SUPPLEMENTAL FEED FOR NURSING BEEF CALVES

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INTRODUCTION

The practice of supplying supplemental feed to nursing beef calves is know as creep feeding. The feed is fed to supplement the grass and milk to which they have access. The purpose of this practice is to produce heavier, higher-grading calves at weaning time. These calves could be marketed at weaning time at a grade and wight suitable to the packer or could be finished in the feedlot in a much shorter period than the majority of calves which received no supplemental feed prior to weaning.

An increased demand for lighter cuts of beef has arisen from smaller families and changes in living habits. One way the producer has been trying to meet this demand is by creep feeding. Increased operating costs and the economical use of feed by younger cattle have also been contributing factors in the practice of creep feeding. The above mentioned items are a few of the more important reasons for creep feeding.

Creep feeding of beef calves is a practice which began to increase in the United States in the late 1920's and early 1930's. Prior to that time a majority of the cattle were marketed at two, three, or even four years of age. Since the early creep feeding research of the 1920's-1930's, several experiment stations have carried out long range studies. Items, such as the kind of supplemental feed, the value of added protein, the value of diethylstilbestrol, and the value of antibiotics have been areas of major concern in these studies, as well as the economic feasibility of creep feeding.

The purpose of this report is to summarize the research which has been conducted on creep feeding of beef calves.

A Description of Creep Feeding Practices

As a general background it might be well to review some of the management factors believed to be important by Taylor and Wendling (1957) in creep feeding beef calves on pasture. They believed that probably the most important point in creep feeding was that the calves must be of good beef type so they would fatten at an early age. This required cows of good beef type plus the use of a good purebred beef bull.

Also, the calves should be early so they could be taught to eat grain before they went to pasture with their mothers. Taylor and Wendling stated that late fall, winter or early spring calves were very desirable. Calves born in the summer ate very little. The creep feeders should be placed in the pasture near the watering places. Salt often helped to attract the cows to a certain location.

Calves could be persuaded to eat more at the creep-feed by the convenient location of feeders which contained a palatable ration. Calves should be as uniform in age as possible. If all of the calves came within a ninety day period, they could usually be marketed together.

When creep feeding, the feeder should never be empty as when the feeder was refilled the calves could eat too much which would get them "off feed". The feed in the feeder should be kept

fresh by removing any which was spoiled. Also, never change the kind of feed suddenly. When the calves were changed from pasture creep-feeding to dry-lot full feed at weaning time, the amount of feed should be reduced and hand-fed. At weaning time, they could become nervous and over-eat if the above was not done.

EQUIPMENT FOR CREEP FEEDING

The following recommendation of equipment needed for creep feeding was published by Maddox and Thompson (1961). The creep should be an enclosure or lot with an opening large enough for calves to pass through, but too small for older cattle. The creep may be constructed with wire, pole, lumber, pipe, or a combination of all of these materials. The openings into the creep for the calves should be 16 to 20 inches wide and 30 to 36 inches high.

The feeders should be constructed to allow calves to feed on one or both sides. They should hold at least five days of feed supply. A feeder which allowed calves to eat from both sides, was 16 feet long, held 125 bushels of grain and would accommodate about 80 calves. If a feeder was constructed as to only allow access to one side, a 10 foot long feeder holding 30 bushels of grain was needed to serve 30 calves. Where shade was needed, the roof of the feeders could be extended to furnish shade. The roof extension would also protect the grain from wind and rain.

EARLY WORK WITH CREEP FEEDING

Creep feeding has received some attention for quite a few years. In this section of the report, a few of the early tests with creep feeding will be reviewed. There will be only a very brief summary of the results which were obtained from these tests. The type of cattle and management has changed over the past few decades, so what might have been the case thirty years ago may have changed by now. However, this period cannot be overlooked altogether because some very good work was accomplished during this period.

Black and Trowbridge (1930) summarized three years of research in which Shorthorn calves were handled in four different ways. One lot received no supplemental feed on pasture, another was enclosed in a creep and allowed to nurse daily, another was fed a mixture in a creep on pasture, and the other group was creep-fed only four to eight weeks before weaning. The two lots which were fed the entire suckling period gained about 100 pounds more than the non-creep-fed lot. Those fed for only four to eight weeks before weaning weighed approximately 70 pounds more. They made very economical use of feed, sold for a higher price per pound, shrank less at weaning, and were put on full feed much faster. At the end of 84 days of feeding after weaning, the creep-fed cattle had enough finish to market. For a 196 day feeding period the creep-fed calves made 7 per cent less gain and consumed 8 per cent more feed per 100 pounds gain. They concluded that creep feeding was unsatisfactory if

the fattening period exceeded 168 days.

Jones and Jones (1932), at the Texas Station, studied creep feeding for fall calves on cows which were stocked at 30 acres of pasture per cow and calf. The total gain for the 168 day creep period was 233 pounds for the creep-fed and 190 pounds for the non-creep-fed. The above figures were while they were suckling the cows.

Creep feeding of spring calves was studied at West Virginia by McComas and Wilson (1938). One group of calves was creep-fed on good pasture stocked at four acres per cow and the calves were sold at weaning. This group was compared to a group on the same type of pasture and receiving no creep ration. The calves which received no creep feed were fattened for 116 days before marketing. These two lots were also compared with calves on mountain pasture which was stocked at 8 acres per cow and calf. During the 168 day suckling period, the group which was creep-fed on the good pasture gained 8.1 per cent more than those which were not creep-fed. The creep-fed lot gained 25.3 per cent more than those on mountain pasture. It took 123 pounds of grain per 100 pounds gain for the creep-fed lot. Returns in this particular year were $1.83 less per head for those not creep-fed and fattened in the feedlot.

Taylor et al. (1938), at Oklahoma, summarized a four year study concerned with creep feeding spring calves. The creep-fed calves ate an average of 215 pounds of grain and gained 39 pounds more than the non-creep-fed for an average period of 100

days. For an average of four years, the creep-fed calves would have had to sell for 72 cents more per hundred to pay for the feed consumed. They concluded that creep feeding definitely did not pay for calves which were to be full fed on grain over 150 days after weaning. Creep feeding these spring calves did reduce shrink at weaning. They felt that creep feeding, however, would be more profitable where calves were dropped in the fall and winter. They would be heavy enough to sell thirty or forty days after being weaned.

The problem of finding the most suitable grain ration for creep feeding spring calves was studied by Black and Trowbridge (1933). For an average of three years, steer calves fed a mixture of 8 parts shelled corn and 1 part cottonseed meal made 7.5 per cent greater gains than those fed only shelled corn. The above study was for a period of 140 days. The ration with the cottonseed meal also produced 8.7 per cent more gain than a ration consisting of 2 parts shelled corn and 1 part oats. The shelled corn, alone, was more economical when figuring the cost per hundred pounds of gain.

At South Dakota, Johnson and Fenn (1943) studied three spring calf crops to see what the effect of creep feeding would be. Shorthorn cattle were used and were pastured at the rate of 1.5 acres per cow and calf for an average suckling period of 158 days. Creep feeding produced 72 pounds more weight gain per calf and improved the market grade from medium to good. If the

calves were sold at weaning, it was more profitable to creep feed due to the 70 pounds extra weight. Creep feeding did not pay when calves were fattened after weaning because of less efficiency and slower gains. Desirable baby beeves were produced from average grade farm cows and purebred bulls, but calves from cull bulls were not suitable for the production of baby beeves.

When calves were to be retained as breeding stock, the possibility of a limited ration being more economical was studied by Kyzer (1944). This was a three year study with spring purebred Angus calves. One group was full fed a creep mixture whereas the other group was fed one-half the amount with the ration being balanced weekly. The three year summary showed an average daily gain of 1.94 to 1.74 for the full creep-fed and the limited creep-fed respectively. The full fed group consumed 111 pounds of feed per calf.

Duncan et al. (1949), with a study at Tennessee, obtained approximately 50 pounds more gain by creep feeding spring calves. The calves required 1140 pounds of grain per 100 pounds of gain. Therefore, creep feeding was not profitable in this particular study. The calves which were creep-fed were sold 84 days after weaning, but it took 112 days to get the non-creep-fed group to a comparable finish.

THE GENERAL ASPECTS OF CREEP FEEDING

Fall Calves

Comparative studies with creep-fed fall calves have been carried out by Duitsman and Kessler (1955, 1956, 1957) and Brethour and Duitsman (1958a, 1958b, 1959, 1960, 1961). These studies were conducted at the Fort Hays Branch Agricultural Experiment Station in Kansas. In Table 1, there is a summary of the years in which creep feeding was practiced and comparative trials could be analyzed. The first report of this work was published in 1955, although the work was initiated in the fall of 1953. The Hereford cow herd, at the above station, was divided into spring and fall calving herds. After calving, each group was divided into different treatment groups. The data presented will be concerned with creep feeding versus non creep feeding fall calves. The spring portion will be discussed later on.

The data used will be comparing groups fed rolled sorghum grain as the only concentrate with groups which were non-creep-fed. In many of these trials other aspects of creep feeding such as the value of added protein, rolled oats, and the implantation of stilbestrol, were studied. The value of these factors will be discussed in a later portion of this report. Also, unless otherwise specified the data presented will be dealing with mixed lots of steers and heifers.

The cows in these groups were fed the same comparative

ration for each trial. In addition to the native grass pasture, they were fed protein supplements. Other feed was also fed when insufficient grass was available. In a few of these trials some of the heifer calves were picked as replacements at the time of weaning. All of the tests have been concerned with selling the calves after they have been fattened instead of selling as fat calves at weaning.

Table 1. The Effect of Creep Feeding Calves on Weight Gain and Feed Consumption.*

	Fall Calves			Spring Calves		
	Pounds Added Gain Per Head	Pounds Feed Intake Per Head	Pounds Added Daily Gain Feedlot	Pounds Added Gain Per Head	Pounds Feed Intake Per Head	Pounds Added Daily Gain Feedlot
1953	79	1107	-.05			
1954	-48 *	1040	.51	5	324	.05
1955	95	1189	-.17	23	372	.01
1956	67	718	.00	14	416	.00
1957						
Steer Calves	93	934	.28			
Heifer Calves	66		-.14			
1958	42	935	-.14			
1959						
Steer Calves	43	619	.00			
Heifer Calves	52		-.19			
Average	54	935		14	371	

*Summarized from Duitsman and Kessler (1955, 1956, 1957) and Brethour and Duitsman (1958a, 1958b, 1959, 1960, 1961).

*With a group fed seventeen per cent protein that year the average total gain was thirteen pounds more than the non-creep-fed group.

As shown in Table 1, there was an average of 54 pounds extra gain with 935 pounds of rolled milo when the calves were creep-fed. In 1954, there was 48 pounds less gain with creep feeding but calves fed a seventeen per cent protein ration that year gained thirteen pounds more than the non-creep-fed lot.

When the calves were placed in the feedlot, the subsequent gain on an average did not seem to be affected by whether they were originally creep-fed or not. However, both years where the lots were divided the heifers that were previously creep-fed had -0.17 pounds less average daily gain. The cattle which were creep-fed were marketed about 40 days earlier in 1953 and 1955 but were marketed at the same time the other years. The extra days in the feedlot were used in order to get a comparable amount of finish and weight on the non-creep-fed calves. A number of other aspects with creep-fed fall calves are discussed in later portions of this study.

Spring Calves

When spring calves were creep-fed at the Fort Hays Station, Table 1, the calves which were creep-fed gained an average of 14 additional pounds on 371 pounds of rolled sorghum grain. The gains in the feedlot were nearly the same as with non-creep-fed calves. However, the creep-fed calves were marketed on an average of eight days earlier. In two of the three years the calves were marketed at the same time.

During a period of four years, at Oklahoma, Nelson et al.

(1952a,b,c, 1953a,b,c, 1954, 1955) studied the effect of creep feeding on spring calves of both sexes. In these studies they evaluated the calves at weaning as to the value of creep feeding up to that time. The steers in these comparative trials were fattened in the dry-lot after weaning each year. The first two years, the heifer calves were wintered on prairie hay and cottonseed cake to study the value of creep feeding on subsequent performance with this type of ration.

The calves, during the creep feeding phase of the tests, received a ration consisting of 1 part cottonseed meal to 9 parts grain the first three years. In the fourth test a creep ration of 8 parts grain, 1 part cottonseed meal, and 1 part cane molasses was used for studying creep feeding versus non creep feeding. Also during this test, two-year-old heifers were used instead of mature cows.

The additional weight gains and feed consumption for the first three years were respectively: Test 1- 20 lbs., 336 lbs; Test 2- 47 lbs., 439 lbs.; and Test 3- 26 lbs. and 313 lbs. There was an average of 31 additional pounds of gain with an average of 373 pounds of creep feed consumed. The fourth year, where molasses was added to the ration with steers and heifers averaged together, there was 108 pounds of additional gain with 740 pounds of creep feed. The gains and feed intake were substantially larger than the previous three years. The use of two-year-old heifers, an usually dry summer, and the use of molasses could account for the differences in the fourth trial.

The additional gain made by the spring creep-fed calves did not pay for the feed consumed the first three years. However, in the fourth test the additional gains increased profits by about twelve dollars per head when sold at weaning. When the steer calves were placed on full feed in the dry-lot, the gains were slightly higher for the calves which were non-creep-fed. The profits for both phases were the same the first year, larger for the non-creep-fed calves the next two years, and for the creep-fed calves the fourth year. Dry-lot fattening the fourth year decreased the difference in the profit which would have been obtained if they had been sold at weaning. The calves which were creep-fed were marketed on an average twenty-eight days earlier. It was apparent from this and other tests that an advantage of creep feeding was a shorter fattening period, but a disadvantage was the additional labor of creep feeding.

The heifer calves in the first two trials after weaning were wintered on prairie hay and cottonseed meal. Thus, the effect of creep feeding could be evaluated under this type of management. In both trials, the heifers which gained the most during the summer gained the least during the winter. The total yearly gains were nearly the same for both groups. Therefore, it is quite evident that creep feeding does not pay for calves which are to be placed on a wintering ration.

At Nebraska, Matsushima et al. (1958, 1959, 1961) have reported on four trials where spring calves were creep-fed.

These studies have been in conjunction with their study of antibiotics; however all of the data reported here will be with calves which received no antibiotics. These calves were grazed with their dams in separate pastures comprised of native Sandhill grasses. An average of the four trials showed 51.5 pounds of gain from 447 pounds of supplemental grain. They felt that unless the creep-fed calves were sold at a higher price per hundred than the non-creep-fed calves, it would not be economically feasible to creep feed under their conditions.

At West Virginia, Anderson et al. (1952) studied the value of creep feeding calves on pasture stocked at 1.5 acres per cow and calf unit. Calves which were creep-fed received 6 parts coarsely cracked corn and 1 part soybean oil meal. Calves which were creep-fed were considerably heavier at weaning, graded higher as feeders, weaned with greater ease, and had less loss of weight at weaning than the non-creep-fed calves. Each creep-fed calf consumed 453 pounds of concentrate. Seventy-five per cent of this feed was eaten during the last two months of the trial. The steer calves gained an average of 105 pounds extra over the non-creep-fed. The heifer calves only had an additional 22 pounds, however. This was an average of 64 extra pounds of gain for the creep-fed lots.

SUPPLEMENTAL PROTEIN AND OTHER CREEP FEEDING VARIATIONS

Added Protein and Complex Rations

The value of adding supplemental protein to the ration of

creep-fed calves has been studied in several tests at the Fort Hays Branch of the Kansas Agricultural Experiment Station. These tests were usually with a third lot where protein was added in a comparison with creep feeding sorghum grain as the complete ration and also a non-creep-fed group was included. Duitsman and Kessler (1956, 1957) and Brethour and Duitsman (1958a) used cottonseed meal to bring the protein of the ration up to 17 per cent. Comparisons were made on both fall and spring creep-fed calves. The effect which this supplemental protein had on the performance of fall calves being creep-fed will be discussed first.

The effect on weight gain of adding cottonseed meal to the sorghum grain creep ration of fall calves was an increase of 61 pounds per calf in one trial and 32 pounds less gain in a second trial. The calves made the additional 61 pounds of gain on an additional 23 pounds of concentrate but when they made 32 pounds less gain the calves consumed 123 pounds less. The test in which the gains were increased 61 pounds, the non-creep calves gained 48 pounds more than the calves creep-fed sorghum grain. The performance in the feedlot after weaning was slightly better for the group fed the cottonseed meal during the first year. Carcass data was not affected by the different treatments.

With spring calves, the value of a 17 percent protein ration was also studied in three trials. The additional gain by adding cottonseed meal to the ration the first, second, and third trial was respectively 21, -8, and 13 pounds. The difference in

respective feed consumption per head for the protein fed group was 9, -8, and -3 pounds of total feed consumed for the creep feeding period. There was an average of 9 pounds extra gain with the additional protein. However, the feed consumption for both groups was nearly equal.

The susequent increase in average daily gain, in the feedlot, was .12, .11, and -.04 pounds for the respective protein fed groups. This additional gain gives an advantage of .06 pounds average daily gain for the protein fed group. The cattle, in both groups, were marketed at the same time with the protein fed group being heavier two out of the three years. The protein fed lot, for an average of the three years, was 14 pounds heavier at marketing. There were no explainable differences in any of the carcass data.

Brethour and Duitsman (1962a, 1963a) compared three different types of rations for creep feeding fall calves. A comparison of rolled sorghum grain, sorghum grain plus soybean meal (80% sorghum grain and 20% soybean meal), and a 13 per cent creep pellet was made. The creep pellet was a 3/8 inch pellet and included a wide variety of feed ingredients. This comparison was to find out if the complex mixture of ingredients had any benefit over the simple farm prepared creep ration. This ration was fed to creep-fed calves in three separate lots for an average creep feeding period of 216 days.

During the creep feeding period of two trials, calves which received the sorghum grain-soybean meal mixture gained more than

the other two groups. There was a small advantage for the creep-pellet over the rolled sorghum grain each year. The sorghum grain-soybean meal fed calves had an average of 29 pounds extra gain over the sorghum grain fed group and the calves receiving the pelleted ration had an average of 15 pounds extra gain over the sorghum grain fed groups.

The sorghum-soybean meal fed group consumed 1052 pounds of creep feed during the first trial and 709 pounds during the second trial. The consumption in the other two lots were nearly equal both trials. The average feed consumption during the creep period, for the two trials, was 886 pounds for the sorghum grain-soybean meal group, 769 pounds for the pelleted group, and 765 pounds for the rolled sorghum grain group.

The calves were placed on full feed after they were weaned. Those which were creep-fed the sorghum grain and pelleted feed were lighter at weaning; however these two groups during the first trial gained more during the full feeding period. Therefore, there was little difference in average total gains among the three lots when marketed. The gains of all three lots were nearly equal during the full feeding period of the second trial. Therefore, the calves creep-fed the sorghum grain were somewhat lighter than the other two groups. There was very little difference in yield or carcass grades which could have been attributed to the difference in creep rations in either trial.

Ration Preparation and Preference

One of the problems in creep feeding has been to determine the type of ration which was most palatable in order to get increased feed consumption. Increased consumption usually has increased weight gains. Meiske et al. (1961), at Minnesota, summarized a three year study to compare the palatability of rolled corn, rolled barley, and rolled oats. They also studied the effect of the preparation of oats on its acceptibility. These grains were fed free-choice in divided compartments of a feeder.

Average daily feed consumption showed that calves preferred rolled corn and rolled barley over rolled oats. About twice as much corn as barley was consumed. Very little oats were consumed. The calves steadily increased corn consumption until they approached weaning. In the early part of the test (first 60 days), the daily grain consumption was very low being less than a pound per day in most cases. The calves did not consistently prefer rolled corn or rolled barley, however, both grains were preferred over rolled oats. In one trial the calves preferred whole oats and rolled corn over rolled oats. The calves actually consumed more whole oats than rolled corn during this trial. These tests point out the importance of feed preparation upon acceptability of a feed.

At Florida, Alexander et al. (1960) set up a test to study the effect of pelleting on creep feeds. Purebred Angus and Hereford calves were used for two years in this study. In the

first year, calves in lot A were fed a mixture of 80 per cent pelleted cornmeal and 20 per cent non-pelleted supplement. Average daily creep feed consumption and gain (pounds) were respectively; pelleted 5.2 and 1.5, non-pelleted 6.7 and 1.8. The weight increase of lot B over lot A was apparently due to 1.5 pounds higher feed consumption.

In the second year, twenty-three calves in lot A were fed a pelleted mixture of 70 per cent yellow cornmeal and 30 per cent supplement. In lot B, twenty-four calves were fed a non-pelleted mixture of 70 per cent steam-rolled (flaked) corn and 30 per cent supplement. Average daily creep feed consumption and daily gain were respectively; pelleted 4.2 and 1.9, non-pelleted 4.0 and 2.1. The difference in weight gain and feed intake were not statistically significant. However, the calves in lot B had the higher average estimated slaughter grades.

Digestability data from steers and sheep indicated a slight advantage for the non-pelleted creep feeds. Digestion coefficients for protein and energy were respectively; pelleted 74.0 and 82.7, non-pelleted 75.0 and 82.8 with steers and pelleted 65.5 and 78.5, non-pelleted 73.0 and 85.9 with the sheep.

At the Fort Hays Branch of the Kansas Station, Brethour and Duitsman (1958b) set up a study to compare whole oats as a creep feed with a group fed rolled sorghum grain and a group which received no creep feed. Creep-fed fall calves ate 718 pounds of rolled sorghum grain and 684 pounds of oats during the creep feeding period. The respective groups gained 67 and 47 pounds

more during this period than the calves non-creep-fed. The price of oats was higher than the sorghum grain that year; therefore the cost of gain was highest for the calves fed oats. The performance of the lots was very similar during the full feeding phase. From the above study, it appeared that rolled sorghum grain was a better creep ration than whole oats.

Nelson et al. (1954), at Oklahoma, added an extra lot to their spring creep feeding trials in order to evaluate molasses as a part of the creep ration. One group of calves was creep-fed 6 parts ground corn, 3 parts oats, and 1 part cottonseed meal. The other group received 5 parts ground corn, 3 parts oats, 1 part cottonseed meal and 1 part cane molasses. The calves receiving the molasses in the creep ration gained an additional 40 pounds and consumed an additional 347 pounds of creep feed. The value of the calves at weaning minus the feed cost was lowest for the group with the molasses added to their creep feed. After a fattening period of seventy-five days for the molasses fed group, eighty-nine days for the control creep-fed group, and one-hundred-seventeen days for the non-creep-fed group the financial return on the non-creep-fed calves was slightly higher than either of the creep-fed groups. The average daily gain in dry-lot was 2.11 for the non-creep-fed group, 1.92 for the control creep-fed group, and 1.79 for the molasses fed group.

Limited Creep Feeding and Alfalfa Hay

A study was initiated by Nelson et al. (1960b), at Oklahoma,

to study the effect of creep feeding a concentrate mixture until weaning, the same ration until spring, and feeding alfalfa hay to calves until spring. The study was started initially in January with two of the lots being fed until April 23. The calves were weaned around the first of July. The cows were on natural pasture and received 2.5 pounds of cottonseed meal per head daily.

The calves which were creep-fed until weaning gained 36 pounds more than those fed alfalfa hay until spring. The continuation of creep feeding until weaning required 422 pounds of concentrate for 33 pounds of gain. Creep feeding the concentrate mixture until spring increased gains 57 pounds over those fed alfalfa hay up to that time. However, when creep feeding was discontinued, those previously fed the mixture gained 33 pounds less than those previously fed alfalfa hay. The consumption of feed for the entire period was 847 pounds for those fed until weaning, 514 pounds for those creep-fed concentrate until spring, and 310 pounds for those fed alfalfa hay. The appraised value of the gain minus the feed cost was about equal for the group fed until weaning and those fed alfalfa hay until spring, but slightly lower for those fed concentrates until spring.

In follow up work on the above an additional two year study, with fall calves, was summarized by Kuhlman et al. (1962) to determine the effects of different management. One problem of major concern was to evaluate the practice of creep feeding fall

calves only until spring. In this summary, calves in lot 1 were not creep-fed. Lot 2 received a creep ration consisting of 55 per cent steam-rolled milo, 30 per cent whole oats, 10 per cent cottonseed meal, and 5 per cent molasses fed until weaning. Lot 3 received the above mixture until spring. The calves in lot 4 received the creep mixture, pelleted, until spring. Those calves in lot 5 received alfalfa hay until spring and those in lot 6 received pelleted alfalfa hay until spring. These were October and November calves which were started on a creep ration around December 20th. The calves were creep-fed until the first part of April (lots 3, 4, 5, and 6). They were weaned around July 20th. The cows were fed an average of 2.5 pounds of pelleted cottonseed meal daily until spring and were on native grass pasture.

The results of this test are summarized in Table 2. Creep feeding a concentrate mixture until spring increased gains an average of 46 pounds (131 versus 168 for lot 2 and 186 for lot 3) over the non-creep-fed lot. During the summer, creep feeding the calves in lot 2 increased gains 27 pounds as compared to lot 1 calves which were non-creep-fed. When creep feeding was discontinued in the spring, the calves previously fed the concentrate meal mixture gained an average of 15 pounds less than the non-creep-fed calves in lot 1.

Winter gains of the calves creep-fed long alfalfa hay and pelleted alfalfa hay were nearly equal and 18 pounds greater than the non-creep-fed calves. Feed consumption of the pelleted

mixture was low and resulted in only an 11 pound increase in gain over the non-creep-fed calves.

The value of the calf minus the cost of creep feed was highest when the creep-fed mixture was fed until spring, second and third highest when fed alfalfa hay in the different forms, lowest when the calves were creep-fed until weaning, and intermediate and nearly equal for those non-creep-fed and creep-fed the pelleted concentrate mixture until spring.

Table 2. Creep-Feeding Fall Calves.*

Lot Number	1	2	3	4	5	6
Creep-Feed	None	Mixture Until Weaning	Mixture Until Spring	Pellet. Until Spring	Alf.Hay Until Spring	Pelleted Alf. Hay Until Spring
Gain to spring, lbs.	131	168	186	147	151	158
Gain, spring to weaning	159	186	144	154	158	153
Total gain	290	354	330	301	309	311
Weaning weight	427	495	466	432	422	447
Feed/calf	-	894	275	132	208	242
Value of gain minus creep-feed cost	$73.25	$67.08	$76.52	$72.66	$76.00	$74.74

*Kuhlman et al. (1962).

DIETHYLSTILBESTROL FOR CREEP-FED CALVES

Implanting calves with diethylstilbestrol on creep rations or adding it to the ration has received a lot of attention during the past few years. There have been many favorable results with this hormone like compound. It has been used to increase weight gain and improve feed effeciency. Therefore, a heavier calf could be produced with less feed.

Implanting with Diethylstilbestrol

Brethour and Duitsman (1959, 1960, 1961, 1962b, 1963b) studied the use of stilbestrol implants for fall calves which were creep-fed. They followed the practice of implanting with 12 milligrams of stilbestrol at approximately sixty-days of age. After the first two years they discontinued using implants with heifers because of problems with vaginal prolapse.

The response to implants was inconsistant in the above tests. In three of five tests implanting stilbestrol increased weaning weight by about 25 pounds. In two of these three tests there were no adverse effects on subsequent feedlot performance. In one of the three tests, however, the feedlot performance of implanted calves was poorer than the controls. In the other two tests implanted calves showed no advantage during the suckling period or in subsequent feedlot performance.

At Iowa, Ewing and Burroughs (1961) summarized two years of study where a six milligram stilbestrol implant was compared to a twelve milligram implant. These two groups were also

compared to a control lot. All of the lots received creep feed and both the heifers and steers were implanted at approximately three and one-half months of age.

The response was similar in both steers and heifers although the response was less consistant in heifers than steers. Stilbestrol implantation increased preweaning weight gain by 11 and 14 per cent, respectively for the 6 and 12 milligram implant. Therefore, it appeared that the 12 milligram implant was more advantageous.

Postweaning feedlot gain was not influenced by previous implantation. The preliminary studies also found no injurious effect upon breeding performance resulting from calfhood implantation.

The effect of implanting steer calves with 12 milligrams of stilbestrol was studied by Meiske et al. (1961), at Minnesota. The steer calves were implanted at approximately two months of age at the start of the creep-feeding period. The implantation of stilbestrol increased the average daily gains approximately 7 per cent. This was a statistically significant increase ($P < .05$).

The feeder grades at weaning were similar, although the implanted calves graded slightly higher. The postweaning performance was not consistently affected by previous implantation.

Nelson (1960a) set up a test in which 0, 6, and 12 milligram implants for creep-fed fall calves were compared. The implants of 6 milligrams of stilbestrol increased the gain of

the steers 16 pounds (7 per cent) and the gains of the heifers 17 pounds (9 per cent) with no noticeable side effects. There was no additional increase in gain of the steers, but an additional increase of 14 pounds by the heifers with the 12 milligram implant. Therefore, the 12 milligram implant, in the heifers, increased weight gain 31 pounds or 16 per cent. Of those implanted with 12 milligrams twenty-five per cent had some noticeable side effects.

Nelson and Kuhlman (1962) summarized the Oklahoma work on implanting calves with stilbestrol. They stated that in thirteen tests with spring calves, the average increase in gain was 29 pounds with an implant of 12 milligrams being accepted as standard.

With fall calves the gains were increased an average of 10 pounds by implanting with 6 milligrams of stilbestrol and 18 pounds with 12 milligrams of stilbestrol. The difference between steers and heifers was small with no detrimental effects on subsequent feedlot gain.

Adding Diethylstilbestrol to the Ration

In a creep feeding trial at Oklahoma, Hendrickson et al. (1958) compared implanting with feeding stilbestrol to spring calves. The calves were implanted twice with a 12 milligram pellet at seventy-five day intervals. The calves which received their stilbestrol in the creep ration consumed 5 milligrams per head daily. The amount added was adjusted weekly for feed

consumption. The implanted calves gained 35 pounds more or 12 per cent more than those fed stilbestrol during the suckling period. However, those being fed stilbestrol actually gained slightly less than the control calves.

Pope et al. (1956, 1957) added 5 milligrams of stilbestrol per calf daily to the creep ration during the last 45 days. The fall calves receiving 5 milligrams of stilbestrol gained approximately 12 per cent more (2.36 versus 2.11) the first year, but only 6 per cent more (2.10 versus 1.97) the second year. Creep-feed consumption and feed per hundred pounds gain was increased slightly the first year. However, the second year the groups fed stilbestrol consumed less creep-feed per calf than those fed the control ration. Slaughter data was similar for the control and stilbestrol fed groups both years.

Hendrickson et al. (1958) made further studies on the effect of adding 5 milligrams of stilbestrol to the creep ration daily. The stilbestrol which was fed to the fall calves in this trial increased the weight gain 23 pounds or about 7.5 per cent. The heifers showed a greater response than the steers. The controls had a slightly higher dressing per cent, graded about one-third grade higher, and tended to show more marbling in the loin eye muscle.

The following year, Nelson et al. (1959) added 5 milligrams of stilbestrol per head daily to the creep ration of spring calves. They then compared the results in this lot with a comparable lot receiving no stilbestrol. In this particular test

stilbestrol did not increase gains over the control group.

Nelson et al. (1960a) again studied the effect that feeding 5 milligrams of stilbestrol, in the creep ration, had on spring creep-fed calves. In this particular test the stilbestrol increased the gain by 26 pounds. The response from feeding stilbestrol was quite variable in the tests reviewed here.

THE USE OF ANTIBIOTICS IN CREEP RATIONS

Certain feed additives have proven to be effective in increasing animal gains and feed efficiency. Many of these additives have been approved by the Food and Drug Administration. There have been several recent tests to determine the effect antibiotics have on calfhood scours and the prevention of liver abscesses in finished cattle at the time of slaughter.

Oral Administration of Antibiotics

At Nebraska, Matsushima et al. (1956) stated that approximately 5 per cent of the beef cattle slaughtered in American packing plants had abscessed livers. The loss from these livers amounted to more than two-million dollars annually. If this vital organ was affected, it could affect the performance of the animal in the feedlot. Liver abscesses appeared about 80 to 120 days after the cattle were put in the feedlot, bu occasionally occurred in cattle directly from the range.

Tests, at the Nebraska experiment station in 1952 and 1953, indicated that steers treated orally with 15 milligrams of

chlorotetracyline (aureomycin) daily from birth to twelve weeks of age had normal livers when slaughtered at the completion of the feeding trial. However, the steers with no aureomycin treatment had a large percentage of liver condemnations due to abscesses.

Due to the progress made in previous tests concerning antibiotics, Matsushima et al. (1956, 1957) decided to do more research along this line. In two tests they made a further study of the oral administration of aureomycin to non-creep-fed steer calves. They were concerned with its effect on daily gain, liver abscesses, and the incidence of calf scours observed during the suckling period. The above factors were in connection with liver conditions in fattening steers. Each calf received two 20 milligram tablets at birth and one tablet daily thereafter until twelve weeks of age.

In both trials, the calves given aureomycin were found to be somewhat heavier at twelve weeks of age when compared to the control group. However, there was no advantage at weaning time in either trial. The incidence of scours was reduced considerably with the aureomycin in the first trial, but was not nearly as successful in the second trial. The cases of scours for the treated and non-treated groups were 12 and 196 respectively during the first year. The second year showed 41 cases of scours for the treated group and 95 cases for the non-treated. The percentage of liver abscesses in the slaughtered fat steers, as far as treated and non-treated groups was concerned, were respectively

2.3 and 16.7 during the first year. However, during the second year there were 17.4 per cent and 33.5 per cent respectively. Many of the treated and non-treated calves being observed for scours were found to have abscessed livers when slaughtered.

Adding Antibiotics to the Ration

The administration of aureomycin by hand, was found to be quite time consuming and impractical under range conditions. Therefore, Matsushima et al. (1958, 1959) added this antibiotic to the creep feed of spring calves. For the treated groups, each calf was given 100 milligrams of aureomycin within a period of twenty-four hours after birth. No further aureomycin was given until the third or fourth week when the calves started to eat a little grain. Aureomycin was consumed at the rate of about 23.8 milligrams per head daily during the first year and 28.6 milligrams the second year.

The creep rations were pelleted the second year because of the decreased consumption of the steers on the aureomycin supplement. Pelleting did not seem to increase the consumption. The consumption, for the entire period, was about 100 pounds more for the first year and 140 pounds more the second year for the calves not fed aureomycin. Due to the decreased consumption, the treated calves had lighter weaning weights the first and second year respectively by 11.2 and 25.8 pounds. The per cent of liver abscesses was 5.3 for the treated group and 13.2 for the control group during the first year. The

second year there was 32 per cent condemnation from the treated group and 24 per cent from the control calves.

In two other trials at Nebraska, Matsushima et al. (1961) used a mixture of streptomycin and penicillin in a creep ration. The addition of these materials increased gains by 17 pounds in one of the two trials. They felt that the differences in the trials were attributed to the loss of antibiotic potency in the pelleting process. The average antibiotic potency of the creep rations was 1 milligram and 16 milligrams per pound in the first and second trials, respectively. The treated calves were also given a 100 milligram antibiotic pellet within twenty-four hours after birth. The above applied to both trials.

The effect of antibiotics has also been studied by Pope et al. (1957), at Oklahoma. They added 40 milligrams of oxytetracycline (terramycin) per head daily to a creep ration forty-six days before weaning. They used fall calves and both the control and antibiotic-fed lots were receiving 5 milligrams of stilbestrol daily. The terramycin increased weight gain by 10 per cent over the controls.

Nelson et al. (1959, 1960a) set up a series of tests to study the effect that 45 milligrams of erythromycin would have on spring and fall creep-fed calves. There was no additional weight gain when erythromycin was added to the creep ration of spring calves. The consumption of creep feed in the two tests was reduced considerably when erythromycin was added. The reduction

was not as great the second year.

The addition of erythromycin, in two fall creep feeding tests, increased the gains by 9 pounds in the first test, but there were no differences in weight gain in the second test. From the work at Oklahoma, it appeared that gains of calves being creep-fed were not consistently increased by adding antibiotics to the creep ration.

COW MANAGEMENT FOR FALL CREEP FEEDING

The increased nutritive requirements of a fall-calving cow suckling a calf, was well established some time ago. Furr et al. (1959) summarized four years of work as to the effect of different levels of supplement on cows and on their calves which were either creep-fed or not creep-fed. In all four years the cows in lots 1 and 2 received an average of 1.5 pounds of pelleted cottonseed meal per head daily during the winter. Cows in lots 3 and 4 received 2.5 pounds of cottonseed meal and 3 pounds of ground yellow corn during the first two years with corn being replaced by milo the last two years. Calves in lots 2 and 4 were creep-fed.

The summarized results of these tests are shown in Table 3. There were definite differences in the weaning weights of the calves. Feeding the cows the high level supplement increased calf weights an average of 30 pounds which was significant at the 5 per cent level of probability. The non-creep-fed calves were 47 pounds heavier and creep-fed calves were 12 pounds

heavier where the cows were on the high level of feeding. Creep feeding increased gain an average of 70 pounds which was significant at the 1 per cent level. The difference was 87 pounds on the low level cow feeding and 52 pounds on the high level feeding.

By mid-April, when supplemental feeding of the cows was stopped, creep feeding had increased gains by 61 pounds and 51 pounds for the low and high level of supplementation, respectively. As one can see, a large percentage of the additional weight resulting from creep feeding had occurred by the middle of April. However, at this time only one-third of the total creep feed had been consumed.

The average amount of creep feed consumed to weaning was approximately 880 pounds. The average cost of the creep feed, in lots 2 and 4, was nearly equal although increasing the amount of supplemental feed to the cows increased feed cost approximately $20.00 per head. Creep feeding consistently resulted in fatter calves at weaning; however most were sold as feeders.

The average results show creep feeding decreased profits at both levels of wintering. All of the lots of calves sold at approximately the same price per 100 pounds, and the value of the increased gain failed to offset the cost of creep feed. The fourth year of the test was the only year that creep feeding was profitable. Yearly variation has to be taken into consideration. It appeared that as far as economical calf

production was concerned, high levels of supplement for nursing cows was not profitable. However, the effect that the level of supplement would have on calving per cent would certainly have to be taken into consideration. More work needs to be done on this aspect before any definite conclusion can be reached.

Table 3. Levels of Supplemental Winter Feeding of Beef Cows and Creep Feeding Fall Calves (Four-Year Average).*

Lot Number	1	2	3	4
Level of Feeding Cow, Pounds Per Head Daily	1½ lbs. Cottonseed Meal	1½ lbs. Cottonseed Meal	2½ lbs. Cottonseed Meal 3 lbs. Grain	2½ lbs. Cottonseed Meal 3 lbs. Grain
Creep Feeding		Yes		Yes
Average weight/calf				
Birth	76	76	77	76
Spring	261	322	293	344
Weaning	469	556	516	568
Supplement feed/cow				
Cottonseed meal	274	274	457	457
Grain			538	538
Supplement feed/calf		884		872
Selling value minus feed cost	$68.41	$66.00	$60.91	$49.62

*Furr et al. (1959).

Zimmerman et al. (1960), at Illinois, set up a trial to compare the results obtained from providing supplemental grain to cows as compared to an equal amount of grain fed to calves in a creep feeder. Fourteen cows were divided into two lots of seven

each. Both lots were fed mixed hay plus a full feed of oat silage. The calves in lot 1 had access to a creep feeder which contained 6 parts oats, 3 parts corn, and 1 part linseed meal. In lot 2, the cow received the creep ration in an amount equal to that consumed by the calves in lot 1. In both lots the calves had access to the hay, but not to the silage. The calves ate very little hay.

The creep-fed calves gained an average of 27 pounds more than those receiving no creep feed. The calves fed the creep ration consumed about 4.2 pounds per head daily during the 97 day period. The grain provided the cows in lot 2 did not decrease their consumption of silage. The results of this trial indicated that calf weight can be increased more economically by creep feeding the calf than by providing extra feed to the cow.

SEASONAL VARIATION IN CREEP FEEDING

Comfort et al. (1957, 1958, 1959, 1960) have studied methods of production to determine in what way the greatest return per cow could be achieved. Several different methods of management were tried. Creep feeding was included in a portion of some of the tests.

In 1957, four different methods of management were used. However, the data on one lot was not completed at the time of publication. Three of the lots were fed to the same approximate weight of 700 pounds and graded high good, and low choice.

The finishing period for all of the groups was in dry-lot. The total amount of shelled corn required to finish September-October calves creep-fed while nursing, December-January calves creep-fed while nursing, and December-January calves creep-fed eight weeks before weaning was 34.9, 18.4, and 16.6 bushels respectively. Nearly twice as much corn was required by the early fall calves.

In the next year September-October calves creep-fed grain from January to July 19 (200 days) and fed in dry-lot for eighty-four days after weaning, required 25.6 bushels of corn and were marketed at 761 pounds. November and December calves creep-fed grain April 1 to September 19 (171 days) and fed in the dry-lot for twenty-two days, required 11.6 bushels of corn and weighed 689 pounds. November and December calves, creep-fed grain May 26 to September 19 (117 days) and fed in the dry-lot for twenty-two days, required 11 bushels of corn and weighed 641 pounds. January and March calves had access to a creep from September 19 to December 21 (90 days) and sold at weaning. The above calves ate only 1.25 bushels of corn and weighed 514 pounds at weaning.

The following comparisons were made during the next year. September-October calves, creep-fed grain January 13 to June 13 (151 days), were fed in dry-lot 112 days after weaning and marketed at twelve months of age. The above calves ate about 8 bushels of corn from the creep and 30 bushels of corn after weaning, graded choice, and weighed 793 pounds when they were

marketed. In another lot, November-December-January calves non-creep-fed were weaned in October and fed for eighty-five days after weaning. They were marketed at twelve months of age, consumed 17 bushels of corn, and weighed 714 pounds when marketed. Half of the above calves graded choice and half graded good. In the third lot, March-April calves non-creep-fed were marketed at weaning (9 months of age). These calves weighed 587 pounds and were fleshy good to choice grade feeders. They made a gain of about 2 pounds per day without creep feeding. The winter calves in this test gave a higher return above all feed costs including that of wintering their dams.

The following year Steptember-October calves creep-fed grain in the dry-lot one-hundred-twenty-one days after weaning were marketed at twelve months of age. They consumed 28.5 bushels of corn to marketing, weighed 801 pounds, and the majority of them graded choice. Also, a group of December-January-February calves creep-fed grain June 6 to September 14 (100 days) and fed on pasture for ninety-nine days after weaning were marketed at the age of eleven months. They ate 4.27 bushels of grain from the creep and 15.3 bushels after weaning. The majority of these calves graded good and weighed 708 pounds when marketed.

SUMMARY

The purpose of this report was to summarize some of the results which have been obtained when supplemental feed was fed

to suckling beef calves. Research workers have found that creep feeding fall calves until weaning increased the weaning weight by about 50-60 pounds. The extra weaning weight usually required about 800-900 pounds of concentrate. Spring calves which were creep-fed usually weighed 25-35 pounds more than non-creep-fed calves at weaning and consumed approximately 400 pounds of creep-feed per calf.

A number of experiment stations studied the value of supplemental protein, complex rations, grain preference, ration preparation, alfalfa hay rations, and limited creep feeding. There appeared to be a slight advantage in weight gain for calves fed additional protein or complex rations, but the results were variable. Tests have shown that calves preferred rolled corn and rolled barley over rolled oats. The calves usually consumed about twice as much corn as barley. Pelleting a concentrate creep ration, in some cases, decreased consumption which lowered weaning weights. Creep-fed calves seemed to prefer rolled sorghum grain over whole oats. Molasses in the creep ration increased feed consumption in a few tests which resulted in greater weaning weights.

Equal results were obtained from fall calves which were fed pelleted alfalfa hay or long alfalfa hay. The winter gains on alfalfa seemed to be about 20 pounds higher than with non-creep-fed calves. However, this winter gain was about 20 pounds less than with calves on a concentrate mixture. Feeding the concentrate mixture, until weaning, increased gains an additional

30 pounds. Creep feeding fall calves a concentrate mixture or alfalfa hay until spring gave the greatest returns.

A 12 milligram stilbestrol implant seemed most successful for beef calves. This implant was usually given at about sixty days of age. The additional gain from the implant seemed to range from 20-30 pounds per animal. The result of adding 5 milligrams of stilbestrol per head daily to the creep ration was quite variable; however an additional 20 pounds gain was frequently obtained. The oral administration of antibiotics (aureomycin) to calves proved effective in controlling calfhood scours and liver abscesses. When these antibiotics (aureomycin usually) were added to creep rations the results were inconsistant. In some cases, feed consumption was markedly decreased by the addition of the antibiotic.

During a four year study in which fall calving cows were fed on a high level of supplementation as compared to a low level, the gains of creep-fed calves were increased an average of 12 pounds by high level supplementation of the cows. The non-creep-fed calves gained an additional 47 pounds when the cows were fed on the high level supplement as compared to non-creeped calves from the low supplement cows. The highest returns were received from cows fed a low level supplement and non-creep-fed calves. The breeding repeatibility and life time performance of the cow would also have to be taken into consideration. In one test, cows suckling non-creep-fed calves were fed the same amount of extra grain as the calves in a creep-

fed lot. Creep-fed calves made more economical use of the feed than the cows in a non-creep-fed lot.

Performance was nearly always improved when calves were supplied with supplemental feed. However, it became a matter of relative costs of grain and cattle as to whether the practice could be recommended or not.

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SUPPLEMENTAL FEED FOR NURSING BEEF CALVES

by

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Research workers have found that supplying supplemental feed to fall born calves from shortly after birth until weaning increased weight gains by about 50-60 pounds. The extra weaning weight usually required about 800-900 pounds of concentrate. Spring calves which were creep-fed (offered supplemental feed) usually gained an additional 25-35 pounds more than non-creep-fed calves at weaning and consumed approximately 400 pounds of creep feed per calf.

The value of supplemental protein, complex rations, grain preference, ration preparation, alfalfa hay rations, and limited creep feeding have been studied. There was a slight advantage in weight gain for calves fed additional protein or complex rations, but the results were variable. Calves preferred rolled corn, rolled barley, and rolled oats in that order. Pelleting a concentrate creep ration, in some cases, decreased consumption which lowered weaning weights. Creep-fed calves seemed to prefer rolled sorghum grain over whole oats. Molasses in the creep ration increased feed consumption in a few tests.

Equal results were obtained from fall calves which were fed pelleted alfalfa hay or long alfalfa hay. The winter gains on alfalfa seemed to be about 20 pounds higher than with non-creep-fed calves. However, this winter gain was about 20 pounds less than with calves on a concentrate mixture. Feeding the concentrate mixture, until weaning, increased gains an additional 30 pounds. Creep feeding fall calves a concentrate mixture or alfalfa hay until spring gave the greatest financial returns.

A 12 milligram stilbestrol implant seemed most successful for beef calves. The additional gain from implants ranged from 20-30 pounds per animal. The results from adding 5 milligrams of stilbestrol per head daily to the creep ration were quite variable; however an additional 20 pounds gain was frequently obtained. The oral administration of antibiotics (aureomycin) to calves proved effective in controlling calfhood scours and liver abscesses. When antibiotics were added to the creep ration results were inconsistant for additional weight gains, scours, and liver abscesses. In some cases, the addition of antibiotics to the creep feed decreased feed consumption.

Fall calving cows fed on a high level of supplement produced creep-fed calves which were 12 pounds heavier at weaning than calves from cows on a low level of supplement. With non-creep-fed calves there was an additional 47 pounds gain per calf where the cows received a high level supplementation. Creep-fed calves usually made more efficient use of feed than when a comparable amount of feed was fed to cows with non-creep-fed calves.

Performance was nearly always improved when calves were supplied with supplemental feed. However, it became a matter of relative costs of grain and cattle as to whether the practice could be recommended.