OXYTETRACYCLINE AND HIGH LEVELS OF PHOSPHORUS IN THE WINTERING RATION OF BEEF CATTLE

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Considerable attention has been given to the use of broad spectrum antibiotics in the ration of fattening cattle. However, studies of the use of antibiotics in wintering rations, such as are used in much of the western range area, are quite limited. Slight improvement in rate of gain, feed conversion and cost per pound of gain has been reported by Daugherty et al. (1958) and Kercher (1958). Various silages made up a part of the ration in these studies. Thomas (1958) reported an increase of 0.27 lb. per day gain on a wintering ration when oxytetracycline was added to a wintering ration in which chopped alfalfa-grass hay was fed as the roughage component.

The addition of a high level of phosphorus to a wintering ration was of interest because of recent evidence shown by Burroughs et al. (1956) and Tillman et al. (1958) that the phosphorus requirement for weight gain and feed conversion is greater than for maintenance of blood phosphorus level and optimum bone growth. Work reported from the Squaw Butte Station (Hubbert et al., 1958) indicated that an additional 5 gm. of phosphorus, provided by phosphorus fertilized hay, might have been responsible for at least a part of the increased rate of gain obtained from feeding phosphorus fertilized meadow hay to weaner cattle.

This paper reports on the influence of the addition of a feeding level of oxytetracycline and 5 gm. of phosphorus, as bone meal, to a wintering ration for beef cattle.

PROCEDURE

Forty Hereford weaner steer and heifer calves were used in a 2 x 2 factorial study of the influence of the addition of 75 mg. of oxytetracycline (fed as Tm-10)[2] and 5 gm. of phosphorus (supplied as bone meal) when added to a wintering ration. Four lots of 5 steers and 5 heifers each were fed for a 126-day period.

All animals received one pound of cottonseed meal, 2 pounds of barley, and a full feed of chopped meadow hay. The hay consisted principally of rush (Juncus spp.) and sedge (Carex spp.) with minor amounts of clover and grass. All animals had access to a 50:50

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[2]Terramycin furnished by Chas. Pfizer and Co., Terre Haute, Indiana.

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salt-bone meal mixture. One gm. of $CuSO_4 \cdot 5H_2O$ per animal per day was provided as an aid in controlling a scouring condition, which is assumed to be due to an imbalance of trace minerals in the forage. Chopped hay was weighed into covered feeders daily and refused feed was weighed at weekly intervals. The animals were fed in open lots without shelter.

Table 1. Summary of crude protein, calcium, and phosphorus content of feeds

Feed	Crude protein	Calcium	Phosphorus
	(%)	(%)	(%)
Meadow	7.07	.47	.10
Barley	9.77	.003	.34
Cottonseed meal	41.00	.012	.67

Individual weights were taken at 14-day intervals throughout the study. The initial and final weights were the average of 2 consecutive day weights. All weights were taken in the morning after the animals had been off water overnight.

RESULTS AND DISCUSSION

The results of the 126-day feeding trial are summarized in table 2.

Table 2. Summary of average weight, average daily gain, and feed consumption during the 126-day study period

Lot number[a]	1	2	3	4
Initial weight (lb.)	371	375	371	374
Final weight (lb.)	551	557	559	571
Daily gain (lb./day)	1.42	1.44	1.49	1.56
Total daily feed intake (lb.)	13.4	13.7	13.5	13.5
Lb. feed/lb. gain	9.44	9.51	9.06	8.65

[a]Lot number 1 - control.
Lot number 2 - 5 gm. P added per day.
Lot number 3 - 75 mg. antibiotic added per day.
Lot number 4 - 5 gm. P and 75 mg. antibiotic added per day.

Statistically significant differences were not apparent at the end of the trial due to either antibiotic feeding or the high level of

added phosphorus. It was apparent, however, that the animals receiving the broad spectrum antibiotic had a slightly greater cumulative rate of gain throughout the feeding period (table 3). The fact that total feed consumption was essentially the same among all lots gave a slight advantage in feed conversion and feed cost per lb. of gain to the antibiotic fed animals.

Table 3. Summary of the influence of antibiotic addition on cumulative average daily gain

Days on study	No antibiotic[a]	75 mg. Oxytetracycline daily[a]
	(lb./day)	(lb./day)
14	1.07	1.28
28	.94	1.27[b]
42	1.12	1.34[b]
56	1.20	1.29
70	1.26	1.43[b]
84	1.37	1.48
98	1.42	1.48
112	1.34	1.50[b]
126	1.43	1.53

[a]Average performance of 20 animals.

[b]Different from "no antibiotic group" ($P < .05$).

The crude protein, phosphorus, and calcium content of the feed consumed by the various lots is summarized in table 4. The animals on the control ration consumed an average of 12.5 gm. of phosphorus per day during the study. The addition of 5 gm. of phosphorus, as bone meal, did not result in an increase in rate of gain. However, there was some evidence of improved performance when both oxytetracycline and 5 gm. of phosphorus were added to the ration.

Table 4. Crude protein, phosphorus, and calcium content of rations consumed during the 126-day feeding period

Lot number	1	2	3	4
Crude protein (%)	9.5	9.5	9.5	9.5
Phosphorus (%)	0.17	0.23	0.17	0.235
Phosphorus (gm./day)	12.5	17.5	12.5	17.7
Calcium (%)	0.40	0.52	0.40	0.53
Calcium (gm./day)	29.5	39.9	29.7	39.6

The control animals consumed an average of 2.7 gm. of phosphorus per 100 lb. of body weight during the experiment. Tillman et al., (1959), working with Hereford steers weighing from 320 to 400 lb., found that response in terms of rate of gain, feed consumption, and feed efficiendy did not differ significantly from linearity when the animals were fed 1.5, 2.0, and 2.5 gm. of phosphorus per 100 lb. of body weight. Thus, it would appear that 2.5 to 2.7 gm. of phosphorus per 100 lb. of body weight is sufficient to support wintering gains of 1.00 to 1.50 lb. per day on a high roughage ration.

It is of considerable practical interest to note that the hay used in this study contributed approximately 6 gm. of phosphorus to the daily animal diet or only 1.3 gm. of phosphorus per 100 lb. body weight. Thus, the phosphorus contribution of the concentrates to such a ration is extremely important. Hubbert et al. (1958) found that Hereford weaner steers would consume approximately one gm. of phosphorus per day in the form of bone meal in a salt-bone meal mix. This appeared to be true in spite of the fact that they were consuming only 8 gm. of phosphorus in the meadow hay and barley ration fed. It appears doubtful that weaner beef cattle can be expected to consume enough phosphorus for optimum performance when fed a ration of low phosphorus meadow hay and 2 lb. of barley, even though salt-bone meal mix might be available.

SUMMARY

Forty Hereford weaner cattle were fed a basal wintering ration consisting of meadow hay, 2 lb. of barley, and 1 lb. of cottonseed meal for a 126-day period. The influence of the addition of 75 mg. of oxytetracycline and 5 gm. of phosphorus (as bone meal) was studied in a 2 x 2 factorial experiment.

The addition of the broad spectrum antibiotic to the ration resulted in a slight advantage in rate of gain and feed conversion.

The addition of 5 gm. of phosphorus, as bone meal, to a ration containing 0.17% phosphorus did not improve rate of gain. There was some evidence of improved performance of the animals receiving both the antibiotic and the high level of phosphorus over the control group.

It appears that weaner beef cattle consuming from 2.5 to 2.7 gm. of phosphorus per 100 lb. of body weight are receiving adequate phosphorus to make wintering gains of 1.00 to 1.50 lb. per day on a high roughage ration.

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