambs	28	38	47
Av. birth wt., kg	4.9	4.4	4.6
Wt. at 7 days of age, kg	6.6	6.1	6.4
Total gain, birth to 7 days, kg	1.7	1.7	1.8
ADG, birth to 7 days, g	243	243	257
Wt. at 28 days of age, kg	11.7	10.9	10.6
Total gain, 7 to 28 days, kg	5.0	4.8	4.2
ADG, 7 to 28 days, g	238	229	200
Lambs with scours, %	7.1	21.1	10.6

In general, the incidence of scours in the total research flock was not as severe during this lambing season as in previous ones. Whether this effect was a result of the severely cold winter encountered, Lacto-Cill^{tm} treatment or both is difficult to determine. Greater incidence of scours normally occurs under milder temperature conditions. Nevertheless, the administration of the *Lactobaccillus acidophilus* organism appears to offer some merit in reducing scours in newborn lambs.

Table 4.—Growth of Single, 3/4 Suffolk 1/4 Rambouillet Lambs Treated with Lacto-Cill[tm]

Item	Control	Treatment 1	Treatment 2
No. of lambs	19	16	18
Av. birth wt., kg	5.8	4.9	5.1
Wt. at 7 days of age, kg	7.9	7.0	7.0
Total gain, birth to 7 days, kg	2.1	2.1	1.9
ADG, birth to 7 days, g	300	300	271
Wt. at 28 days of age, kg	14.6	12.5	13.5
Total gain, 7 to 28 days, kg	6.7	5.5	6.4
ADG, 7 to 28 days, g	319	262	305
Lambs with scours, %	21.1	18.8	5.6

PERFORMANCE OF EARLY-WEANED LAMBS FED THREE PROTEIN LEVELS AND SLAUGHTERED AT THREE WEIGHTS

D. G. Ely, W. P. Deweese, J. D. Kemp and F. A. Thrift

Many lambs are weaned from their dams at approximately 2 months of age at a weight of 18 kg. These lambs are then fed on different dietary regimes to slaughter at 45 kg at approximately 5 months of age. Some packers today, however, are preferring lambs weighing more than 45 kg. Therefore, this study was conducted to determine the effects of post-weaning dietary protein levels on live animal performance and carcass characteristics of lambs weaned at 18 kg and slaughtered at different weights.

Seventy-two, 1/2 Hampshire 1/4 Suffolk 1/4 Rambouillet wether lambs were weaned at 18.2 kg and allotted to 12 pens of 6 lambs each. All lambs received a self-fed diet of 15% crude protein from 18.2 to 36.4 kg when one lamb from each pen was slaughtered. The remaining 60 lambs, at 36.4 kg, in the same pens, then received a self-fed diet of 9, 12 or 15% protein until slaughter as individual lambs weighing 45.5 or 53.1 kg. Composition of the diets is shown in Table 1.

Table 1.—Ingredient Composition of Diets Fed to Lambs (Percent)

Ingredient	Protein Level, % 9	12	15
Ground corn	80.3	72.2	63.3
Ground alfalfa hay	10.0	10.0	10.0
Soybean meal (44% CP)	2.7	10.8	19.7
Liquid cane molasses	5.0	5.0	5.0
Dicalcium phosphate	1.0	1.0	1.0
Trace mineral salt	1.0	1.0	1.0
Aureomycin*	+	+	+

*4.5 kg (2 g activity/0.45 kg) added to each 909-kg diet.

Daily gains, feed intakes and feed efficiencies are summarized in Table 2. Because all lambs received the 15% protein diet from 18.2 kg (weaning) to 36.4 kg, no comparisons could be made for this weight interval for the 9 and 12% protein diets. The younger and smaller lambs consuming the 12 and 15% protein diets gained faster than the lambs fed the 9% protein diet. Feed consumption was not directly related to dietary protein levels, although feed intake was generally higher when the 15% diet was fed. Feed/gain was most efficient when the higher protein diets were fed to lighter weight lambs. Based on live animal performance, after early-weaned lambs are fed a 15% protein diet to 36.4 kg, they should receive a lower dietary level to either 45.5 or 53.1 kg, and in this study the 12% diet appeared optimum.

Table 2.—Performance of Lambs Fed 9, 12 and 15% Protein Diets to Different Weights

Lamb Weight	Protein Level, %		
	9	12	15
18.2 to 36.4 kg			
ADG, kg	-	-	0.35
Daily FI, kg	-	-	1.32
F/G	-	-	3.91
36.5 to 45.5 kg			
ADG, kg	0.23	0.26	0.24
Daily FI, kg	1.57	1.57	1.75
F/G	7.29	6.08	6.90
45.6 to 53.1 kg			
ADG, kg	0.17	0.21	0.20
Daily FI, kg	1.62	1.53	1.62
F/G	9.34	8.07	8.34

Table 3 shows the relationship of dietary protein level and slaughter weight on carcass characteristics. Heavier lambs at slaughter had smaller *longissimus* muscle area/22 kg carcass weight than lighter lambs. This measurement is an indirect measure of carcass muscling and shows that, as slaughter

Table 3.—Carcass Characteristics of Lambs Fed 9, 12 and 15% Protein Diets to Different Slaughter Weights

Slaughter Weight	Dietary Level, %		
	9	12	15
36.4 kg*			
LMA/22.7 kg carcass, cm^2	-	-	15.6
BF/22.7 kg carcass, mm	-	-	4.1
K & P fat, % of carcass	-	-	2.2
45.5 kg			
LMA/22.7 kg carcass, cm^2	14.6	14.3	14.4
BF/22.7 kg carcass, mm	7.0	7.0	6.9
K & P fat, % of carcass	3.0	2.7	2.6
53.1 kg			
LMA/22.7 kg carcass, cm^2	12.7	12.9	12.5
BF/22.7 kg carcass, mm	7.2	8.4	8.4
K & P fat, % of carcass	4.1	3.1	3.5

**Longissimus* muscle area (LMA), backfat (BF), and kidney and pelvic fat (K & P fat), respectively.

weight increases, *longissimus* area per unit of carcass decreases. Dietary protein did not affect this measurement. As slaughter weight increased, backfat increased and backfat tended to be greater in lambs fed 12 and 15% protein diets. However, kidney and pelvic fat was greatest when the 9% protein diet was fed. Although not shown in the table, percentages of leg, loin, rack and shoulder were not affected by dietary protein level or slaughter weight.

It is concluded that the most efficient gain and most desirable carcass characteristics were produced when early-weaned lambs were fed a 15% protein diet to 36.4 kg and a 12% protein diet from 36.4 kg to slaughter weights of either 45.5 or 53.1 kg.

MONENSIN-RALGRO INTERACTION IN EARLY-WEANED LAMBS

B. P. Glenn, D. G. Ely and W. P. Deweese

MONENSIN IN THE FEEDLOT

Monensin (trade name Rumensin®) is a feed additive approved for use in beef cattle diets and has been used throughout the U.S. in feedlots. With small additions of monensin (generally 30 g/ton of diet) to the diet, feed utilization by growing cattle is improved. This improvement in feed efficiency is concluded as monensin's biggest advantage.

MONENSIN FOR SHEEP

Lambs fed high-concentrate diets in the feedlot also benefit from monensin. Kentucky data reported at Sheeprofit Day-1977 indicated a 7.2% improvement in feed efficiency for lambs when monensin was added at the level of 10g/ton of diet. The daily gains generally remained the same with or without monensin, while feed intake was reduced 9.1%. The carcass characteristics were not affected by monensin treatment.

Ralgro is also a growth stimulant for both lambs and steers. This study was conducted to determine whether using both monensin and Ralgro would produce an additive effect on performance in lambs.

MONENSIN-RALGRO INTERACTION

Procedure—Thirty-two early-weaned Suffolk x (Suffolk x Rambouillet) lambs averaging 24.6 kg were allotted to four treatment groups: (1) Control (C); (2) 16.5 mg monensin per kg of feed (M); (3) one 12-mg Ralgro(R) implant per lamb + Control ration; (4) 16.5 mg monensin per kg of feed + one 12-mg Ralgro implant per lamb (M + R). The monensin level represents 15 g/ton. Lambs for treatments R and M + R were implanted on day one of the trial. Lambs were self-fed in the drylot a 13% crude protein diet containing 10% cottonseed hulls for 70 days.

Results—A performance summary of lambs fed monensin and implanted with Ralgro is shown in Table 1. Average daily gain (ADG) was 2.8% greater for R lambs than for C but 1.7% less for M + R lambs. However, feed intake (FI) was reduced 2.3% compared with C in M + R lambs. Therefore, despite gaining less, M + R lambs were most efficient in their feed utilization (3.3% more efficient than C). Monensin alone did not improve lamb performance. Table 2 gives a carcass summary of the lambs slaughtered at the end of the 70-day feeding period. Monensin-fed lambs dressed highest and had the greatest amount of backfat (BF) per 22.7 kg of carcass. M + R carcasses were the leanest (21.9% less

BF than the C lambs). As a result, the M + R carcasses had a yield grade 14.7% leaner than the value for C.

These data indicate that the combination of monensin and a Ralgro implant improves feed efficiency and produces leaner carcasses.

Table 1.—Performance Summary of Lambs Fed Monensin and Implanted with Ralgro

		Treatment		
Measurement, 70 days	C	M	R	M+R
		% of control		
ADG, kg	0.27	-0.2	2.8	-1.7
FI, kg	1.57	-0.3	0.9	-2.3
Feed/gain	5.68	0	-1.9	-3.3

Table 2.—Summary of Carcass Characteristics of Lambs Fed Monensin and Implanted with Ralgro

		Treatment		
Characteristic	C	M	R	M+R
		% of control		
Dressing percent	50.5	2.4	-1.4	.6
BF/22.7 kg carcass, mm	6.4	18.3	14.1	-21.9
Yield grade	3.4	5.9	2.9	-14.7

MONENSIN AND DIFFERENT DIETARY PROTEIN LEVELS FOR LAMBS[1]

B. P. Glenn, D. G. Ely and W. P. Deweese

RUMINANT RESPONSE TO MONENSIN

Monensin (Rumensin®) is a feed additive for beef cattle diets, but has not been approved for sheep by the Food and Drug Administration. Monensin's feedlot response of improved feed efficiency occurs through improved energy metabolism in the ruminant animal. Monensin alters the rumen fermentation to increase propionic acid and decrease acetic and butyric acid production. Since propionic acid is used more efficiently as an energy source, overall energy availability to the animal is greater when monensin is fed. This allows amino acids that are also utilized for energy to be spared. Therefore, monensin may result in an overall "protein-sparing" effect for the animal.

MONENSIN-PROTEIN LEVEL INTERACTION

Procedure—Two trials were conducted with lambs: a nitrogen balance and a feedlot trial. In both trials three crude protein (CP) levels, 10, 13 and 16%, were fed, each with or without 16.5 mg monensin (M) per kg diet (15 g/ton). Diets were basically corn and soybean meal with 20% cottonseed hulls, 5% molasses and 1% trace mineral salt. In each trial, 24 crossbred lambs were allotted to the 6

[1] Partially supported by a grant from Elanco Products Company, Greenfield, Ind.

dietary treatments so there were 4 lambs per treatment, individually fed to provide 4 replications per treatment.

Nitrogen Balance—Lambs were maintained in wooden metabolism cages and fed twice daily according to 1.2 x digestible energy requirement for maintenance. A 7-day total collection of feces and urine was conducted. Data collected are presented in Table 1. Nitrogen digestibility increased as protein level in the diet increased. Monensin increased nitrogen digestibility by 6.5%. Nitrogen retained as a percent of digested nitrogen was improved with monensin supplementation only at the 13% CP level, to give a mean 18.8% retained. The 10 and 16% CP diets were not utilized as well as the 13% level with or without monensin.

Table 1.—Nitrogen Balance in Lambs Fed Monensin with Three Dietary Protein Levels

Treatment	Dietary Protein, %			Average
	10	13	16	
	Nitrogen digestibility, %			
Control	49.0	64.3	72.4	61.9[d]
Monensin	53.9	71.7	72.0	65.9
Average*	51.5[a]	68.0[b]	72.2[c]	
	Nitrogen retained, % of digested			
Control	11.8	16.2	6.8	11.6
Monensin	-7.7	21.3	6.5	6.7
Average	2.1	18.8	6.7	

*[a,b,c]Values in the same line bearing different superscripts are different (P < .05).
[d]61.9 significantly (P < .05) different from 65.9.

Feedlot—The lambs were maintained in drylot pens and self-fed their diet for 56 days. They were weighed every 14 days, and the results are presented in Table 2. Average daily gain tended to increase with monensin at the 10 and 16% CP levels but not at the 13% level where nitrogen balance was

Table 2.—Feedlot Performance of Lambs Fed Monensin with Three Dietary Protein Levels

Treatment	Dietary Protein, %			Average
	10	13	16	
	Average daily gain, kg			
Control	0.24	0.28	0.24	0.25
Monensin	0.26	0.25	0.32	0.28
Average	0.25	0.27	0.28	
	Feed efficiency, kg/kg gain			
Control	8.34	7.10	8.98	8.14
Monensin	8.14	7.13	6.75	7.34
Average	8.24	7.12	7.87	

improved in the previous trial. The lambs were more efficient in feed utilization with monensin at the 10 and 16% CP levels. Again, the 13% CP level was unaffected, but these lambs were still the most efficient overall. Thirteen percent CP has been demonstrated at the Kentucky station to be the requirement for growing lambs. If feeding away from the requirement (that is, 10 and 16% CP), it seems that the response to monensin is greater.

A "protein-sparing" effect of monensin cannot be clearly defined from these data. However, it is evident that a dietary protein level-monensin interaction does exist. On limited feed intake in the balance trial, monensin had its greatest effect at the level of protein requirement, 13% CP. With the self-feeding regime in the feedlot trial, monensin improved feed efficiency at the 10 and 16% CP levels which are below and above the protein requirement, respectively, for growing lambs.

INCREASING NUTRIENT UTILIZATION IN LAMBS FED LOW QUALITY ROUGHAGE[1]

D. G. Ely, B. P. Glenn and R. J. Thomas

The ruminant animal has the unique ability to digest roughage by way of microorganisms. However, for maximum performance these microbes must have a constant supply of nitrogen and energy to multiply and, thus, to digest the larger amount of roughage for the animal. Mature sheep are periodically fed low quality roughage or are pastured on highly fibrous forage. Feed additions that would increase the utilization of poorer quality feed would prove highly advantageous. Distillers feeds have been shown to produce maximum cellulose digestion by ruminal microorganisms. Therefore, the objective of these studies was to determine if nutrient utilization in lambs could be improved by supplementing high-roughage diets containing cottonseed hulls (a low quality roughage) plus urea with distillers dried solubles and/or starch.

In the first experiment, six abomasal-cannulated wethers weighing 50 kg were assigned to a replicated 3 x 3 Latin Square design and fed diets containing approximately 75% roughage, 2.4 to 3.3% urea, 5.3 to 13.3% starch, minerals and 0 to 10% distillers dried solubles (DDS). Diets were fed at 12-hour intervals at a rate of 340 g per feeding. Abomasal and fecal samples were collected to determine ruminal and total gastrointestinal (GI) tract digestibilities, respectively. Ruminal cellulose and total GI tract digestion of cellulose and nitrogen is summarized in Table 1. Although ruminal

Table 1.—Ruminal Cellulose and Total GI Tract Digestion of Cellulose and Nitrogen in Lambs Fed Different Levels of DDS (Percent)

	DDS, %		
Item	0	5	10
Ruminal			
Cellulose*	20.2^{a}	30.4^{b}	30.9^{b}
Total GI tract			
Cellulose	57.5	61.7	58.1
Nitrogen*	63.2^{a}	$57.1^{a,b}$	53.4^{b}

*[a,b]Values bearing different superscripts are different ($P < .05$).

cellulose digestion was low, a 50% increase in digestion is evidence of stimulatory effect of DDS. Greater total GI tract cellulose digestions were also found with the DDS diets. Conversely, total nitrogen digestion was greatest with the control diet.

[1]Supported by a grant from the Distillers Feed Research Council, Cincinnati, Ohio.

A second experiment was conducted to determine if a combination of DDS and starch would stimulate nutrient utilization even further. Abomasal-cannulated wethers were fed the diets shown in Table 2. Ruminal cellulose and total GI cellulose and nitrogen digestion are summarized in Table 3.

Table 2.—Ingredient Composition of Diets Containing Different Levels of DDS and Starch (Percent)

DDS level, %	0	2.5	5.0	7.5
Starch level, %	13.3	8.9	4.4	0
Ingredient:				
Cottonseed hulls	64.9	64.9	64.9	64.9
Solka floc*	10.1	12.2	14.4	16.6
Vegetable oil	4.0	4.0	4.0	4.0
DDS	-	2.5	5.0	7.5
Urea (281)	3.3	3.1	2.9	2.6
Starch	13.3	8.9	4.4	-
Dicalcium phosphate	2.0	2.0	2.0	2.0
Sodium sulfate	1.0	1.0	1.0	1.0
Trace mineral salt	1.0	1.0	1.0	1.0
Chromic oxide	0.4	0.4	0.4	0.4
Vitamin premix	+	+	+	+

*Purified wood cellulose.

Table 3.—Ruminal Cellulose and Total GI Tract Digestion of Cellulose and Nitrogen in Lambs Fed Different Combinations of DDS and Starch (Percent)

DDS level, %	0	2.5	5.0	7.5
Starch level, %	13.3	8.9	4.4	0
Ruminal				
Cellulose	46.1	49.3	50.2	37.5
Total GI tract				
Cellulose	54.2	56.7	60.6	51.7
Nitrogen	47.3	49.2	49.3	40.7

Greatest ruminal cellulose digestion was found when the 5.0% DDS-4.4% starch was fed. Feeding grain, such as corn, wheat or milo, should produce similar results. Total GI tract digestion of cellulose and nitrogen followed a similar trend.

These data indicate that although 5% DDS seems to stimulate nutrient utilization above that obtained when only nonprotein nitrogen (urea) supplements high-roughage diets, the addition of small amounts of starch, through grains, will result in even greater nutrient utilization.

SULFUR SUPPLEMENTATION TO KENTUCKY 31 FESCUE FED TO LAMBS

D. G. Ely, J. W. Spears and L. P. Bush[1]

Much research has been conducted in which sheep and cattle diets have been supplemented with sulfur. These research findings have prompted the National Research Council to list the sulfur requirement for growing sheep to be 0.18 to 0.26%. However, recent work has indicated that sulfur availability in certain natural feeds may limit ruminal fermentation (Barton *et al.*, 1971; Bull and Vandersall, 1973; Spears *et al.*, 1976). The objective of this study was to determine the effect of sulfur supplementation on Kentucky 31 (Ky 31) fescue forage utilization by lambs.

Five crossbred wethers fitted with permanent abomasal cannulas were fed the fescue forage shown in Table 1 in a 5 x 5 Latin Square design. The concentration of sulfur (0.20%) should

Table 1.—Chemical Composition of Dehydrated KY 31 Tall Fescue

Component	Percent
Dry matter	89.3
Neutral-detergent fiber	55.3
Acid-detergent fiber	30.8
Lignin	3.3
Crude protein	10.4
Protein nitrogen (% of total nitrogen)	84.0
Nonprotein nitrogen (% of total nitrogen)	16.0
Sulfur	0.2

theoretically meet the animal's requirement for maximum growth. This fescue was harvested in June in mid- to full-bloom stage. Each lamb was fed 908 g daily in two equal portions at 12-hour intervals. Forage was top-dressed with 7 g salt and 0.05 or 0.15% elemental or L-methionine sulfur. Nitrogen: sulfur ratios of the diets are shown in Table 2. Abomasal and fecal samples were collected to determine ruminal and total gastrointestinal (GI) tract digestibility, respectively.

Table 2.—Nitrogen:Sulfur Ratios of Diets Fed to Lambs

Dietary Treatment	N:S Ratio
Control (chopped, dehydrated tall fescue)	8.4
Control + 0.05% elemental S	6.7
Control + 0.15% elemental S	4.8
Control + 0.05% L-methionine S	6.7
Control + 0.15% L-methionine S	4.8

Ruminal and total GI tract neutral-detergent and acid-detergent fiber digestibilities are presented in Table 3. Sulfur supplementation in ruminant diets seems to be manifested in the rumen. It is concluded that availability of the sulfur present in forage may limit ruminal utilization of dietary

[1] L. P. Bush is Professor of Agronomy.

Table 3.—Ruminal and Total GI Tract Digestion of Neutral-Detergent (NDF) and Acid-Detergent Fiber (ADF) in Lambs Fed Tall Fescue Supplemented with Sulfur (Percent)

Item	Control	Elemental S, %		L-methionine S, %	
		0.05	0.15	0.05	0.15
Ruminal					
NDF*	56.3[a]	59.8[a,b]	61.6[b]	56.8[a,b]	62.1[b]
ADF*	51.6[a]	54.9[a,b]	57.0[b]	45.0[a,b]	56.3[b]
Total GI tract					
NDF	63.7	64.5	64.5	67.0	65.5
ADF	60.3	60.5	61.5	64.5	62.0

*[a,b]Values bearing different superscripts in the same row are different (P 〈.10).

components and, therefore, limit animal growth. This may be true especially for forages that have been heavily fertilized with nitrogen, which can result in an excess accumulation of nitrate-nitrogen in the plant. This effect is most pronounced in the spring and especially so in fescue. However, supplementation with 0.15% of either elemental or methionine sulfur can alleviate some of this limitation when tall fescue diets are consumed by ruminants.

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VITAMIN D AND MAGNESIUM INTERACTION IN GROWING LAMBS

R. J. Thomas, D. G. Ely and J. A. Boling

Two trials were conducted to test the effects of elevated levels of dietary magnesium coupled with Vitamin D injections.

The first trial utilized 27 lambs divided into 3 treatment groups with 3 replications of each treatment. All lambs were fed a diet containing six times the N.R.C. requirement of magnesium. The duration of the experiment was 63 days, with injections of placebo or vitamin D on the 1st, 21st and 42nd days. The control group received the corn oil placebo injection. The low-vitamin D group received 13,944 IU of vitamin D intramuscular injection. The high-vitamin D group received 27,888 IU of vitamin D intramuscularly. The lambs were weighed and bled at the same intervals as injections were given. On the 63rd day, lambs were weighed, bled and slaughtered and heart, kidney, liver, metacarpal bone and *longissimus* muscle were taken for analysis. Plasma and tissue samples were analyzed for calcium (Ca), magnesium (Mg) and phosphorus (P).

The growth parameters indicated no depression owing to either Mg or vitamin D treatments. There were no significant differences owing to treatment in any of the tissues studied. However, liver P tended to decrease, in contrast to all the other tissues examined, as the level of vitamin D injection increased (Table 1). Plasma Ca and Mg decreased across all treatments; however, an elevation was evident in the P with time with the most prominent elevation in the high D treatment (Fig. 1).

Table 1.—Liver Phosphorus, Magnesium and Calcium in Lambs Fed Two Levels of Vitamin D_3

Mineral (% DM)	Treatment C	Treatment 1 D_3	Treatment 2 D_3
P	0.585	0.417	0.320
Mg	0.071	0.060	0.059
Ca	0.186	0.189	0.134

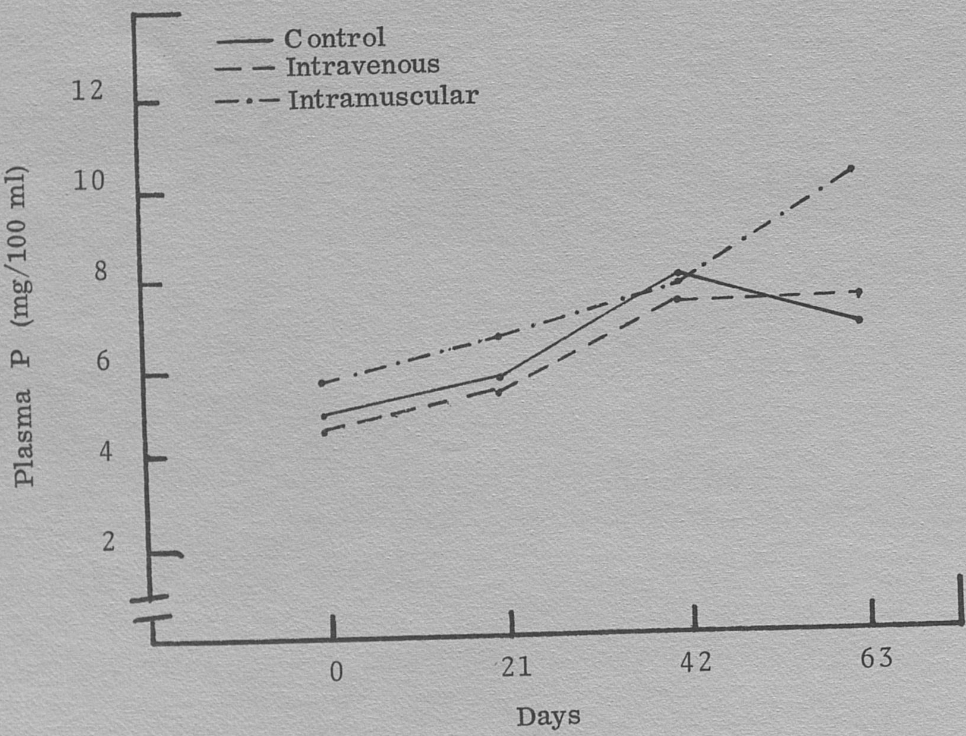

Fig. 1.—Plasma phosphorus of lambs supplemented with Vitamin D_3.

One of the major functions of vitamin D is to mobilize P in order to equilibriate elevated uptake levels of Ca and thus maintain proper physiological Ca:P ratios. From this data, it seems that the liver may be the first soft tissue depot of phosphorus that is tapped for the aforementioned function.

In the second trial 21 lambs were divided into three treatment groups, individually penned and fed a 13% CP diet containing two times the N.R.C. Mg requirement for 21 days. The vitamin D_3 treatment in this trial was administered to test not only the dose response, but to test for differences in mode of D_3 administration. The control group was given 0.3 cc vitamin D_3 carrier intramuscularly on day 1. The IM group was injected with 30,000 IU of vitamin D_3 intramuscularly on day 1. The IV group was injected with 30,000 IU of vitamin D_3 intravenously on day 1. Liver biopsies were taken just prior to injection and 21 days post-injection. Serum blood samples were taken immediately prior to injection, 6, 12, 18 and 24 hours post-injection and 3, 4, 6, 9, 12, 15, 18 and 21 days thereafter. Serum and the wet ash liver samples were analyzed for Ca, Mg and P.

The serum P in both vitamin D_3 treatments was elevated over control for most of the trial (Fig. 2). There was a slight elevation of IM over IV throughout the trial indicating the possibility of difference due to mode of administration. There was significantly less deposition of liver P from day 1 to 21 in the IV group when compared to the control or IM groups (Table 2). This fact, coupled with the general trend in the serum, indicates vitamin D_3 is utilizing liver P to balance Ca to maintain a physiological homeostatic condition.

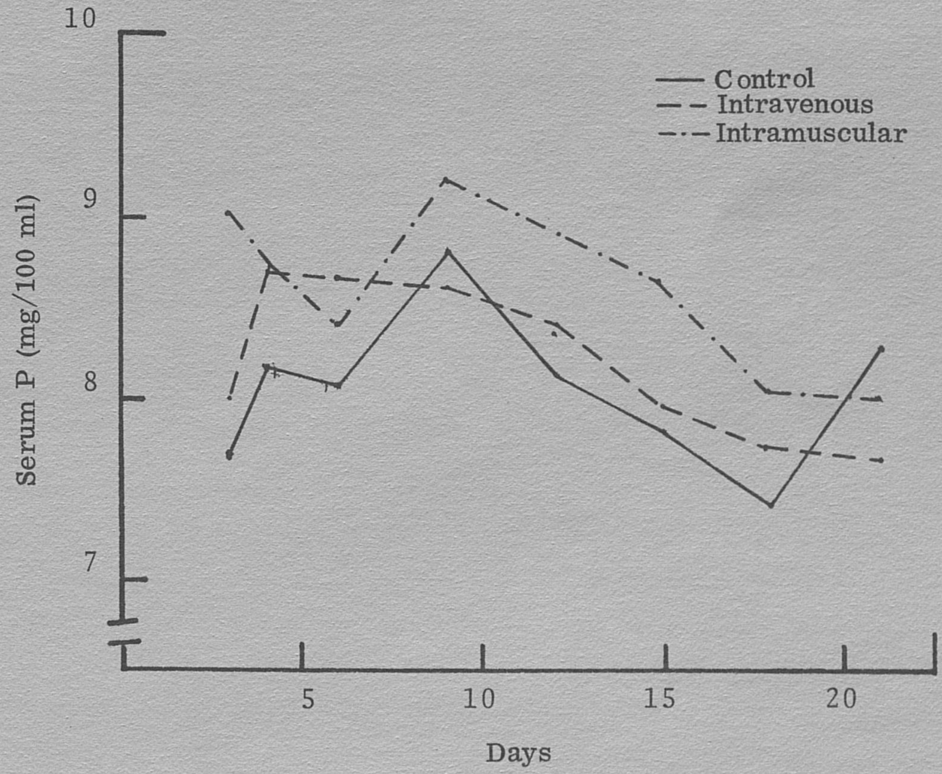

Fig. 2.—Serum phosphorus of lambs supplemented with Vitamin D_3.

Table 2.—Liver Phosphorus in Lambs Supplemented with Vitamin D_3 (% of Dry Matter).

	Treatment*		
Biopsy Day	C	IV	IM
1	0.61	0.73	0.54
21	0.80	0.86	0.70
(Percent of difference)	(31.0	17.0	30.0)

* C - Control; IV - Intravenous; IM - Intramuscular.

LIPID COATING A SUPPLEMENTAL AMINO ACID FOR SHEEP

B. P. Glenn and D. G. Ely

The purpose of lipid coating a supplemental amino acid such as lysine in a corn-based diet is to determine whether the amino acid will be protected from ruminal breakdown and will bypass to the small intestine. Presumably, since lysine is the first-limiting amino acid in this type diet, the total balance of amino acids in the small intestine would be improved if lysine were coated to allow ruminal bypass. This study was conducted to determine the effectiveness of coating supplemental lysine with coconut oil in relation to nutrient digestion, nitrogen balance and recovery of amino acids in the abomasum and blood plasma.

Four mature wethers fitted with abomasal cannulas were assigned to a 4 x 4 Latin Square design. Dietary treatments were: Control (C) = basal diet; Lysine (LYS) = Control + 1% supplemental lysine; Coconut oil-coated lysine (CN-LYS) = Control + 1% supplemental lysine coated with coconut oil; and Coconut oil + diet (CN-DIET) = Control + 1% supplemental lysine + an equal amount of coconut oil added to the entire diet. The basal diet contained approximately 73% corn, 19% solka-floc (a purified wood cellulose) and 5% molasses. Four periods were conducted, with each sampling period consisting of a 7-day total collection of feces and urine and a 6-day collection of abomasal digesta.

Ruminal and total digestibilities of nutrients in the wethers were not affected by dietary treatment. Nitrogen metabolism data are presented in Table 1. Nitrogen digestibility increased when lysine was added to the diet. However, owing to large urinary nitrogen losses, the nitrogen diggested that was retained decreased in wethers fed the lysine-supplemented diets (LYS, CN-LYS and CN-DIET). More dietary nitrogen reached the abomasum in the C wethers (109.8%), while only approximately 81% of the dietary nitrogen passed through the rumen when coconut oil was added (CN-LYS and CN-DIET). Lysine recovery in the abomasal digesta and the plasma is shown in Table 2. More lysine reached the abomasum in wethers fed CN-LYS. Therefore, coconut oil coating protected the amino acid in the rumen. Likewise, the plasma concentration of lysine was increased with coconut oil addition (CN-LYS and CN-DIET). However, the highest lysine concentration was noted for the CN-DIET treatment. Apparently, between delivery to the abomasum and absorption into the plasma, the imbalance of amino acids that occurred with CN-LYS increased lysine utilization in the tissue to cause lower plasma lysine concentration.

Amino acid nutrition for the ruminant may be manipulated using techniques such as lipid coating to protect the supplemental source. It is difficult, however to predict the effect an increased amino acid will have once it is absorbed into the bloodstream of the sheep.

Table 1.—Nitrogen Metabolism in Wethers Fed Supplemental Lipid-coated Lysine.

	Diet			
Component	C	LYS	CN-LYS	CN-DIET
Nitrogen				
Digestibility, %	67.1*	74.7	75.7	73.5
Digested retained, %	53.5*	32.9	29.1	44.0
Abomasal, % of intake	109.8*	96.8**	81.9	81.2

*C significantly (P ⟨ .05) different from average of LYS, CN-LYS and CN-DIET.
**LYS significantly (P ⟨ .05) different from average of CN-LYS and CN-DIET.

Table 2.—Lysine Recovered from Wethers Fed Supplemental Lipid-coated Lysine.

Location	Diet			
	C	LYS	CN-LYS	CN-DIET
Abomasal, g/day	2.8	2.8	3.3	3.0
Plasma, μmol/100 ml	7.8	8.2	8.8	9.4

PROTEIN LEVELS FOR LATE LAMBS

D. G. Ely, W. P. Deweese, R. J. Thomas, B. P. Glenn and T. W. Robb

It is a common belief among Kentucky sheepmen that a lamb that has not been sold as a milk-fed lamb by July 1 will still be on the farm the following fall. Unfortunately, many producers have some lambs that do not reach a market weight of 40 to 45 kg (88.0 to 89.0 lb) by July 1. Reasons for failing to reach this weight earlier include late-born lambs, hot weather, internal parasites, genetically slow-growing lambs and poor feeding conditions. Therefore, a "late" lamb results from any of these conditions.

A producer with "late" lambs may gain economically to wean these lambs, shear them and feed them a high-concentrate diet in drylot. This study was initiated to evaluate the performance of such lambs in drylot when fed diets containing three protein levels.

Forty-five 3/4 Suffolk 1/4 Rambouillet, 1/2 Finn 1/2 Southdown or purebred Polled Dorset lambs were randomly assigned to 15 pens of three lambs each. Lambs were 7 to 9 months old when the trial was initiated. Five pens received each of the diets shown in Table 1, which contained either 16, 19 or 22% crude protein. All diets were self-fed for a 33-day feeding period. All lambs were drenched for internal parasites and adapted to the same high-concentrate diet over a 2-week period prior to the experiment.

Table 1.—Ingredient Composition and Cost of 16, 19 and 22% Protein Diets Fed to Late Lambs

Ingredient, %	Dietary Protein Level, %		
	16	19	22
Cottonseed hulls	20.0	20.0	20.0
Ground corn	52.0	43.5	35.0
Soybean meal (44% CP)	22.0	30.5	39.0
Liquid cane molasses	5.0	5.0	5.0
Trace mineral salt	1.0	1.0	1.0
Aureomycin*	+	+	+
Vitamin A, D, E premix**	+	+	+
Cost/909 kg***	$92.72	$102.41	$112.21

*4.5 kg (2 g activity/0.45 kg) added to each 909 kg diet.
**Added to meet requirement of 35 kg lamb.
***One ton.

Live animal performance is shown in Table 2. Greatest gains were obtained when the 19% protein diet was fed. Since feed intakes were similar, feed/gain (5.80) was most efficient with the 19% diet which, in turn, resulted in lowest feed cost. Apparently, the 16% protein diet was suboptimum for most efficient gain. The 22% diet apparently provided excess protein resulting in inefficient use of the dietary protein (soybean meal—the most expensive ingredient in the diet). These data indicate that 19% protein in self-fed, high-concentrate diets for "late" lambs is the optimum level for most economically efficient gains.

Table 2.—Feedlot Performance of Late Lambs Fed 16, 19 and 22% Protein Diets

	Dietary Protein Level, %		
Item	16	19	22
No. of lambs	15	15	15
Av. initial wt., kg	31.0	30.6	32.1
Av. final wt., kg	40.3	41.7	41.3
Total gain, kg	9.3	11.1	9.2
ADG, 33 days, g	282.0	336.0	279.0
Daily FI, kg	2.01	1.95	1.98
Feed/gain	7.13	5.80	7.10
Feed cost/kg gain, cents*	72.65	65.31	87.61

*To obtain feed cost/lb gain, divide feed cost values by 2.2.

PERFORMANCE OF EWES GRAZING BOONE ORCHARDGRASS, KENTUCKY 31 TALL FESCUE AND KENHY TALL FESCUE AT DIFFERENT INTENSITIES

D. G. Ely, C. R. Bloomquist and W. P. Deweese

In a grazing system, the sheep literally lives on its feed; thus, it is necessary to consider the whole ecology of the plant, soil, animal nutrition and animal health. Only in a field situation can the balance between the forage and the animal be analyzed. Boone orchardgrass (OG) and Kentucky 31 tall fescue (Ky 31) are two grasses which offer potential for sheep production because of high animal-carrying capacity. Kenhy tall fescue is a hybrid of annual ryegrass x Ky 31 developed at the University of Kentucky. OG is a highly palatable forage for sheep that produces excellent spring growth. However, production is reduced in late spring and summer. Ky 31 also produces excellent spring growth but is more fibrous than OG, and excess growth may produce unpalatable forage for sheep. Kenhy was developed to improve palatability over Ky 31 and increase resistance to drought. The objective of this study was to evaluate the performance of open ewes grazing OG, Ky 31 and Kenhy at three grazing intensities.

Eighty-seven, crossbred, mature ewes were randomly allotted to nine pastures in a 3 x 3 Latin Square design on April 8. Lambs had been weaned from the ewes one week previously which followed a 56-day lactation period. All ewes were drenched with Loxon for internal parasites the day the experiment began. Each pasture was 0.27 hectare (ha) or 0.67 acre and was stocked with 5, 10 or 14 ewes, corresponding to grazing intensities of 18.5, 37.0 or 51.9 ewes per ha, respectively. Each stand had been established four years and had been treated the same each year. Each pasture was fertilized during the second week of March with 112 kg ammonium nitrate per ha and again during the first week of June with an equal amount of ammonium nitrate. The experiment continued from April 8 until July 1.

Average chemical composition of the forages is shown in Table 1. Dry matter and fiber components increased as the grazing season progressed into late spring and summer. These components were also greater with higher stocking rates. Protein decreased as the trial progressed, but increased with greater stocking rate. Considerable variation in mineral content within a forage species was found between stocking rates. Performance of ewes in terms of gain per ha is summarized in Table 2. OG produced the greatest gain per hectare, and most of the gain was accumulated during the first month of the grazing period. Optimum stocking rates in this study were 37.0, 18.5 and 37.0 ewes/ha for OG, Ky 31 and Kenhy, respectively. OG stocked at 37.0 ewes/ha had less dry matter and fiber, but a greater amount of protein than Ky 31 and Kenhy fescue stocked at the same intensity. Fecal grab samples were taken from ewes on April 29, May 20, June 10 and July 1 and analyzed for internal parasite egg production. This analysis was used as an indicator of internal parasite infestation. These results are illustrated in Fig. 1. Ewes grazing OG had lower counts than those grazing the fescues at each stocking rate. Greater amounts of forage accumulated in the fescue than in OG pastures. This accumulation may have resulted from greater spring growth and/or lower palatability of both fescues than for OG. Internal parasite eggs eliminated through the feces must have an environment that is warm, moist and sheltered from the sun before they can develop into an infective stage. Once in the infective stage, these larvae are consumed by the animal through the forage, reach the digestive tract of the animal where they mature and reproduce. One or both of the factors mentioned above may have allowed a more optimum environment for parasite development in the fescues than in OG which could partially explain the decreased animal production from the fescue forage.

Table 1.—Chemical Components of OG, KY 31 and Kenhy Forage Consumed by Ewes.

Ewes/ha	18.5			37.0			51.9		
Forage	OG	Ky 31	Kenhy	OG	Ky 31	Kenhy	OG	Ky 31	Kenhy
Component*, **									
Dry matter	31.1	36.9	33.0	30.4	39.0	36.3	36.6	41.8	43.7
Neutral-detergent fiber	55.0	54.3	51.2	55.3	56.8	58.5	58.3	59.6	61.9
Acid-detergent fiber	23.5	28.4	25.0	23.8	25.5	27.0	26.5	27.0	28.2
Crude protein	23.8	23.3	24.3	26.4	22.3	24.9	25.3	22.0	22.8
Phosphorus	0.6	0.4	0.4	0.5	0.5	0.5	0.5	0.4	0.5
Potassium	2.7	2.2	2.6	2.8	2.1	2.4	2.3	2.1	2.6
Calcium	0.33	0.51	0.52	0.32	0.54	0.39	0.63	0.54	0.35
Magnesium	0.16	0.19	0.17	0.20	0.19	0.21	0.22	0.22	0.22

*Average of collections on April 8, April 29 and May 20.
**All components, except dry matter, expressed as percentage of dry matter.

Table 2.—Performance of Ewes Grazing OG, KY 31 and Kenhy at Different Stocking Rates (Gain/ha, kg)*

	Ewes/ha		
Forage	18.5	37.0	51.9
OG	228	360	8
Ky 31	196	144	34
Kenhy	65	167	-44

*Grazing period April 8-July 1.

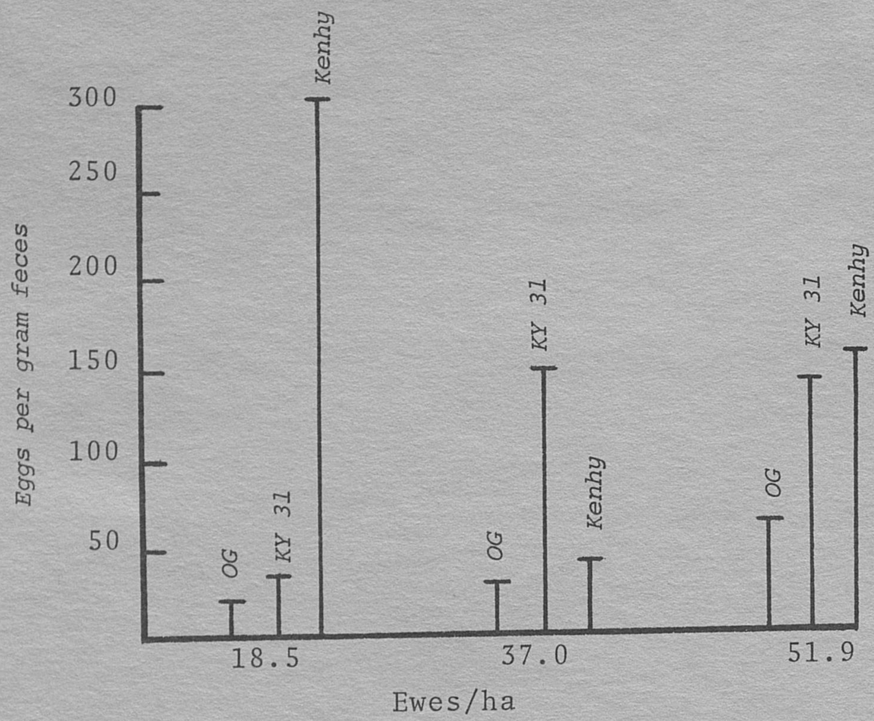

Fig. 1.—Fecal parasite egg counts in ewes grazing OG, Ky 31, and Kenhy at three intensities.

MANAGEMENT PROCEDURES FOR ARTIFICIAL REARING AND PROFITING FROM THE ORPHAN LAMB

T. W. Robb, D. G. Ely, W. P. Deweese, R. J. Thomas and B. P. Glenn

Many times the sheep producer finds himself faced with the ordeal of having to rear orphan lambs. It could be a result of multiple births, little or no milk, or numerous other problems.

The University of Kentucky Sheep Research Unit was also confronted with these situations, especially with multiple births (triplets and quadruplets). One group of Finn x Southdown ewes were too prolific compared with the amount of milk available. We were pleased with this increased prolificacy rate; however, we found ourselves faced with the situation of having to rear 50 lambs artificially.

The following is a description of materials and management methods used to raise these lambs artificially on milk replacer.

MATERIALS

The building used was draft free and equipped with forced air electric heaters. These heaters would not be necessary as long as the internal temperature remains above freezing. Supplemental heat could be provided to young and weak individuals from suspended heat lamps. A sloped concrete floor with a drain allowed for easy cleaning and a ventilation fan kept the air circulating.

Raised pens were used to restrain the lambs with the bottom of the pen being 0.61 m (2 ft) above the concrete. Flooring consisted of 12.5 mm (1/2-inch) expanded metal. [It was later discovered that

19 to 25 mm (3/4 or 1 inch) would have been more desirable.] Metal hay panels were used for the sides of the pen.

Lamb-Bar nipples were used to feed milk replacer. These nipples were attached to the sides of the pen approximately 0.45 m (18 in) above the metal floor. Tubes attached to the nipples ran directly through holes in the side of styrofoam coolers placed immediately behind the nipples. These coolers were used as the milk reservoir. Blue ice (commercial ice substitute) was used to keep milk cold to avoid over-consumption; formaldehyde was added at the rate of 1 cc per 4.4 1 of formula to curb scouring.

Creep feeders consisted of round chicken feeders suspended from the ceiling. These feeders reduced waste and prevented lambs from "pawing" and wasting feed.

Miscellaneous equipment used was a refrigerator to keep milk cold and re-freeze the blue ice. An old wringer-type washing machine was used for mixing the milk replacer.

Newly arrived lambs were allowed to go hungry for approximately 5 hours. They were then injected with 1 cc of dextran and 1 cc of vitamins A and D. The lambs were manually nursed on the cold formula at this time. This was accomplished by placing the lamb in front of the nipple, forcing the nipple into its mouth and squeezing its mouth around the nipple. This procedure was repeated every 4 to 6 hours for 2 days. By this time, 90% of the lambs were nursing by their own efforts.

Special attention was directed towards lambs which developed vices (penis, scrotum and ear sucking). These individuals were removed and placed in individual pens, hand-fed for 4 days and then returned to their original pen.

After lambs were started on the milk replacer, a continuous supply of cold milk was available. Four nipples were supplied for every 15 lambs. A pelleted creep was provided *ad lib* at 4 weeks of age and lambs were vaccinated for enterotoxemia at 6 weeks.

General maintenance procedures were as follows:

1. Cleaning of milk replacer mixing equipment after each use.
2. Cleaning of milk feeders twice a week.
3. Hosing down floor once a day with hot water.

Lambs were not weaned at the time of this publication; therefore, cost data are unavailable. This information will be available in a later publication.

COCCIDIOSIS IN SHEEP

R. J. Thomas, D. G. Ely and G. L. M. Chappell

Coccidiosis is a disease caused by protozoa. The two major species involved with the disease are *Eimeria arloingi* and *Eimeria nina-kohl-yakimovi.* These two organisms, along with the other types of coccidial protozoans are part of the natural microbial population of the sheep's gut. Only when conditions are optimum do the coccidia exhibit the explosive growth that causes the disease. The animals most susceptible to coccidia are feedlot lambs at 3 to 6 months of age. It should be noted that the younger lambs can also contract the disease. Coccidiosis is not a disease that usually causes death, except in the very young lamb, but a disease that cripples the growth potential of the feedlot lambs. This poor performance is usually the greatest economic loss to the producer.

The symptoms are bloody diarrhea, general unthriftiness, anemia, wool slippage and weight loss. Bloody diarrhea is usually the most consistent symptom. This is due to the action of the organism in destruction of the intestinal mucosa. The other symptoms follow as adjuncts to the mucosal destruction. Nervous system problems may develop, with paralysis of the hindquarters being the most evident sign. If death is to occur it will follow rapidly after onset of symptoms. Usually unthriftiness is the rule for the duration of the disease.

Treatment should be started immediately upon discerning the symptoms. Sulfonamides, such as sulfamethazine, at 2 to 3 g/head/day are better used as preventatives; however, they may contribute in retarding the disease process. Nitrofurazone is probably the drug of choice, administered at the rate of 7 to 10 mg/kg of body weight, to prevent death and minimize symptoms. One thing to be remembered in treating coccidiosis is that the organism is in the gut naturally and attempts to sterilize the gut can lead to disastrous results—and, at best, provide the environment for recurring coccidial infection.

As with most problems involving sheep diseases, the best approach is good management that will lead to the best protection. Several situations should be avoided to minimize coccidial infection. Avoid overcrowding in the feedlot, keep water and feedbunks clean and try to keep the feedlot itself as clean and dry as possible. When starting lambs on a feeding program, gradually introduce feeds such as silage, pulps of any kind and grain. Also avoid the sudden grazing of lush pastures.

With all the factors considered, coccidiosis can be minimized with good management practices and commonsense in dealing with feedlot lambs.

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PREGNANCY TOXEMIA

R. J. Thomas, D. G. Ely and G. L. M. Chappell

Pregnancy toxemia is a common disease of ewes that is characteristically highly fatal. The condition has several names associated with it, such as twin lamb disease, lambing sickness, ketosis and acetonemia. The disease is not contagious, and the major cause is improper nutrition of the gestating ewe. Occurrence starts in the fifth month of pregnancy and can carry over into the post-lambing period. The ewes most likely to be affected will be those in poor condition or overfat ewes, both carrying twins or triplets. The metabolic cause of death is disruption of carbohydrate and fat metabolism of the ewe.

The symptoms follow a general pattern in all cases. First, the ewe goes off feed and water. Blindness, grinding of the teeth and labored breathing soon follow. It is at this point that the ewe will go down in paralysis and into a coma with death soon to follow. The progress of these symptoms is variable, and time from onset to death may take from 1 to 10 days. The rapid onset of death clouds the issue in that some contagious disease may be mistakenly suspected. However, testing urine in all cases for ketone bodies proves to be fairly definitive and eliminates most other probable causes.

Treatment of ewes with pregnancy toxemia is, in general, unsuccessful owing to the complex metabolic problems involved. Very few ewes can be satisfactorily treated, but if an affected ewe is carrying only a single lamb she may recover spontaneously after lambing.

To prevent this problem, the burden falls on the correct management of the ewe prior to conception and for the duration of gestation. Therefore, all ewes should be in good condition before conception, with special attention being given to thin, emaciated ewes and overly fat ewes, because these ewes will be the most likely to contract the disease. All ewes should be well fed, especially during the final trimester of pregnancy. Unless excellent pasture is available, grain will have to be supplemented. Another major consideration is to avoid stressing the ewes. Avoid unnecessary changes in feeding and even limited starvation; try to move the ewes as little as possible.

Pregnancy toxemia must be prevented because treatment at best is nonrewarding. Management is the key to having healthy ewes which will provide the producer with bonus lambs that give the best profit.

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WHITE MUSCLE DISEASE

R. J. Thomas, D. G. Ely and G. L. M. Chappell

White muscle disease (WMD) is a basic deficiency problem in lambs. WMD is known also as nutrition muscular dystrophy, stiff lamb disease and selenium responsive unthriftiness. The disease is most prevalent in newborn and very young lambs; however, on certain diets it can be demonstrated in lambs 10-15 months old.WMD is a disease of the skeletal and heart muscles, owing to lack of vitamin E and/or selenium. The muscle destruction occurs in muscle pairs, with the lesion appearing white against the normal color of the muscle. The same white lesion is apparent when the heart muscle is involved. The cause of death from WMD is usually heart failure.

The symptoms in new-born lambs are an inability to walk or suckle. In the older lambs, they have stiff or straddling gait, arched back, inability to rise from a lying position, and prostration. There must be a distinction made between WMD and lamb arthritis. If the lambs have arthritis and are driven, the gait loosens and they walk more normally; however, in WMD driving will only worsen the problem and cause the lambs to fall.

Treatment is usually a combination of both Vitamin E and selenium injected. Vitamin E or selenium can be used alone if proper dosage, such as 250-500 mg alphatocopheroyl acetate (vitamin E) or 2 mg of sodium selenite, is utilized. It must be noted that care must be taken in the administration of selenium because selenium toxicity is just as detrimental as selenium deficiency. Both Vitamin E and selenium can be added to the diet but within FDA guidelines.

Prevention of WMD in newborn lambs can be accomplished through good nutrition of the gestating ewes. Wheat, wheat bran and linseed meal are all good sources of vitamin E. The same feedstuffs may be included in a creep ration to help the older lambs. The routine injection of all newborn lambs with vitamin E-selenium combination will give good results. Care must be taken to avoid the use of cod liver oil as a purgative as this will increase the demand for vitamin E.

WEED CONTROL IN ALFALFA AND FORAGE CROPS

Charles E. Rieck and J. W. Herron*

Weeds in alfalfa decrease the yield, lower the quality of the forage and increase disease and insect problems as well as cause premature loss of stand, harvesting problems and irritate or poison the animals consuming the forage.

Annual grasses and small, seeded, broadleaf weeds may be controlled by applying preplant-incorporated herbicides before alfalfa is established. Proper incorporation (depth and uniformity) will increase the effectiveness of these types of herbicides. Eptam 7E (3 1/2 pt/A), Balan 1.5E (3-4 qt/A) and Tolban 4E (1 1/2 to 2 pt/A) are all recommended for this type of treatment.

In established alfalfa, chickweed, henbit, wild mustards and other winter annuals reduce stand and quality of the forage. The farmer has several choices to reduce competition from these weeds. Furloe 4EC (203 qt/A), Princep 80W (1 lb/A) and Premmerge (2-3 qt/A) all do an adequate amount of control on these species. Kerb 50 (2-3 lb/A) will control these species plus control cool-season grasses such as bluegrass, fescue and quackgrass.

Pastures with mixed stands of cool-season grasses and legumes can be treated for control of thistles, pig weed, lambsquarter and other broadleaves with 2,4 DB (2 qt/A).

Controlling broadleaf weeds in cool-season pastures can be obtained with 2,4D (1-2 qt/A) or Banvel (1-2 qt/A). Musk thistle is easily controlled with these treatments when application is properly done at the correct time.

POISON HEMLOCK

Common names for poison hemlock are spotted hemlock, deadly hemlock, poison parsley and poison stinkweed.

Description—Poison hemlock is a smooth herbaceous plant that belongs to the parsley or carrot family and resembles wild carrots. It grows from 3 to 8 feet tall, with purple-spotted stems and finely-divided lacy leaves that have a disagreeable odor. The flowers are small, white, in umbels and blossom in early summer.

Poison hemlock is frequently found growing in borders of fields, meadows, roadsides and waste places.

Conditions of Poisoning—Poisoning is most likely to occur in early spring when the leaves are green and other forage is not available. The entire plant is poisonous. Cases of human poisoning have occurred from mistakenly eating the seeds, leaves and roots for anise, parsley or parsnips.

Symptoms—Poisoning generally appears suddenly, and the owner finds the animal "down." Some symptoms that may be noticed are: excessive salivation (slobbering), loss of appetite, muscular weakness or twitching of the muscles, incoordination, rapid pulse and great pain. Death occurs from respiratory paralysis.

Treatment—if animals are found and diagnosed early enough, purgatives may be given to empty the digestive tract. Intestinal astringents such as tannic acid are useful. Nerve and heat stimulants may be given.

MOUNTAIN LAUREL

Common names for mountain laurel are calico-bush, poison bush and ivy bush.

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Description—Mountain laurel is a member of the heath family and grows as a rounded-topped evergreen shrub or small tree from 3 to 5 feet high. The leaves are from 1 to 5 inches thick, leathery, shiny, dark green on the upper surface and light green on the under surface. They are arranged alternately (or irregularly) on the stem or twig. The flowers are bell-shaped, showy, usually rose to white with purple markings, approximately 3/4 inch across, and borne in the spring.

Plants of these species grow in upland wooded areas, hilly pastures, and on acid soil throughout the eastern United States.

Conditions of Poisoning—These plants are usually avoided by livestock, but in late fall, winter or early spring when other foliage is not plentiful or is covered by snow, the animals may graze on the foliage.

Symptoms—The first symptom is irregular breathing. Later there is slobbering at the mouth, gritting of the teeth, vomiting, staggering, blindness, and then death. Meat from these animals should not be eaten. If the animal recovers, several days should elapse before it is used for human consumption.

Treatment—If the animals are found early enough, oil drenches, with materials such as mineral oil, raw linseed oil, lard, etc. should be given.

Since rhododendron, and other species of laurel produce almost identical symptoms in poisoned animals the treatment should be the same as that for poisoning from mountain laurel.

LARKSPUR

Common names for larkspur are staggerweed and delphinium.

Description—There are several different species of larkspur found growing in Kentucky. Most are stout perennial plants from 4 to 35 inches tall. The very deeply lobed leaves are arranged alternately along the stem. The flowers are spurred, blue or occasionally, white, are arranged in clusters at the top of the plant, and appear in the spring.

Larkspur is commonly found in rich open-wooded areas and along streams.

Conditions of Poisoning—Larkspur is the most poisonous in the early stages of growth during April and May. Poisoning occurs when livestock graze in woodland pastures before other green herbage is available. Cattle are the most susceptible, but horses and sheep can be poisoned by eating large quantities.

Symptoms—Symptoms of larkspur poisoning differ according to the amount eaten and the animal's tolerance. Small amounts may cause loss of appetite, excitability, staggering and constipation. Severe symptoms that develop when an animal eats large quantities are slobbering, vomiting, colic, bloating and convulsions. Death is due to respiratory paralysis.

Treatment—Protect animals from excitement by keeping them in a quiet place and giving them such drugs as chloral hydrate or one of the barbiturates. These drugs must be administered by a veterinarian. Epsom salts may be given to help the constipation. It may be necessary to treat the animal for bloat.

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