Summary

Fall-calving cows were fed at different levels of supplemental winter feed in two experiments. In the experiment with three and one-half-year-old cows, prairie hay was the roughage during the winter feeding season. Feeding a high level of supplement decreased winter weight losses of the cows and markedly increased weaning weights of the calves compared to feeding a low level of supplement. With first-calf two and one-half-year-old heifers fed prairie hay in a trap and those grazing the dry range, the level of winter feeding had little effect on weaning weights of the calves. Weight losses of the cows were less and weaning weights of the calves were heavier for cows fed prairie hay than for those grazing dry grass. Estimated milk production of the cows was relatively low but was highly correlated with average daily gain of the calves.

Effect of Alternate Low-High or High-Low Winter Feed Levels on Growth and Reproduction of Replacement Heifers

D. O. Pinney, L. S. Pope, and D. F. Stephens

A serious obstacle in maintaining a cow-calf herd is the long interval between birth and the time the young heifer gets into production. In well-managed herds, heifers usually calve at two or three years of age. This results in considerable expense in rearing the replacement heifer, much of which is related to the cost of supplemental feed during the first and second winter periods. Any method of reducing this cost without affecting reproduction or future usefulness, therefore, would improve the net return.

As a part of an extensive study on the effect of different planes of nutrition to which the beef female is exposed during the winter, one phase was directed toward the problem of how seriously poor feed levels may effect body development and reproductive processes during the first winter as a weaner calf, or the second winter as a bred yearling.

Plan of Experiment

In the fall of 1960, 75 weaner, Hereford, heifer calves were selected from the Ft. Reno Experimental herd for similarity in age, weight, sire, and productivity of dam. Five uniform groups were started on winter feeding tests in early November at aproximately eight months of age.

All heifers were pasture exposed to bulls the following summer as yearlings, whereupon they returned to their original winter feeding level, or in the case of the reversal treatments (i.e. Low-High or High-Low) to the opposite level. The treatments imposed during the first winter as calves or the second winter as bred yearlings were as follows:

Lot Number	First Winter (Calves)	Second Winter (Bred yearlings)
1	Low	Low
2	Low	High
3	Moderate	Moderate
4	High	High
5	High	Low

All heifers grazed native grass pastures (principally bluestem) yearlong. In the Low treatment, the supplemental feed allowance was adjusted at two week intervals to permit no gain in weight as weaners, and a loss of 20 percent or more of fall body weight the following winter as bred yearlings. Moderately fed heifers gained about .5 lb. per head daily during the first winter and lost less than 10 percent fall weight the second winter. In the High level treatment, 1 lb. or more daily gain the first winter as calves was desired, with essentially no loss the second winter. Actually, to induce early winter weight loss, Low level heifers were confined to drylot and fed wheat straw with no supplement for three to four weeks before returning to range pasture. All heifers had free access to a mineral mix of two parts salt and one part steamed bone meal, year-long.

The wintering period each year extended from about November 1 to mid-April (approximately 165 days). Gains or losses in body weight were controlled by frequent weighings and subsequent adjustment of supplemental feed. In addition to detailed records on body weight changes, feed intake, and skeletal size at six-month intervals, reproductive performance and weaning weights were obtained. The results discussed below were obtained from the first group of heifers from weaning to 2.5 years of age, or after they had weaned their first calves.

Results

The average results obtained during the two wintering periods are summarized in Table 1. Due to an oversight, the heifers were not vaccinated for Leptospirosis, an infectious reproductive disease, known to be prevalent on the Ft. Reno station. As a consequence, 10 heifers aborted within a month's period during the late fall of 1961 and were removed from the data shown in Table 1. A prompt vaccination program was instituted among the heifers that had not aborted, and the difficulty was checked. A yearly vaccination program (early May) has been routinely followed at Ft. Reno with all females since 1956, and

losses from Leptospirosis among vaccinated females has been very light. Older females in the experimental herd were less affected during this outbreak. This incident clearly shows the need for a consistent vaccination program where the threat of Lepto is prevalent.

Upon completion of this study, all heifers in the trial were culled. A new repetition is now in progress. While the numbers involved in this trial are small, it is believed that they represent a trend which may be borne out in future studies.

Table 1.—Effect of Alternate Winter Treatments (Low-High and High-Low) on Growth and Reproductive Performance of Two-Year-Old Heifers.

Lot No. 1st Winter Treatment 2nd Winter Treatment	1 Low Low	2 Low High	3 Mod. Mod.	4 High High	5 High Low
Number heifers[1]	13	14	12	15	11
Avg. weight change, lbs.					
8 to 18 months of age					
Winter gain	—40	—39	91	162	167
Summer gain	337	327	282	232	236
Net yearly change	297	288	373	394	403
18 to 30 months of age					
Winter gain	—170	+17	—113	—18	—254
Summer gain	281	186	249	187	315
Net yearly change	111	203	136	169	61
Fall wt. at 30 months of age[2], lbs.	855	956	928	1009	911
Winter supplement per/head (lbs.)					
1st winter					
C.S. Meal	97	97	259	334	334
Grd. Milo	133	133	450	1040	1040
2nd winter					
C.S. Meal	90	266	185	266	90
Grd. Milo	24	817	126	817	24
Avg. winter supplemental feed cost per/head, ($)	8.87	27.54	24.32	50.11	31.44
Calf production data:					
Avg. calving date	3/27	3/24	3/13	3/7	3/2
% calf crop[1]	77	64	58	67	82
Avg. birth weight, lbs.[3]	60.5	69.4	64.8	67.2	62.5
Avg. weaning wt., lbs.[3]	357	383	392	428	373
Avg. Daily Gain of Calves	1.56	1.62	1.60	1.69	1.44
Avg. daily milk production, lbs., (five estimates)	8.34	8.70	8.73	8.10	7.30

[1]Excludes heifers that aborted due to Leptospirosis in the late fall of 1960.
[2]Includes only heifers calving and raising a calf.
[3]Corrected for sex by adding 5 lbs. to birth wts. and 24 lbs. to weaning wts. on heifer calves.

Note the typical winter-summer gain pattenrs of heifers fed at different levels during the winter. The winter performance each year directly reflected the level of supplemental feed, as was planned. After weaning their first calves (2.5 years of age), heifers of Lots 1, 3, and 4 averaged 855, 928, and 1009 lbs., respectively. These weights were related to the continuous Low, Moderate, and High treatments imposed each of two successive winters. In other words, a difference of about 150 lbs. between Low vs. High, and 75 lbs. between Low vs. Moderate, remained at 2.5 years of age.

Where the alternate winter feeding programs were followed, heifers wintered at High levels the first winter as weaner calves (Lot 5) lost excessively the second winter when switched to the Low treatment. Doubtless, this was due to their fleshy condition at the start of the second winter. Conversely, poorly-fed heifers the first winter, but well fed the second (Lot 2), gained 17 lbs. during the second winter while bearing calves. This was better than any other treatment imposed.

The fall body weights, when compared to continuous Low, Moderate, or High treatments, show a weight advantage of about 100 lbs. for the Low-High group over Lot 1 wintered each year at the Low level, and about 50 lbs. for Lot 5 on the High-Low regime. Hence, there was some advantage in body weight, as borne out in skeletal size from photographic measurements, for the switchover to the High level, but this was most advantageous for the Low-High regime. Both Low-High and High-Low groups tended to about equal the Moderates (Lot 3) in body weight and were 50 to 100 lbs. lighter than those wintered High level both years (Lot 4).

In terms of calf production data, it can be seen that Low feed levels the first winter as weaner calves delays conception the following summer on pasture with an average difference of about 20 days between Low and High levels. Due to the small numbers involved, data on percent calf crop are not too meaningful. Birth weights reflected the previous winter's treatment of the dam, with an average difference of about seven lbs. between Lows (Lots 1 and 5) and Highs (Lots 2 and 4).

Weaning weights of calves from Lots 1, 3, and 4 (continuous Low, Moderate, or High levels) were directly related to the winter feed treatment of the dam. Where alternate levels were followed (Lots 2 vs. 5) little difference was observed (10 lb. average). This may be best explained by an examination of average daily gain of calves from birth to weaning in light of average birth dates. Low-High calves were dropped later than those of Lot 4 (High level), but the heifers did about as good a job of raising them according to average daily gains and milk production data. On the reverse treatment (High-Low), while the calves were dropped early, the previous winter's feed level was so poor that the daily gains of the calves and milk yield were both reduced.

Milk production data shown in Table 1 appear somewhat erratic and with the exception of the low milk production of Lot 5, females, showed little difference among the treatments. Much more difference due to feed level has been reported elsewhere for older cows.

Summary

Winter feed levels that permit a weaner heifer calf to make little or no gain from fall to spring markedly retards the appearance of heat and delays the subsequent calf crop. Poor winter feeding during the second winter as a bred yearling seriously reduces milk flow the following summer and affects weaning weights. Both treatments, however, appear superior to a Low level both years, but of no advantage over the Moderate level. Maximum body size and weaning weight have been obtained when heifers are fed to gain at least 1 lb. per head daily as weaners, and lose little or no weight as bred yearlings from fall to spring after calving. Feed costs from this regime, however, were excessively high in this experiment, therefore the Moderate regime proved more profitable.

Mineral-Vitamin Interrelationship in Ruminant Nutrition

Allen D. Tillman

It has been estimated that fully 60 percent of the veterinary practice in the United States involves noninfectious diseases, most of which are of nutritional origin. In most cases, severe individual nutrient deficiencies can be identified and rectified by adding the missing nutrient, but the greatest loss in livestock production results from borderline deficiencies. In animals with borderline deficiencies, there are no definite clinical symptoms. Metabolic functions simply slow down to comply with the level of the limiting nutrient resulting in slower growth and less efficiency. To prevent these borderline or subclinical conditions, the nutrient requirements of animals must be met. This is sometimes much more difficult than is apparent to the layman. Recent changes in production methods in plants and animals, with emphasis upon faster and greater growth by the use of fertilizers and other adjuncts, have tended to increase the incidence of borderline deficiencies. Several mineral-vitamin interrelationships in ruminant nutrition are discussed in this article. They include nitrate and vitamin A, calcium and zinc, cobalt and vitamin B_{12}, vitamin E and selenium, and copper and molybdenum.