At an average age of 142 days the weaned lambs averaged about 83 pounds compared to 95 pounds for the non-weaned lambs.

One of the early weaned lambs weighed only 20 pounds at weaning time and responded poorly. This and other experiences suggest that lambs weighing less than 25 pounds at 30 days of age may need better rations, care or something than these lambs received.

Other than the growth pattern, the data of interest from this trial concerned the feed efficiency of the weaned lambs. These 16 lambs gained 855 pounds and consumed 4,125 pounds of feed. Thus, they gained a pound for each 4.8 pounds of feed consumed.

### Addenda

The results presented in this preliminary report are not presented as recommendations, but to indicate to anyone interested that on those occasions when it seems necessary to wean lambs at young ages it can be done. There is much that is not known about how to best feed and manage such lambs before, during and after weaning; but this record of some experiences may serve as a guide for those who wish to try such a management scheme. It is believed that either ration 2 of trial one or the ration used in trial two will give satisfactory results up until the lambs weigh 55-65 pounds after which time any good lamb fattening ration should be satisfactory.

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## The Effect of Pre-Weaning Plane of Nutrition on the Growth and Development of Beef Calves

*J. J. Guenther, S. A. Ewing and G. V. Odell*

Among the majority of modern consumers, beef is considered not only the king, but also the whole royal family of appetite appeal. Thus, from the standpoint of product demand the beef producer occupies an enviable position among his fellow food provisioners. Yet, if beef is to maintain its esteemed position in the market-place and if beef is to withstand growing competition from other protein foodstuffs, the beef producer must constantly strive to keep abreast of consumer demands, to increase his production efficiency and to improve the quality of his product.

To effectively cope with these problems, the need for fundamental information concerning the effect of various feeding and management practices on the growth and development of the beef calf is obvious. The following data represent a portion of the results from such a study currently in progress at the Oklahoma Agricultural Experiment Station.

## Procedure

The research reported herein was derived from two separate experiments. In the first experiment, the influence of the nutritional level of the dam, during the gestation period, on subsequent growth and development of their calves from birth to slaughter weight was investigated. For this study, two groups of steer calves, each containing eight calves, were produced by three-year-old cows on low and high levels of wintering.

In the second experiment, the influence of pre-weaning plane of nutrition on the pre- and post-weaning performance of beef calves was studied. For this test, fifteen steer calves were obtained and allotted as follows:

(a) Four calves, *weaned at 140 days,* then maintained on limited creep feed on pasture to restrict gains until 240 days of age.
(b) Five calves, *weaned at 240 days.* No creep feed during the pre-weaning period.
(c) Six calves, *weaned at 240 days and creep fed* a high concentrate feed during the pre-weaning period.

The post-weaning feedlot test was conducted at the Ft. Reno Station. All calves were self-fed a finishing ration, containing approximately 65 percent concentrate, until removed for slaughter. The standard feed conversion, carcass quality and measurement data (including specific gravity) were obtained. Carcass fat content was calculated from the specific gravity determination.

## Results and Discussion

Data in Table 1 show the influence of the nutritional level of the dam, during the gestation period, on the subsequent performance of their calves from birth to weaning and from weaning to slaughter weight. Calves from dams fed on a high plane of nutrition during gestation averaged 13 pounds heavier at birth than those from the low level dams. The "high" level calves also gained 17 pounds more than the "lows" during the pre-weaning period and by weaning time had increased this weight advantage to 30 pounds. Daily gain during this time favored the calves from the high levl dams by 0.13 pounds per day.

Results show that the calves from the high level dams continued to outperform the lows in the post-weaning feedlot test. These calves averaged 967 pounds when removed from test, 44 pounds more than those from the low level dams. Moreover, the high plane steers required 17 days less time in the feedlot. Originally, it was intended to slaughter

**Table 1. Effect of Nutritional Level of Dam on Performance of Calves from Birth to Weaning and Weaning to Slaughter Weight.**

| Level of Nutrition of Dam | Low | High |
|---|---|---|
| Pre-weaning Performance | | |
| Number of Calves | 8 | 8 |
| Birth Weight | 63 | 76 |
| Weaning Weight | 378 | 408 |
| Gain to Weaning | 315 | 332 |
| Weaning Age | 204 | 199 |
| Daily Gain to Weaning | 1.55 | 1.68 |
| Post-weaning Feedlot Performance | | |
| Initial Weight | 404 | 434 |
| Slaughter Weight | 923 | 967 |
| Feedlot Gain | 519 | 533 |
| Days on Feed | 224 | 207 |
| Daily Gain on Feed | 2.32 | 2.58 |
| Pounds Feed/100 Pounds Gain | 878 | 799 |

both groups at the same final live weight. However, the low level calves were removed from test at a lighter weight, when it became apparent from the daily gain records that they would have to be carried through the hot summer months to attain the necessary weight. Obviously, then, the differences in average daily gain and in feed efficiency, which favored the high plane calves by 0.26 pounds per day and 79 pounds feed, respectively, would have been much greater if the steers from the low level dams had been fed to the same final weight as the highs.

These results indicate that the level of nutrition of the dam, during gestation, has a considerable effect not only on birth weight and preweaning growth of the beef calf, but also on the subsequent post-weaning feedlot performance. Thus, dams which are well nourished during gestation appear to transmit to their calves a certain impetus which is maintained throughout its entire growing period. Conversely, calves from poorly nourished dams never seem to fully compensate for their poor start in life.

Data showing the influence of nutritional level of the dam on the carcass characteristics of calves fed to slaughter weight are presented in Table 2. Only small difefrences were noted between the two steer groups in the carcass quality results. The high level steers produced heavier carcasses which averaged slightly higher in conformation score and which exhibited a little less physiological age than the carcasses from the low level dams. The low plane calves yielded lighter carcasses, but showed a slightly higher dressing percent and marbling score than did the highs. No difference was obtained in carcass grade, however. Also, in overall carcass development, only minor treatment differences were noted. High plane carcasses tended to have larger ribeyes, a little more fat cover

**Table 2. Effect of Nutritional Level of Dam on Carcass Characteristics of Calves Fed to Slaughter Weight.**

| Level of Nutrition of Dam | Low | High |
|---|---|---|
| Carcass Quality Data | | |
| Slaughter Weight | 923 | 967 |
| Carcass Weight | 583 | 605 |
| Dressing Percent | 63.2 | 62.6 |
| Conformation Score | Good+ | Choice− |
| Maturity Score | B− | A+ |
| Marbling Score | Modest= | Small− |
| Carcass Grade | Choice− | Choice− |
| Carcass Development Data | | |
| Ribeye Area[1] | 10.9 | 11.6 |
| Fat Cover[2] | 0.76 | 0.83 |
| Length of Carcass[2] | 45.3 | 45.7 |
| Length of Leg | 27.6 | 28.6 |
| Length of Loin | 23.9 | 24.2 |
| Depth of Body | 14.8 | 14.8 |
| Width of Shoulder | 8.4 | 8.9 |
| Width of Round | 8.9 | 8.9 |
| Specific Gravity | 1.0498 | 1.0473 |
| Pounds Fat | 179 | 194 |
| Percent Fat | 30.7 | 32.1 |

[1] Square inches
[2] Inches

and to be larger scaled than the lows. In fat content, the high plane calves averaged 15 pounds or 1.4 percent more total carcass fat than did those from the low level dams.

Presented in Table 3 are the data showing the influence of pre-weaning nutritional level on the pre- and post-weaning performance of growing beef calves. Creep fed calves weighed, on the average, 70 pounds more at weaning than the normal weaned calves and 170 pounds more than the early weaners. Average daily gain to weaning favored the creep fed calves by 0.25 and 0.58 pounds per day, respectively, over the normal and early weaned calves. At the close of the post-weaning feedlot test, however, live weight differences between treatment groups had been greatly reduced. Thus, at slaughter, the creep fed steers outweighed the normal and early weaned steers by only 33 and 67 pounds, respectively. Both total and daily fedlot gain favored the calves which were restricted during the pre-weaning period.

In this regard, the early weaned calves gained 41 and 118 pounds more on test and average 0.10 and 0.25 pounds more per day, respectively, than did the normal and creep fed calves. Feed efficiency also favored the early weaned calves over the normal weaned and creep fed steers, even though the latter two groups were in the feedlot for shorter periods of time (8 and 28 days, respectively). Nevertheless, it is pointed out that

**Table 3. Effect of Pre-weaning Plane of Nutrition on the Pre- and Post-weaning Performance of Beef Calves.**

| Pre-weaning Treatment | Early Weaned (140 days) | Normal Weaned (240 days) | Normal Weaned + Creep |
|---|---|---|---|
| Pre-weaning Performance | | | |
| Number of Calves | 4 | 5 | 6 |
| Birth Weight | 73 | 75 | 75 |
| Weaning Weight | 328 | 430 | 500 |
| Gain to Weaning | 255 | 355 | 425 |
| Daily Gain to Weaning | 1.05 | 1.38 | 1.63 |
| Post-weaning Feedlot Performance | | | |
| Initial Weight | 302 | 377 | 487 |
| Slaughter Weight | 866 | 900 | 933 |
| Feedlot Gain | 564 | 523 | 446 |
| Days on Feed | 241 | 233 | 213 |
| Daily Gain on Feed | 2.34 | 2.24 | 2.09 |
| Pounds Feed/100 Pounds Gain | 757 | 807 | 861 |

all treatment lots were not slaughtered at the same final weight. Had the early and normal weaned calves been carried to the same live weight as the creep fed calves, their efficiency of feed conversion would have been reduced considerably. The converse would also be true for the creep fed calves, if they had been removed from test at a lighter live weight.

Data in Table 3 indicate that, while calves limited in nutrient intake early in life tend to compensate for this restriction by making rapid and efficient gains when put on full feed, they would require a considerably longer feedlot period to fully compensate for the initial advantage obtained by calves full fed early in life.

Results showing the influence of pre-weaning plane of nutrition on carcass characteristics of calves fed to slaughter weight appear in Table 4. Small, but important, differences were noted in the carcass quality data of the experimental steers. Creep fed calves yielded the heaviest carcasses, averaging 18 and 44 pounds more, respectively, than the normal and early weaned steers. Although little differences were observed in scores for conformation, maturity, and marbling, when these factors were considered simultaneously, they resulted in a ⅓ of a grade difference in carcass grade, favoring the creep fed and normal weaned steers. While this is but a small difference, it was critical with these cattle; for it resulted in the creep fed and normal weaned cattle being graded U.S. Choice and the early weaned cattle being rated U.S. Good by the federal grader.

Apparently, full feeding early in life is necessary for maximum ribeye development. In this regard, the creep fed calves averaged 1.0 square inches more ribeye than the normal weaned steers, while the latter were only 0.4 square inches larger in ribeye area than the early weaners. In addition, early weaned calves deposited more external fat than either the normal weaned or creep fed calves.

**Table 4. Effect of Pre-weaning Plane of Nutrition on Carcass Characteristics of Calves Fed to Slaughter Weight.**

| Pre-weaning Treatment | Early Weaned (140 days) | Normal Weaned (240 days) | Normal Weaned + Creep |
|---|---|---|---|
| Carcass Quality Data | | | |
| Slaughter Weight | 866 | 900 | 933 |
| Carcass Weight | 547 | 573 | 591 |
| Dressing Percent | 63.2 | 63.7 | 63.3 |
| Conformation Score | Good+ | Choice− | Choice− |
| Maturity Score | B− | A+ | B− |
| Marbling Score | Small− | Small | Small |
| Carcass Grade | Good+ | Choice− | Choice− |
| Carcass Development Data | | | |
| Ribeye Area[1] | 10.1 | 10.5 | 11.5 |
| Fat Cover[2] | 0.87 | 0.76 | 0.78 |
| Length of Carcass[2] | 44.7 | 45.5 | 45.7 |
| Length of Leg | 27.9 | 28.1 | 28.1 |
| Length of Loin | 23.1 | 23.8 | 23.8 |
| Depth of Body | 15.0 | 15.3 | 15.3 |
| Width of Shoulder | 8.2 | 8.5 | 8.8 |
| Width of Round | 9.0 | 8.9 | 8.7 |
| Specific Gravity | 1.0474 | 1.0508 | 1.0448 |
| Pounds Fat | 175 | 173 | 197 |
| Percent Fat | 31.9 | 30.1 | 33.4 |

[1] Square inches
[2] Inches

Skeletal-wise, the full fed and normal weaned calves developed at about the same rate during the feedlot period; however, both groups produced larger scaled carcasses than did the early weaned steers. Finally, the creep fed calves produced about 1.5 percent more total carcass fat than the early weaners, yet the latter had 1.8 percent more carcass fat than the normal weaned steers.

## Summary

The research data reported above was obtained from two separate experiments, both of which are segments of a larger experiment, currently in progress, designed to study the growth and development of beef calves during three phases of life; the pre-natal, pre-weaning, and post-weaning feedlot phase.

In the 1st experiment the influence of the nutritional level of the dam, during gestation, on subsequent growth and development of their calves was investigated. Results indicate that the nutritional level of the dam had a considerable effect on both the pre-weaning and post-weaning feedlot performance of their calves. Calves from the well-nourished dams were heavier at birth, at weaning and at the conclusions of the feedlot

period than those from the poorly-nourished dams. Calves from the high level dams produced heavier, larger scaled carcasses, required less time in the feedlot and were more efficient converters of feed than were the low level calves.

In the second experiment, the influence of pre-weaning plane of nutrition on the pre- and post-weaning performance of beef calves was studied. Results indicate that, while calves limited in nutrient intake early in life tend to compensate for this restriction by making rapid and efficient gains when returned to full feed, they would require a considerably longer feedlot period to fully compensate for the initial advantage obtained by calves full fed early in life. Carcasses from the creep fed calves were larger, had more ribeye area, less external fat cover, and graded higher than those from the early weaned calves.

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## Improving the Utilization of Milo for Fattening Calves: The Effect of Various Supplements[1]

*Curtis W. Absher, Robert Totusek, Robert E. Renbarger and Eldon C. Nelson*

Previous research at the Oklahoma Station has been directed toward improving the efficiency of milo (sorghum grain) for fattening calves, and a considerable amount of additional work is now in progress. Milo, on a chemical basis, appears to be equal in value to corn. However, feedlot comparisons in the Southwest have consistently shown milo to be 10 to 20 percent less efficient than corn. Even so, milo makes up a large portion of cattle fattening rations in Oklahoma and much of the Southwest because of its relative price advantage over other feeds. Therefore, any changes in milo rations that will improve milo utilization and feed efficiency will add considerably to the income derived from the feeding of milo to beef cattle.

Much of the previous work at the Oklahoma Station was concerned with the physical preparation of the milo grain. This appears a logical place to start to improve milo utilization because of the hard, flinty outer portion of the milo kernal. Although some improvement in milo utiilzation can be made through processing methods (see Feeders' Day Reports for 1964 and earlier years) milo is still inferior to corn in feed efficiency.

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[1] The urea used in this study was generously provided through the courtesy of Dr. L. E. Craig, John Deere Chemical Company, Tulsa, Oklahoma.