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R. R. Thalman

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FEEDING AND CARE OF CALVES



THE UNIVERSITY OF NEBRASKA COLLEGE OF AGRICULTURE
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W. W. BURR, DIRECTOR

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Feeding and Care of Calves

R. R. THALMAN

Department of Animal Husbandry

THE usual practice of letting beef calves nurse their mothers until they reach weaning age is of course the most desirable method of production. Certainly it is the least troublesome to the owner and many are willing to concede it the most profitable, especially if labor is considered. Occasionally, however, the calf's mother dies, the cow is sold, or sickness of the cow leaves the calf an orphan. There are times, also, when it seems practical to purchase young calves that normally would continue to receive milk for several months. Where it is possible to put two calves on one cow, or provide nurse cows, the problem is easily solved. There are many instances, however, when no milk or at least a limited amount is available to the calf and the owner is faced with the problem of trying to cheat Mother Nature by substituting other feeds. This is not as easily done as many of the uninitiated are inclined to believe. It is not infrequent that considerable difficulty is encountered in raising calves with limited amounts of milk or none at all. Requests for information on calf gruels, mixed grain feeds, and commercial supplements are frequent enough to make a short circular upon this subject seem desirable. Furthermore, as the more diversified agricultural program gets under way these requests are increasing.

Importance of a Good Start

This circular is concerned primarily with the everyday problems of calf feeding upon limited milk rations. In order to understand these problems it is necessary to have in mind a fairly clear picture of the growth and nutritional requirements of the young calf. To jump in blindly and start feeding the calf is to invite failure or at best unsatisfactory results.

There are but two good reasons for developing the beef calf: (1) to produce beef or veal and (2) to be grown out and used for breeding purposes either in the herd where grown or in a buyer's herd. In either case the calf should be well grown and properly developed if the venture is to be successful, financially or otherwise. Since much depends upon the calf's early start in life, it is very important that proper care and feed be given at that time.

Young animals make far more rapid and efficient gains than older ones. Properly fed, a 300-pound beef-bred calf will gain slightly more than two pounds per day over extended periods and in so doing will require considerably less feed than his two-year-old brother. It is important, therefore, from a cost standpoint to get those good gains while he is still a calf and the impulse to grow is at its height.

Ration Requirements for the Growing Calf

Whether a calf is to be used in the breeding herd or to produce beef makes little difference so far as the nutrient requirements are concerned. This is especially true during the first eight months of the animal's life.

After that the calf that is to go into the breeding herd will of course use relatively larger amounts of roughages and pasture than the fattening calf. Heifers kept for breeding will need little or no grain after they reach a year of age if good roughages are available. Since this circular deals only with young calves we need not be concerned whether the objective is beef production or the maturing of a breeding animal. It usually pays to give all calves under 8 to 12 months of age as good care as possible.

To produce normal growth and development the calf requires the following nutrients: proteins, fats, carbohydrates, minerals, and vitamins. To omit from the ration any one or more of these nutrients is to invite failure. Further, these nutrients must be fed in sufficient quantities and in the proper proportion for optimum results. To supply these nutrients the feeder must use feeds that will furnish them. In addition these nutrients must be found in the feeds that the calf can handle at any given stage in his development. More than that, the feeds should be sufficiently palatable to the calf so that he will eat them without being forced by hunger to do so. The successful feeder must understand feeds and in addition something of the physiology of the digestive tract.

The Digestive Tract

It is well known that cattle have four separate stomachs. One of these, the rumen or paunch, is very large in the mature animal, and has large capacity for coarse feeds such as silage, hay, and fodder. From the paunch comes the feed for "rechewing" or rumination, commonly called "cud chewing." Incidentally no digestion other than by bacterial action takes place in the paunch. Digestion is left for the fourth or true stomach and is accomplished by enzymes found in digestive juices secreted by the stomach. Additional digestion takes place in the small intestine. The amount and character of the digestive juices are dependent to some extent upon the character of the food eaten and upon the age of the animal. For example, the calf digests milk quite readily but does not handle the more complex foods of plant origin as readily as the cow.

In mature cattle the capacity of the "paunch" is several times as large as the combined capacity of the other three stomachs. On the other hand, a calf slaughtered at birth reveals a paunch smaller than an ordinary tea cup but a true stomach somewhat larger than a quart milk bottle. The calf's stomachs are arranged in this fashion because his food in early life consists primarily of milk. As he grows older his digestive organs develop and he gradually becomes able to digest the more complex feeds until finally he can live entirely upon plant growth.

Because of his undeveloped paunch the calf has a limited capacity for feed. He must, therefore, take his food at frequent intervals and in limited amounts. It must be easily and quickly digested and contain all of the nutrients needed by his body. Should he be required to take a coarse, bulky feed, he would not only have difficulty digesting it but would be consuming a relatively small amount of digestible nutrients, and likely one

or more of the necessary nutrients would not be found in that particular feedstuff. His chance, therefore, of receiving a balanced diet would be small.

Meeting the Nutrient Requirements

Milk.—Milk is the natural food of the young animal, and it lacks but few nutrients. For the young animal, milk is the most natural and most complete food available and it is with difficulty that milk can be excluded from the diet of the young.

The value of the first milk or colostrum to the newborn calf is quite generally known. Colostrum is thick, very yellow in color, and contains nearly six times as much protein as is contained in ordinary milk. Contrary to popular opinion it is not much higher in fat than ordinary milk.

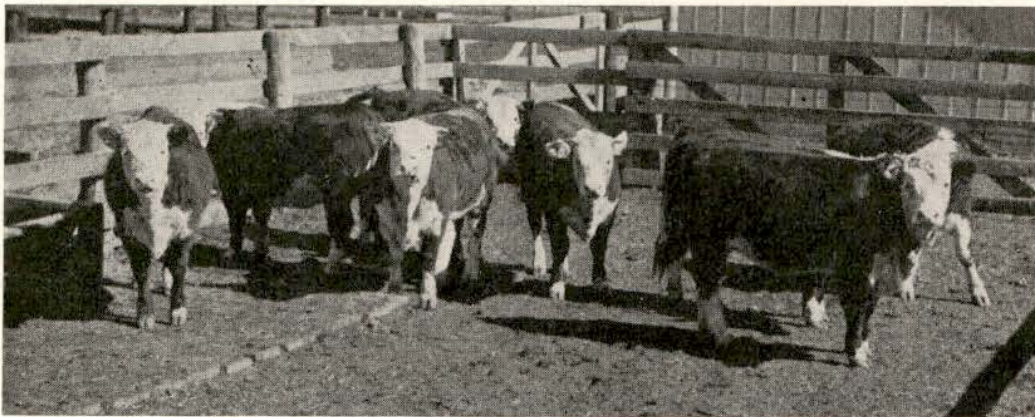


FIG. 1.—High-quality heifers that have a good start in life. Growth and thriftiness like this cannot be obtained without grain at an early age.

Colostrum is noticeably higher in mineral content, so necessary to bone growth, than common milk and the nutrients provided are very easily digested. The laxative properties of colostrum are important and it is believed that it may also have a beneficial germicidal effect. A calf started from birth on his mother's milk as nature intended, is usually off to a good start.

Even though the digestive systems of young calves are not fully developed they are capable of digesting and assimilating without difficulty the nutrients of milk. The protein content of milk is high and of good quality and meets the protein requirements for growth. The fat and sugar found in milk furnish concentrated energy in an easily assimilated form for the production of heat and fat. The high calcium and phosphorus content provides for rapid bone growth and if the cow is receiving a satisfactory ration most of the vitamin requirements will be adequately accounted for. It can thus be seen that it is with difficulty that man can substitute other feeds for milk, and if he does, care in the selection of feeds is essential.

There are few if any feeds better than milk for the young calf, but even milk is not 100 per cent sufficient under all conditions. If the calf is to be fattened and developed properly he will need additional feed in the form of grain and a high-quality roughage, preferably a good legume hay. This supplementary feeding should start as soon as he will eat, which in most cases will begin at around a month of age. It is a good investment to allow the calf access to a creep in which ground grain and bright, leafy alfalfa hay are provided. The feeder so handling his calves will be well repaid for his efforts.

All milk does not have the same effect upon the digestive tract. It is a well known fact that milk too rich in fat is likely to cause digestive disturbances. Milk from the Jersey or especially the Guernsey is not regarded by most calf feeders as being as good as that from Holsteins or the beef breeds. Most purebred breeders fitting show calves will not use Jersey or Guernsey cows for nurse cows because of the danger of the milk causing scours and other digestive ailments. Since there is considerable difference in the composition of milk from different cows even within a given breed, it is also a good practice not to keep shifting the calf from one cow to another.

Mastitis or "garget," an udder disease of cows, is very dangerous to the well-being of calves, especially to the younger ones. Milk from cows so diseased should never be used for the calf. Feeding it may cause severe intestinal inflammation and scours, resulting in much sickness and many deaths among calves.

Protein requirements and how to supply them.—During the growing period the calf requires rather large amounts of protein. Not only must the supply of protein be adequate but it must be of good quality, containing the essential amino acids for growth, life, and well-being of the animal. Protein is that nutrient used for the production of lean meat or muscle, hair, and hide. To limit the protein below bodily requirements slows up the growth and may result in a stunted calf.

There are two general types of protein-rich feeds: (1) legume roughages and (2) protein concentrates. The latter class might be divided into two classes: those with a high and those with a medium quantity of protein. Common protein feeds of each class suitable for calf feeding are as follows:

Protein Roughages

- Alfalfa hay—green, leafy, and fine stemmed
- Clover hay—clean, good colored, leafy, and fine
- Lespedeza hay—good quality and leafy
- Soybean hay—well cured—not too mature when cut

Protein Concentrates

- Cottonseed cake or meal
- Linseed oil meal
- Soybean oil meal
- Meat meal or tankage

Fish meal
Dried milk (skimmed or whole)
Corn gluten meal
Peanut meal
Blood meal (used only in small quantities)



FIG. 2.—Good-quality calves that look contented and well-fed. Silage, cottonseed cake and a little grain make a difference. These calves have had only the protection of an open shed during the winter.

In deciding upon which of these feeds to use one must of course keep relative cost in mind but not to the exclusion of all other factors, especially for the calf. Of the roughages none are superior, or even equal, to good bright leafy alfalfa hay. Fine second, third, or fourth cuttings are best for calves. Occasionally, however, a calf subject to bloat will be encountered; and in that case it may be necessary to resort to prairie hay or a mixture of prairie and alfalfa or to clover hay. In some cases feeding a lower grade of alfalfa will overcome the difficulty. No matter what roughage is used, the calf should receive only that of good quality, properly cured, and as free from dust, mold, and other foreign material as possible.

Frequently a small amount of alfalfa or other protein roughage can be ground into a meal and mixed with the grain ration. In doing this, however, care should be exercised not to make the mixture contain more than 15 per cent by weight of this meal. Additional roughage may be provided in a rack from which the calf may eat at will.

Feeding a high protein concentrate to the calf is a practice that is seldom if ever uneconomical. It is by far the most effective and least costly method of assuring a proper protein supply. This is especially true where

the milk ration is limited, and even with a plentiful milk supply the practice is desirable.

Protein feeds of animal origin such as tankage, meat meal, and fish meal are superior from the standpoint of both quantity and quality of protein. Most of these feeds are highly digestible and contain most of the essential amino acids. Blood meal may be one exception and though very high in its protein content the digestibility is relatively low and the protein only of fair quality. The principal objection to the exclusive use of these feeds is their odor and resulting lack of palatability. Though a calf soon learns to eat them, they are best used in limited quantities, and when mixed with other feeds.

Of the protein feeds of plant origin there is little difference between linseed, cottonseed, and soybean oil meal. Relative price should in this case be the principal factor in selection. All are palatable and nutritious and contain a relatively good quality of protein, though soybean oil meal is low in minerals, especially calcium. Corn gluten meal can best be used to supplement grain rations other than corn, or in mixtures with other protein concentrates.

Carbohydrate requirements—energy- and fat-producing feeds.—Besides the protein required for growth the calf requires a certain amount of energy-producing food. The starches, sugars, and fats fall under this heading and where grain feeding is practiced the calf does not normally suffer from a lack of these nutrients. In addition to energy for growth, the calf requires energy for digestion, activity, body heat, and fuel for the vital organs. These demands for energy represent a fixed maintenance charge. Fat is produced by the energy-producing food that is available after the above demands have been supplied. Therefore, if the calf is to fatten he must consume more energy-producing food than is required to maintain the body. However, if he is to use these nutrients most efficiently there must be a proper balance between the protein and these energy-producing feeds and hence the term heard so frequently, "balanced ration." Generally speaking fat and carbohydrates have the same general function in the ration. However, fat is a more concentrated form of energy-producing food than carbohydrates and is worth approximately $2\frac{1}{4}$ times as much for this purpose.

The ratio of protein to carbohydrates and fat is known as the nutritive ratio. It is found by multiplying digestible fat by $2\frac{1}{4}$ and adding the product to the digestible carbohydrates, which gives total digestible energy-producing material. This then divided by the digestible crude protein equals the ratio between protein and energy-producing material, or nutritive ratio. For example, the nutritive ratio of corn is found as follows: 100 pounds of corn contain 7.8 pounds of digestible protein, 66.8 pounds of digestible carbohydrates, and 4.3 pounds of digestible fat. Thus we have:

$$66.8 + (2\frac{1}{4} \times 4.3 = 9.68) = 76.48 \div 7.8 = 9.8$$

The nutritive ratio is thus 1 part of protein to 9.8 parts of energy-producing material. This illustration shows but a single feed but the nutritive ratio of other rations is found in the same way.

The proper nutritive ratio for cattle is dependent upon their age and whether or not they are being fattened or maintained in stock flesh. For the young calf the desirable nutritive ratio varies between one part of protein to 3.9 and 4.5 parts of energy-producing material. In other words, the ration that falls within this nutritive ratio will, if supplied in sufficient quantity, meet the nutritive requirements of the calf for maximum production, provided of course that these nutrients are supplied in a form suitable to the relatively undeveloped digestive apparatus of the calf.

The farm grains as a class are all relatively high in their carbohydrate and fat value. Some are more easily digestible, more easily assimilated, and more palatable than others, but, by and large, considerable substitution of one grain for another can be made without changing the ration materially. In addition to the grains, such feeds as molasses have considerable energy value.



FIG. 3.—Heifers just coming of breeding age and matured like these need little or no grain from this stage on. Silage with alfalfa or a high protein concentrate will keep them in good flesh.

Feeds rich in carbohydrate include corn, wheat, grain sorghums, barley, rye, oats, millet, and hominy. Of the feeds listed corn rates the top because of its palatability, high energy value, digestibility, and, most of the time, its availability. Wheat may be substituted for corn either wholly or in part with fairly good results though the ration will be less palatable to calves. Rye has about the same analysis as wheat but is less palatable and should be used as a part of the grain ration. Oats are very palatable and higher in protein than corn but are more bulky. The bulkiness is due to the fibrous hull which is low in digestibility, thus rendering oats less nutritious than corn.

In making up a ration for calves, it is always very desirable to use a mixture of more than one of the above grains. Such a mixture is more

palatable and at the same time adds to the chances of including in the ration the various nutrients necessary for growth and fattening. With these grains should be mixed one or more of the high protein concentrates previously discussed.

Grains and grain by-products intermediate in protein and carbohydrate value.—This classification includes such feeds as wheat bran, shorts, soybeans, cowpeas, and brewer's grains. Of these feeds the most commonly used for calves are bran and shorts or middlings. They are considerably lower in protein than the protein concentrates previously discussed, but also higher in protein than the high carbohydrate concentrates. For this reason they enjoy an intermediate position as regards proteins and carbohydrates or energy value. Being rather bulky in nature they add to the palatability of the concentrated grain ration. They also aid in keeping the bowels open and have a beneficial effect upon the digestive tract that aids in keeping the calf on feed.

Minerals.—To build a sound and healthy skeleton and body, adequate amounts of minerals, especially calcium and phosphorus, are required. A lack of sufficient minerals may be even more disastrous to the calf than a shortage of protein or carbohydrates. Should a mineral-deficient ration continue over long periods, skeletal development is abnormal, resulting in serious deformities. The calf's bones are unable to stand the increasing weight and may bend, become unsound in the joints, and in some cases may even break. There is also a tendency for the calf to become unthrifty, listless, and to use his feed very inefficiently.

The calf getting plenty of milk is usually free from mineral deficiencies unless mineral-deficient supplementary feeds are continued over relatively long periods. Calves getting plenty of good legume hay such as alfalfa or good pasture are also relatively free of mineral deficiencies, unless growth is very rapid. In the event that a protein concentrate such as tankage or fish meal is fed, the mineral content of the ration is also increased materially.

Should the calf appear unthrifty and show evidences of mineral deficiencies by enlarged joints, crooked bones, and a tendency to chew rags, sticks, bones and otherwise show a depraved appetite, the condition is readily corrected through the use of mineral feeds. These need not be expensive commercial mixtures, but can be made at home easily and cheaply.

Mineral deficiencies caused by insufficient amounts of calcium and phosphorus are far the most common. This is true because these minerals are needed in relatively large amounts. Iodine may in some localities be at fault though iodine deficiencies in Nebraska are not common. In rare cases deficient iron and copper may cause trouble, but few calves will need additional mineral feeding of these types under most conditions.

Where there is a deficiency of calcium and phosphorus in the ration, bone meal, which may be purchased from the packing houses, will probably come as near meeting the needs as any other substance. Powdered limestone (calcium carbonate), air-slacked lime, marble dust, or finely

ground oyster shell may be used to correct a deficiency of calcium or lime in the ration.

A mineral mixture that gives excellent results for all classes of farm livestock can be made as follows: steamed bone meal 2 parts, ground limestone 2 parts, and salt 1 part. This mixture should be kept before the calves at all times so that they can eat it at will. It can also be mixed in the feed at the rate of 1 pound to each 100 pounds of the grain mixture. Very good, ready-mixed commercial mineral feeds are available on the market. Many of these contain iodine and other mineral ingredients which may or may not be needed but which do no harm. Should goiter or "big neck" occur in calves, the condition can be corrected by giving iodine. This can be added to the above mixture if desired, in the form of potassium, sodium, or calcium iodide. If mixed into the mineral, two hundredths of one per cent of the mineral mixture (approximately two ounces) are a sufficient amount.

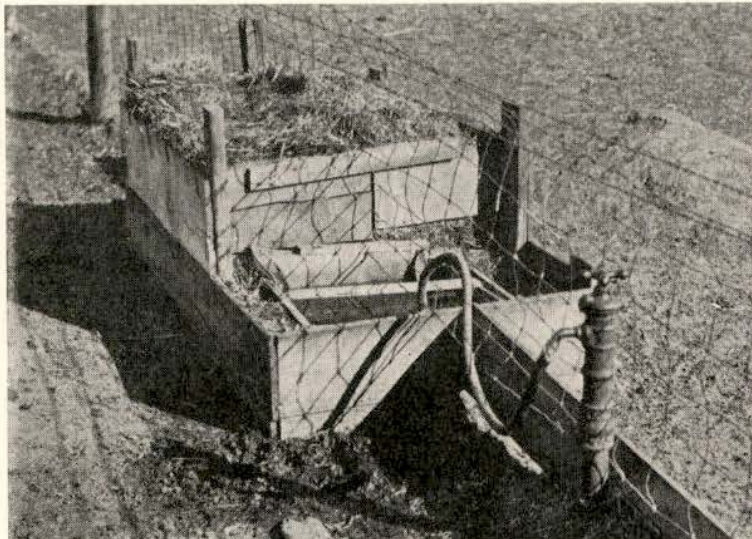


FIG. 4.—A water tank so protected insures calves a cool drink in summer and a warm drink in winter. Good, clean water cannot be overemphasized in calf feeding.

Vitamins.—Luckily the cattle feeder is relatively free of vitamin troubles in his feeding operations with calves. Vitamin C is not needed by the calf, and vitamins A and B are quite likely to be present in the good grain mixture containing yellow corn and other grains. Vitamin D and to some extent Vitamin A are found in limited amounts in good green leafy alfalfa hays and in the pasture grasses. Most milk contains some vitamin A and to a lesser extent vitamin D. If the calves show a tendency toward respiratory troubles, lack of thriftiness, and crooked legs with big joints when fed rations high in mineral, this is evidence of a lack of vitamins A and D. The condition can be corrected by feeding cod-liver oil which is rich in both vitamins. Cod-liver oil fed at the rate of one tablespoonful daily should prove ample.

Salt.—Common salt is required by all animals and should be provided either in the feed mixture or be available to the calf as such whenever he desires it. The latter way is a good practice, and for calves fine salt is better than block salt. A calf from birth until a year of age will require a little less than one ounce of salt per day.

Water.—Too often the calf is made to get all his drink from milk. Even the small calf from two or three weeks on should have access to good clean water at frequent intervals. This is especially true in the summer. The water in winter should not be near freezing as is too often the case. Ice water chills the calf and stops digestion until that water is warmed by the body heat. If the calf is to be kept thrifty, the water should also be clean.

Rations for Calves Receiving Milk

It is not unusual for calves to be carried upon their mother's milk for several months without other feed than a little pasture or hay. Grass plus milk from the dam is of course the rule with most of the range-bred calves. Raising calves on the farm should, however, be a different practice. On the average corn-belt farm it is most generally uneconomical to carry calves until they are yearlings and sell them as stockers or feeders. The farm cow herd should use the pasture in summer and the rough feed in winter. Surplus grain should be sold through the calf and that animal marketed as beef. If the quality is good and the calf is of acceptable beef conformation, it is generally a better practice to have the calf ready for market at from 12 to 15 months of age. If the calf is of the dairy type or mixed breeding, it is probably a better practice to market the calf as veal. This is especially true with the steers. Frequently steer calves so marketed will sell for almost as many dollars per head as veal as they would if sold as yearlings.

Whether sold as veal or baby beef, grain feeding from an early age is both necessary and economical. Never in the calf's life will he return as much for the grain consumed as during the calf stage. The practice of feeding grain to suckling calves has been termed creep feeding, which means nothing more than starting the grain feeding while the calf is still nursing. It has many advantages, among the most important of which are the following: (1) it produces extra finish and growth, thus making a bigger and fatter calf at a younger age; (2) it prevents the usual afterweaning setback; (3) it shortens the feeding period after weaning from 200 days to from 90 to 100 days; (4) it reduces the overhead expense and the risk attendant on keeping the calves 6 to 10 months longer; (5) it uses the feed more efficiently; and (6) it permits a larger cow herd or reduces the necessary pasture acreage.

Even though running with his mother, the calf will start to eat grain before he is a month old. Though he does not eat much, the habit established then will stand him in good stead when he is two to three months old. By this age he will be eating sufficient grain to start the fattening process. For the young calf it is better if the grain is ground. Since fatten-

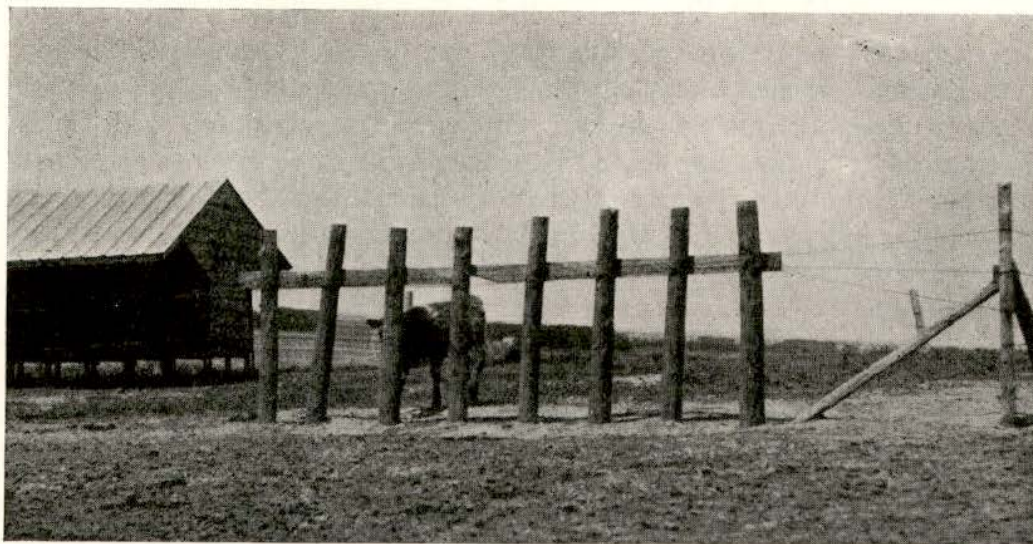


FIG. 5.—An inexpensive creep for calves is a sound investment where cattle are kept. This creep would be more effective if some shade were afforded the calves.

ing and growth are the objectives, the ration should be well balanced. Corn or similar grain should form the bulk of the ration but it should also include a high-protein feed. Ground oats and corn make a very satisfactory grain feed, being both palatable and nutritious. Oil meal or other protein feed will balance the ration very well. For the fattening calf the following ration mixtures will be found quite satisfactory: (In all cases, proportions are given by weight.)

Ration No. 1

Cracked corn	5 parts
Ground oats	3 parts
Linseed meal	2 parts

Ration No. 3

Cracked corn	8 parts
Linseed meal	2 parts

Ration No. 5

Cracked corn	8½ parts
Alfalfa meal (leafy)	½ part
Linseed meal	1 part

Ration No. 2

Cracked corn	4 parts
Ground oats	4 parts
Wheat bran or shorts	2 parts

Ration No. 4

Cracked corn	4 parts
Ground oats	3 parts
Bran	1 part
Molasses	2 parts

Substituting feeds in the mixtures.—Cracked corn has been used for illustration. It is no doubt the best of the farm-grown carbohydrate feeds but wheat, rye, barley, or the grain sorghums can be substituted for it. With the small grains it is best to use oats in the mixture to add to the palatability and give bulkiness to the grain mixture.

The protein feed suggested for these rations (linseed meal) can be replaced with cottonseed meal, soybean meal, or others of the protein concentrates discussed on pages 7 and 8. If tankage or fish meal is used the quantity can be cut down by one-third since it has a higher protein content

than linseed meal and like feeds. Better results will be obtained with "dry-rendered" than with "wet-rendered" or "digester" tankage.

In Ration 4, molasses was introduced to add palatability to the mixture in case it seems desirable to induce more grain consumption. Fine, leafy alfalfa or other legume hay should be fed in racks in addition to the above mixtures. In the case of older calves, 8 to 12 months, that are to be kept for breeding purposes, it is sometimes desirable to feed silage and limit the amount of grain lest the calves get fatter than is consistent with good management.

Feeding skimmilk.—This is of course a more complicated feeding problem than allowing the calf to run with its dam. Such problems as changing from whole milk to skimmilk, amount to feed and frequency, as well as supplementary feeding, take some time and care. Perhaps this accounts for many of the stunted, paunchy calves one so often sees around farms where skimmilk is used. However, it has often been demonstrated that there is little difference between the skimmilk and whole-milk calves under proper feeding methods.

It is always a good practice to keep the calf on whole milk the first month or six weeks to insure a good start. Further it gives the calf sufficient time for the development of his digestive apparatus to a point where he can digest a small amount of grain. In addition, he learns to eat grain during this period, and when the change is made from whole to skimmed milk, there is less of a shock to the digestive system. Once the calf reaches an age where he can eat and digest grains, he will do practically as well upon skimmed milk as upon whole milk. The only difference between the two is, of course, the fat content, the fat being removed in the separating process. Good grain mixtures supply enough fat to take the place of that in milk.

Changing to skimmilk should be done gradually. The time required for the change is usually from a week to 10 days. If there is any foam on the milk it should be removed before feeding since it may cause bloat and other digestive disturbances.

Milk, whether whole or skimmed, is more easily digested and less likely to cause trouble if fed warm. If possible, it should be about body temperature. A thermometer used in warming the milk should register about 95° F. Further, the milk should not be fresh one day and almost sour the next, for trouble is sure to develop if it is. The pails should be kept scrupulously clean. Dirty pails are frequently responsible for sick calves.

The amount of milk fed will of course depend upon the age and size of the calf as well as the quantity of the milk supply. The average-size calf should receive around 8 pounds of milk daily for the first two weeks, after which the allowance may be increased approximately 2 pounds each week until the calf is consuming approximately 20 pounds at 8 weeks of age. For all practical purposes, a pint of milk weighs 1 pound.

If enough milk is not available, it must be borne in mind that the addition of water to the milk does not help the calf any. It is better to

give the calf short rations of milk than to dilute the milk and decrease the calf's capacity for other feed. Watered milk and too little grain and other feed are responsible for most stunted, "pot-bellied" calves that are of no particular value.

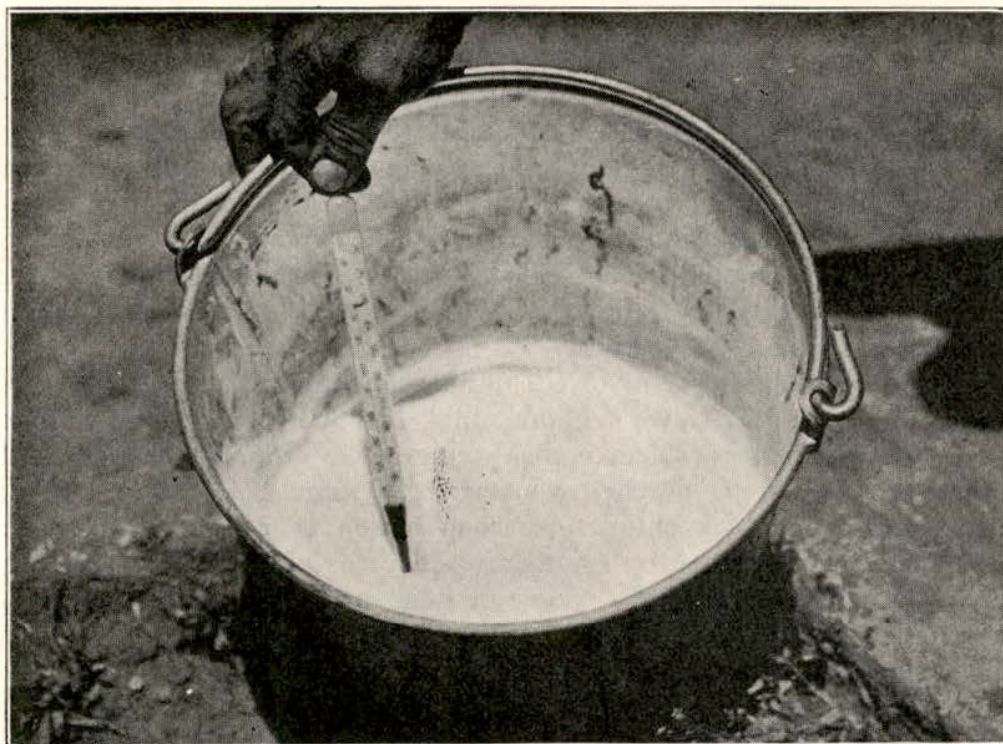


FIG. 6.—Take temperature of milk for calf feeding.

Skim milk feeding should never be practiced without supplementary grain feeding. Supplementary feed is even more necessary and economical than when the calves are getting whole milk. The feeds and grain mixtures can be the same as those listed for calves on whole milk. If the calves seem to lack bloom when so fed, the proportion of corn may be increased slightly.

Weaning age is normally around eight months when calves are running with their dams. Calves intended for show purposes may be continued on milk for much longer periods. If a calf is getting skim milk and the amount is limited, he might as well be weaned at about seven months of age. Younger calves, five to six months old, are often weaned, but rate of growth is usually slowed down when this is done.

Dried skim milk can sometimes be purchased at a price that is not prohibitive for calf feeding. It makes a good substitute for milk when the latter is not available. The protein content is relatively high and it is easily digested. Dried milk can be fed in the powdered form mixed with the grain or as a liquid in water. If fed as a liquid it is customary to dissolve one pound of milk powder in nine pounds of hot water (110° to

140° F.). It of course is necessary to allow the mixture to cool down to approximately 95° F. before feeding.

Dried buttermilk may be used in the place of skimmilk, but more care will be required in getting the calf on feed. Buttermilk is likely to cause scours and the calf must become accustomed to it very gradually.

Feeding the Calf without Milk

The value of milk in the calf ration has been pointed out in the foregoing pages, and the feeder who attempts to raise calves, especially the very young ones, without milk is undertaking a rather difficult job. The task is so difficult that the practice of raising calves in this manner for commercial beef purposes cannot be recommended. Where an animal is a potential breeding animal of considerable value, it might of course prove practical, since the trouble and cost involved would be more than offset by the calf's ultimate productivity.

In spite of the trouble involved, numerous inquiries are received regarding the feeding of calves without milk. No doubt one of the reasons for the interest in this problem is that young calves around sale barns and shipping points can be purchased for from 50 cents to \$2.00 per head, which makes them look cheap. A second reason is no doubt the result of the effective advertising by commercial concerns of calf gruels that can be used as substitutes for milk. Some of these preparations are very satisfactory and give relatively good results, but these mixtures are usually rather expensive. Normally, however, the feeder without milk would be better off financially to leave the young calf alone or else purchase a good nurse cow that would take care of more than one calf until such time as the calf would perform satisfactorily upon home-grown feeds.

If the feeder is going to undertake to raise calves without milk, it would certainly be desirable to leave the calf on the cow for at least the first month. In the opinion of the writer, there would seldom if ever be a situation where it would pay to attempt the raising of calves from birth without milk.

As previously mentioned, perhaps the best milk substitute ordinarily available is powdered skimmilk. This might be supplemented by some good commercial calf meal or home-made gruel. Few attempts have been made experimentally to produce calves without any milk. In most cases the calves have been allowed whole milk for from six to nine weeks and then placed upon dry feeds made into calf meals. Where properly handled, this method of raising calves has proved quite successful. The gains made during the first six months were of course lower than where skimmilk was used, and they in turn were lower than with calves fed upon whole milk. As yearlings, however, the difference due to handling during the first six months was not so marked as at the halfway stage. Most of these tests were concerned with the raising of dairy calves and the condition as yearlings was therefore less of a factor in success than with the beef calf.

The use of gruels should probably be limited to the very young calf because of the labor involved. At two to three months of age a calf will get along almost as well upon dry calf meals. Such meals fed as gruels should be finely ground to keep them from settling out when mixed with water. Very coarse grinding or cracking is preferable when the meal is fed dry.

Several grain mixtures suitable for gruels or dry meals are in use and have given fairly good results.

1. Cornell (N.Y.) Experiment Station.
 - 25.00 pounds yellow corn meal
 - 15.00 pounds malted barley or ground barley
 - 10.00 pounds red dog flour or wheat middlings
 - 1.00 pound precipitated bone meal
 - 1.00 pound precipitated calcium carbonate
 - 1.00 pound salt
2. Cornell (N.Y.) Experiment Station.
 - 32.25 pounds ground yellow corn
 - 28.00 pounds rolled oats (not including hulls)
 - 10.00 pounds wheat bran
 - 5.00 pounds linseed meal
 - 3.00 pounds white fish meal
 - 20.00 pounds dried skim milk
 - 0.50 pound salt
 - 0.50 pound each of bone meal and ground limestone
 - 0.50 pound cod-liver oil
3. U. S. Bureau of Dairy Industry.
 - 50.00 pounds corn meal finely ground
 - 15.00 pounds linseed oil meal
 - 15.00 pounds oats, finely ground or preferably rolled
 - 10.00 pounds dried blood flour or fish meal
 - 10.00 pounds skim milk powder
 - 0.50 pound salt

Stir one-half pound of the mixture into $4\frac{1}{2}$ pints or pounds of boiling water and feed when sufficiently cool. This constitutes one feed or half of the daily ration for a calf one month old. This may be increased as the calf increases in age until he is receiving two pounds of the mixture in water daily at two months of age.

4. Purdue (Indiana) Experiment Station.
 - 10.00 pounds hominy feed or corn meal
 - 10.00 pounds linseed oil meal
 - 10.00 pounds red dog flour
 - 10.00 pounds blood flour

Stir one-half pound of the above mixture into three pints of boiling water and cool to 95° F. This constitutes one feed where the calf is fed twice daily at one month of age.

Commercial calf feeds are numerous and varied both as to price and composition. When using them the feeder should follow the recommendations of the manufacturers.

Pasture for Calves

While there are few feeds so good as green grass for general health and well-being of farm animals, it is not always advisable to turn calves to pasture. Green succulent grass early in the spring is likely to cause scours in young calves. In addition, the grass is frequently so palatable that the calves do not eat enough grain for fattening. This is important with the calf being raised for beef purposes. The young animal being kept for breeding purposes may have pasture when he is old enough to continue eating grain and the forage is sufficiently mature not to cause excessive "looseness."

Silage and Miscellaneous Feeds for Calves

Though rather bulky in nature, silage makes an excellent feed for calves that are past four and five months of age. Though not very concentrated, a handful or two of silage mixed with the grain serves as an appetizer and aids in keeping the calf on feed. This is especially true where the calf is being crowded for market or show in hot weather. Fresh chopped fodder, root crops, or wet beet pulp also have the same effect.

Castrating, Dehorning, Marking, and Shelter

Castrating.—If a calf is to be "steered," the sooner it is done the less the setback to the calf. Calves can be castrated when but a day or two old if they are healthy, and if done it is seldom if ever that bad results are encountered. While castrating can be done at any age it should be done before three months. Either the knife or pinchers can be used but the writer much prefers the knife method. Too frequently the pinchers fail to do a good job and as a result it is not uncommon to have to repeat the operation or else have a "staggy" calf. It is not necessary to castrate calves intended for veal.

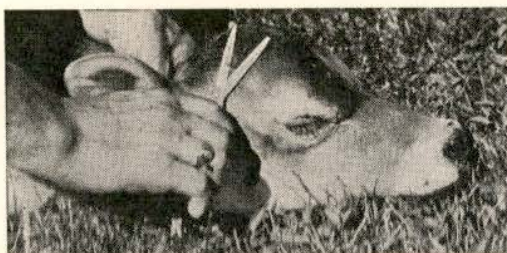


FIG. 7.—Dehorning with caustic should be done before the calf is two weeks old. The button is exposed by clipping and the caustic applied. A scar is left where the horn would have grown.

Dehorning can be done when the calf is very young by preventing the growth of horns or at any time after the horns are well formed. If horns are to be prevented from growing the calf must be treated just as soon as the horn button appears, which will be from a few days to two weeks after birth. The procedure for treating to prevent horns is very well described in Nebraska Extension Circular 622. Quoting from that circular:

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"First clip the hair from a small spot around each horn button, a little knob that may readily be felt with the fingers. Then just inside the outer edge of the clipped area make a thick application of vaseline or petroleum jelly. A small pencil or stick of fresh caustic potash or caustic soda is next wrapped in paper to protect the hands of the attendant. One end of the caustic, which is allowed to extend beyond the paper, is moistened in water and rubbed in a circular motion against the horn button until the skin is burned through and the button destroyed. Usually the stick is applied alternately to each button so as to allow the caustic time to take effect. When properly done, there should be a spot the size of a dime above each horn button where the skin is completely burned through. Care should be used not to moisten the caustic too much or to get it on any other part of the animal, as it will burn the hide. When finished, powdered alum or powdered boric acid may be sprinkled over the burned spot to prevent bleeding.

"After treating, do not turn calves out into the rain, for the caustic may run down and burn the head. The calves should be kept separate for a few hours after application to prevent licking by the mothers or by other calves. If this is not done, bad burns may result.

"A paste for the prevention of horns may be purchased and used by those who prefer it to the stick of caustic. Directions should be followed closely if good results are to be obtained. Care must be taken, however, to see that the calf does not scrape off the paste for 20 minutes or before it effectively destroys the horn buttons."

Marking the calf for identification is not always necessary unless the calf is a purebred which is to be used for breeding purposes. In that case it is not only desirable but necessary. The marks should be of a permanent nature and a record made of the same so that no chance for error or confusion would ever occur. Brands can be used although they detract from the looks of the animal. Neck chains with numbers are fairly satisfactory, but necessitate some attention and occasionally are lost or worn out. On the horned breeds, horn brands work fairly well but must be renewed about once each year while the horns are growing. Tattoo numbers in the ear are probably the most satisfactory for permanent marks but cannot be read without catching the animal. Formerly the black breeds were not adapted to the tattoo but there is a tattoo ink that works very well with Angus cattle at this time. The Angus in the University herd have been tattooed and the numbers are easily legible. Ear notches also make a very satisfactory method of marking, but mar the appearance of the animal to some extent.

Shelter in Nebraska need not be elaborate. The climate in the middle west is not so severe in winter that tight barns are necessary. Closed barns are conducive to pneumonia since calves become sweaty at night and then catch cold when turned out the following morning. In the winter a good windbreak and a shed open to the south, if well bedded, will be sufficient for calves after they are a month or two old. The bedding should be kept

clean and dry. During the summer shade is necessary and where sheds are used they should be open near the ground on at least three sides to permit a free flow of air. Often it is desirable to hang burlap or other material on the open sides to darken the shed to protect the calves from flies.

All too frequently the beneficial effects of the sun are overlooked. Calves will become thrifty and have more resistance to disease if exposed daily to sunlight. They should not be shut in a dark barn over long periods. Direct sunlight, besides keeping down disease, is also a potent source of vitamin D, which is the factor responsible in the prevention of rickets and bone disorder.

Keeping the Calf Healthy

Vaccination against blackleg should never be neglected. Immunization against this disease, which kills so many young animals between three months and two years of age, is almost 100 per cent effective by vaccination. The cost of vaccinating a calf is approximately 10 cents and immunization is practically complete, though some cattle owners vaccinate twice, approximately six months apart. It is a good practice to vaccinate all calves when they are approximately six months of age or before. Fall or winter is usually the best time.

Ringworm is probably the most common ailment of young calves. It is a parasite which affects the top layer of skin, causing circular bare spots on the hide that are covered with crusts. Treatment consists of scrubbing with a stiff brush until the scurf is removed. When this is done a strong solution of tincture of iodine should be applied. Three or four treatments will usually clear up the condition. A mixture of one part of tincture of iodine and three parts of glycerine is also good for treating ringworm. It sticks better than tincture of iodine alone and is not so apt to flow over the skin area where it is not needed.

Pneumonia is common among calves, especially during the fall and early spring months. The symptoms are coughing, listlessness, rapid and labored breathing, and fever. Death may result in a few hours or a few days, or the animal may recover.

When it occurs the calf should be placed in a dry, well bedded stall with as near constant temperature as possible. Do not disturb the calf other than to give him his milk. Blanketing sometimes helps. Other than the above there is little that can be done without the service of a veterinarian. Pneumonia is often referred to as hemorrhagic septicemia and some cattlemen vaccinate in the fall against it with a mixed bacterin. Some veterinarians recommend the practice and others do not.

Lice can do considerable damage among a group of calves. They cause excessive rubbing and a ragged appearance of the calf due to the loss of hair. The calf also becomes thin and unthrifty. Clean premises is the first step in lice prevention. If the calf is infested with lice, washing the calf and then wetting him with a diluted dip solution is quite effective. Two to three treatments at weekly intervals will be necessary. Kerosene emulsion

is probably better for treating badly infested calves. It is made as follows:

Dissolve about one-quarter pound of common laundry soap in one gallon of soft water by boiling. When the soap has all dissolved and the solution is still hot, pour into it two gallons of kerosene and stir the mixture vigorously. Of the resulting creamy emulsion one part is added to eight or ten parts of warm soft water. This can be used as a spray or applied by means of a stiff fibered brush. Two treatments at from 10- to 14-day intervals are often necessary.

Sodium fluoride in powder form or other lice powders may be used for the biting type of lice but are not very effective for the blood sucking types. The powder should be sprinkled along the neck, back, shoulders, inner surface of the thighs, and on the head and ears. Do not get the powder in the calf's eyes.

Scours is of two types, that resulting from indigestion and the infectious type. The former is usually caused by overfeeding, irregular amounts of feed, partially spoiled feeds, and filth either in the feed or feeding utensils. To overcome the trouble, first remove the cause, then cut back slightly on the feed and be careful of the temperature of the milk and water if the calf is hand-fed. Give three tablespoons of castor oil (as a drench). Two or three raw eggs twice daily are also quite effective at times.

Infectious dysentery or white scours generally appears shortly after birth and is noted by light-colored, very foul-smelling droppings. Although the disease may occur within 24 hours after birth, it usually manifests itself from the fourth to the eighth day of age. Not often the calf dies within a few days. The calf is listless, his eyes have a dull appearance, and respiration is increased. The calf becomes gaunt and emaciated and in most cases dies, the death rate being from 85 to 100 per cent.

Serum or vaccine is sometimes used in an attempt to prevent the occurrence of white scours. The reports of the results of such attempts are contradictory and most veterinarians are inclined to regard vaccination of questionable value. Some success in treating an infected calf has been obtained by giving him a dose of castor oil followed by a dose of milk of magnesia. A rectal injection of salt solution (1 oz. salt in 1 qt. of water) is then given. A few drops of Lugol's solution added to the salt water helps. To date, however, the chances of saving an infected calf are very small.

Foul foot (foot rot) is usually worst in wet, muddy lots. It begins as an inflammation of the foot starting between the toes. It may affect one or more feet. Swelling and redness are noted around the hoof head and in advanced stages the swelling spreads from the foot to the knee. The animal is very lame and shows extreme pain. Unless treated the animal will recover, die, or lose a foot. Treatment is very simple and consists of cleaning up the foot, especially between the toes, and applying a solution of formaldehyde and glycerine (half and half). Daily treatments for two or three days usually suffice.

Warts may sometimes be removed by daily treatment with castor oil or ordinary used crank-case oil. As a rule they drop off before the calf is two years old.

Bloat may be caused by improper feeding, green alfalfa hay, or by the calf sucking air while nursing. In minor cases a stick in the mouth as one would use a bridle bit will help. Two or three ounces of ordinary mineral oil is also effective in stopping slight cases of bloat. Often a tube can be passed through the mouth into the stomach and the gas thus allowed to escape. In doing this, however, be very careful not to push the tube down the windpipe or let the calf suck saliva into the lungs. Only in emergencies is it best to puncture the paunch. If it is done a trocar and cannula should be used. If these are not available and it is a question of saving the calf, use a clean, sharp knife. Always stick on the *left* side and about half way between the hip and last rib or in the center of the "hunger hollow."

Pink eye (infectious keratitis) is not uncommon in cattle and especially in calves. It is a transmissible disease of the eyes causing considerable discomfort to the animal, frequently causing blindness and occasionally death among calves. The disease frequently runs its course in from two to four weeks but unless treated leaves many animals with defective sight.

Treatment is quite simple and effective. When it appears treatment should begin at once to prevent it from spreading to the rest of the herd. Disinfectant eye lotions may be used to advantage and a 10 per cent solution of argyrol in water is perhaps the most suitable for the purpose. There are also on the market salve preparations that are very effective for treating pink eye. These preparations usually come in tubes and they are sold by most livestock supply companies. Directions for their use are given on each tube of the medicine.

Infected eyes are extremely sensitive to light and in severe cases it is advisable to keep the animal in darkened quarters until he recovers.

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