

FEE DING AND MANAGEMENT OF DAIRY CALVES

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Feeding and Management of Dairy Calves

BY C. Y. CANNON, D. L. ESPE AND FLOYD JOHNSTON

One of the most important factors in the profitable management of a dairy herd is the ability to successfully raise calves that are born into the herd. Occasionally animals can be purchased cheaper than they can be reared, but herd improvement seldom continues long when the dairyman purchases replacements at random through public or private sales.

In numerous herds, and especially among the larger ones, it is difficult to raise even enough females to maintain their numbers. The average annual replacement rate for dairy herds is higher than many realize. Studies show that usually about one-fourth of the milking herd must be replaced every year. Length of a lactation period, breeding difficulties and the fact that about half the calves are males limit the number of living heifer calves dropped annually to about one-third the number of cows in the herd. This means that in a 12-cow herd one could expect to rear not more than four heifer calves to weaning age every year. Of these four calves, three would have to be kept to maintain such a herd. This leaves only one calf a year to replace animals which should be culled or which die between weaning age and freshening time. In a six-cow herd the loss of a heifer once in 2 years would prevent culling. Of course, at times most of the calves dropped are heifers, but the reverse may occur, when most are bulls.

Poorly bred heifers require just as much feed as well bred animals. In most cases feed costs are about three-fourths of the total costs of rearing the calf to producing age. Though extreme fleshing is undesirable in the growing heifer, stunted calves are usually the most expensive animals to rear over a period of years.

Only well bred dairy calves should be raised to go into the milking herd. Calves sired by properly selected purebred bulls and from the higher producing cows of the herd will pay for the feed and effort it takes to raise them. Cow testing associations offer to progressive dairymen a useful method of determining which of their cows are the high producers and also furnish information on the breeding ability of bulls.

An experiment conducted at the Iowa Agricultural Experi-

ment Station furnishes forceful proof that the use of properly selected purebred bulls will bring about herd improvement. Purebred bulls used on scrub cows improved the production of their daughters and granddaughters markedly. The daughters of the scrub cows sired by good dairy sires produced about 40 percent more than their dams, while the granddaughters nearly doubled the production of the scrub cows.

Dairymen are realizing more fully now that the feed and care of the mother before the calf is born has a bearing on the raising of the calf. Recent experiments indicate that calves coming from cows which have been fed low grade roughages are more susceptible to disease and harder to raise than calves from well fed cows.

PREPARATION OF THE COW FOR CALVING

Preparation of the cow for calving should start soon after she becomes pregnant. Both for milk production and for the health of the coming calf the cow must be fed plenty of first class roughage supplemented by a balanced grain ration during the entire period of pregnancy.

It is not until the fetus is about 5 months old that its nutritive demands are great enough to cause a measureable effect upon the flow of the milk. Approximately two-thirds of the growth of the fetus is made during the last 3 months before birth. The nutritive needs of the fetus, therefore, increase very markedly during the last few months it is carried. The dam also should be preparing her own body to stand the strain of the coming lactation.

THE COW NEEDS A DRY PERIOD

Good management requires that the cow be dry for 6 weeks to 2 months between lactations. This gives her sufficient time, if receiving an adequate ration, to rebuild the body stores used during the previous lactation. It also relieves the cow of the labor of milk production during the time the fetus is making its greatest demands on the dam.

Cows can assimilate certain essential nutrients at only a very moderate rate. For instance, a heavily producing cow frequently assimilates less phosphorus from her feed than is contained in her milk. She draws upon the mineral reserves in her body to supply the phosphorus in the milk; no amount of minerals in the feed will correct this condition. Only a dry period or very low production permits the cow to recover this loss. If she freshens without this dry period she will probably milk at a lower level of production during the following lactation.

STOPPING THE MILK FLOW

There is little danger in drying up a cow of one of the larger breeds, even when she is producing 20 or more pounds of milk daily, or a Jersey or Guernsey cow producing 15 or more pounds of milk daily, by stopping the milkings entirely, provided the feed is suitably controlled. Pressure of milk on the secreting tissue will soon prevent milk formation. Unless the udder becomes inflamed and sensitive, there is less danger of infection and future udder trouble in stopping the milkings entirely than in milking the cow every day or two, or even partially milking her every day.

It is essential to feed only roughage during this drying-off period; either timothy or mixed hay is suitable. Some especially persistent milkers may even have to be fed only straw and water for a couple of days. Do not think because a cow does not dry up when on full feed that she does not need a dry period. As soon as the cow stops secreting milk, grain feeding can be gradually resumed to continue her preparation for calving.

FEEDING THE DRY COW

It is necessary that the cow carry a large amount of flesh at calving time. This is one requirement for a healthy calf and also for large and profitable production during the ensuing year. It is doubtful if a dairy cow can become over-fat during a dry period of 2 months or less. When the cow starts to milk again this extra weight soon disappears. The good cow produces during the first month or two of lactation at a higher level than can be sustained by her nutrient intake. The purpose of fattening the dairy cow during the dry period is to meet this extra demand for nutrients. The nutrients which she has stored in her body are then profitably transformed into butterfat. Unthrifty, emaciated cows usually produce poorly and give birth to weak calves.

Ordinarily the ration that is proper for the cow during the milking period is the one that can be used during the dry period in preparing the cow for calving, because the cow must rebuild her muscle and bone tissues during this time as well as store fat. The one modification is during the week or 10 days immediately preceding parturition when there should be some reduction in the amount of grain fed if the cow has been carried on a high level of grain intake. At this time the cow should get about 4-8 pounds of grain daily, the amount being adjusted to the size of the cow. A change in the mixture of grain to be fed during these few days before the parturition should also be

made. Such mixture should include more oats and bran and less corn and cottonseed meal. Such a mixture of grain will help to keep the cow from becoming constipated, a real danger at this time. A good mixture to use at this time is:

Oats	3 parts
Wheat bran	3 parts
Cracked soybeans ¹	1 part

This mixture will be improved somewhat by adding dry beet pulp if it is available at a reasonable price. This mixture could be:

Oats	2 parts
Wheat bran	2 parts
Dried beet pulp	2 parts
Cracked soybeans ¹	1 part

See that the cow has plenty of exercise at this time. The movement of the udder in walking tends to relieve its congestion. A certain amount of exercise also aids in easy calving.

The cow should not be milked prior to calving except in extreme cases. Relieving pressure in the udder immediately starts the cow to producing milk. Not only is this premature secretion probably harmful to the secretory tissue in the udder but it causes a strain upon the cow when all her strength is needed for development of the fetus and for normal calving. In instances where the udder becomes painfully swollen or in cases where the cow is especially susceptible to milk fever, partial milking just prior to calving may be advisable.

Another reason for not milking the cow before she calves is that such milking causes a reduction in the usefulness of the colostrum to the calf.

Colostrum or the first milk that a cow produces after calving is different in composition from other milk (table 1) as it is very high in protein. This protein is the carrier of anti-bodies which are essential to the health of the young calf. These anti-bodies become effective in the blood soon after the calf consumes colostrum and make the calf more resistant to disease organisms. As the anti-body content of colostrum decreases rapidly in succeeding milkings, the calf should be allowed to consume the first milk from the cow.

TIME OF BIRTH

The time of birth is a critical period for the calf and cow. If the cow has been properly fitted for calving and delivery is normal there is little need for anxiety. A few days before calving, the cow should be placed in a clean well bedded stall so that

¹ Either soybean oilmeal, linseed oilmeal or corn gluten meal can be substituted for cracked soybeans.

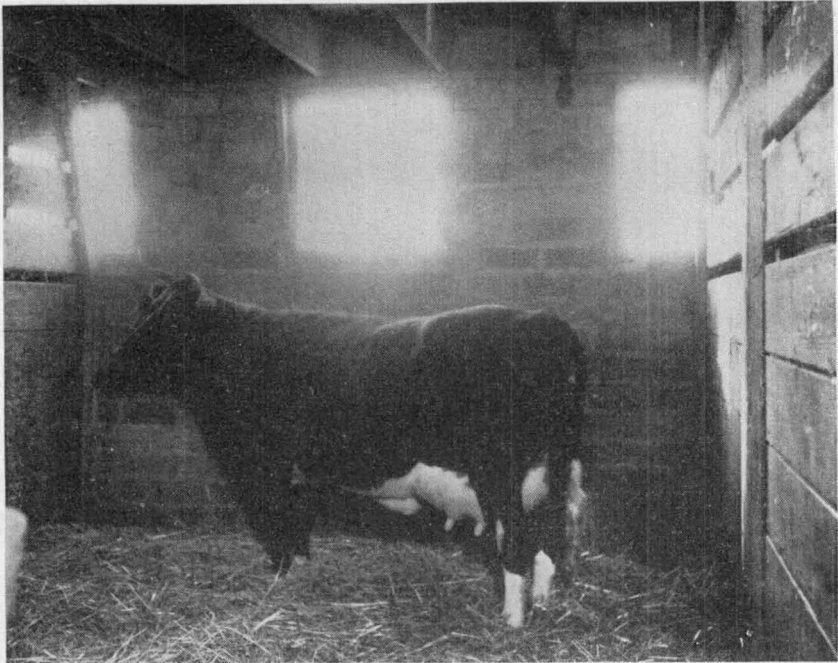


Fig. 1. A few days before calving the cow should be placed in a clean, well bedded box stall.

she may become accustomed to her surroundings. She should be kept under observation when near calving time so help can be given in case it is needed.

If the cow has difficulty in giving birth to the calf, an examination should be made to determine whether presentation of the calf is normal. If normal, the front feet will appear first, immediately followed by the nose. An examination of the feet will determine whether they are the front or rear, as invariably the front feet are turned down and the rear feet up. Any malpresentation requires immediate attention to correct the position of the calf so that it can be delivered safely by the mother. A veterinarian should be called for this service.

CARE OF THE CALF AT BIRTH

If the calf does not start breathing immediately after it is dropped, first make sure that all mucus is removed from the nose and mouth. Then alternately lift the calf by the front legs and then the hind legs at a slightly slower rate than normal breathing. As the diaphragm rises and falls, the lungs are alternately compressed and expanded, resulting in forced respiration. Two men should work together, applying this type

of artificial respiration. When only one person is present a more convenient way is alternately to compress and relax the chest walls with the hands. Care should be taken, however, not to compress the chest too frequently or too severely.

Ordinarily the mother will start licking the calf as soon as it is dropped. Heifers especially should be watched to see that they claim their calves at once. When the weather is cold and the cow fails to claim her calf it should be rubbed dry. The calf should be assisted to suckle if it has not done so within a few hours after birth.

Some dairymen leave the calf with its dam for a day or two after birth, while others remove it immediately and commence hand feeding. In either case, during the first few days of its life the calf should receive its dam's milk.

CARE OF THE COW AT CALVING TIME

Care of the cow at calving time is equally important with that of the calf. She should be kept out of drafts and given a pail of warm water. Water and not feed is important at this time. A bran mash is probably the best feed for the cow after calving as it is bulky, overcomes any tendency to constipation and carries a minimum of heat producing nutrients. Great care should be used in returning the cow to the regular milking ration. Do not overfeed her, as it should take from 3 weeks to a month to place her on full feed.

It is during the first few days after freshening that milk fever is most likely to occur. Rarely do first-calf heifers have this trouble but older cows, especially heavy producers, should be watched carefully for its appearance. Completely milking out the udder immediately after the cow calves encourages the appearance of milk fever. A good preventive practice is to milk out the udder only partially the first day or two. During this time the calf may be kept in a separate stall and put with the cow long enough to feed. The udder can be relieved of the necessary amount of milk through supplementary hand milking. Complete and regular milking of the cow should be instituted by the third or fourth day after calving.

METHODS OF FEEDING CALVES

HAND METHOD

Probably most dairymen, especially in Iowa, will prefer to raise their calves by hand—that is, feeding them milk from buckets. To raise calves successfully by hand some precautions are necessary. The calf's stomach has four compartments, only two of which, the first and fourth, are important in this dis-

cussion. The fourth compartment corresponds to the human stomach and is frequently spoken of as the "true stomach." When the calf sucks the cow the milk goes directly into the "true stomach." Here the casein coagulates into a hard curd which gradually liquefies in the course of several hours. When a calf drinks from a pail, however, the milk enters the compartment so rapidly that part of it spills over into the first stomach, commonly known as the rumen or paunch. In the paunch—which is designed for handling the more indigestible feeds such as grain or roughages—the milk is broken down principally by bacterial action into its component parts, some of which are of little value. These partly fermented products seem to upset the normal digestive processes at times; for this reason it is better to feed too small an amount of milk during the first month of the calf's life than to feed too liberally. It will not hurt the calf to be hungry enough at mealtime to bawl for its food. Three-fourths pound of milk daily per 10 pounds of liveweight is adequate to keep calves growing nicely.

Any practical arrangement which forces the calf to drink more slowly is advantageous. Some feeders go so far as to obtain pails with attached nipples. Though some very good pails embodying this feature are now on the market, the time required in feeding calves and washing the pails makes their advantage doubtful.

Care should be exercised at this time to prevent the calves sucking each other or eating soiled bedding. Calves should be prevented from sucking each other because udder troubles may occur at the time of first freshening or before because of this premature stimulation. Putting calves in stanchions and feeding them grain after they have drunk their milk will help to prevent sucking.

In early life it is perhaps better to allow the calves their daily allotted milk in three feedings approximately 8 hours apart. After they are 2-3 weeks of age the calves can adjust to only two feedings per day. It is essential that the exact amount of milk fed to each calf be known and regulated. The milk should be accurately measured or weighed and the calves fed individually. Another necessity with young calves is that the milk temperature at feeding time should be as close to 100° F. as possible and should never be below 90° F. In cold weather, unless the calf is fed immediately after milking, this requirement is somewhat difficult to meet. It is better to use sweet, fresh milk when feeding young calves, although calves will not scour on sour milk providing a uniform acidity is maintained. Skimmilk inoculated with *acidophilus bacilli* and allowed to stand for 24 hours at around 70° F. is sometimes recommended



Fig. 2. It is essential that the amount of milk fed to each calf be known exactly and regulated.

for feeding very young calves to overcome mild digestive disorders.

Pails used to feed the calves should be washed and scalded after each usage; dirty pails are a dangerous source of digestive troubles in calves.

Whole milk should be fed to calves until they are about 3 weeks of age when they can be gradually changed to skimmilk. Although calves that are fed only whole milk are generally fatter and smoother in appearance, many trials prove conclusively that they do not make superior animals. With butterfat values as they are it is almost prohibitive to raise hand-fed calves on whole milk.

While calves are being fed milk they should become accustomed to eating hay and grain, consequently they should not be fed excessive amounts of skimmilk; about 14-18 pounds (7-9 quarts) daily is sufficient. As the calf grows it will need many more nutrients than are supplied by milk. Hay and grain will furnish these.

If skimmilk is plentiful it can be fed profitably in limited amounts to calves until they are 8-10 months old. If there is a shortage of skimmilk the milk can be omitted from the feed when the calf is 4-5 months old, provided the calf is receiving a well balanced and adequate supply of grain and hay.

Some calf raisers are reluctant to feed the foam which collects on machine separated milk. Experiments indicate that if the milk is weighed to definite amounts there are no more dangers in feeding the milk with the foam than without the foam. Most of the troubles that arise are from overfeeding rather than from the foam.

When clean and undiluted by wash water, buttermilk can replace skimmilk as a feed for calves. Calves fed buttermilk do not usually do as well as those receiving skimmilk.

Whey is not recommended for replacing milk in raising calves as it lacks the protein necessary for growth which is found both in skimmilk and buttermilk. When whey is properly supplemented with protein it may be used with fair results. Usually there is little difficulty in getting calves to drink buttermilk or whey.

NURSE COW METHOD

Experiments show that calves can be raised by the nurse cow method with more freedom from calf ailments, such as scours, and with more bloom and sleek general appearance than by any other method. Although the nurse cow method is somewhat more costly, the cost does not prohibit dairymen with valuable calves from using it.

The procedure suggested for raising calves by this method is to put enough calves on a nurse cow so that each calf will get 8-10 pounds of milk daily. The calves should be allowed to nurse twice or more times each day until they are about 3 months old. During the next 2 weeks the calves should nurse only once daily, after which they are weaned. If other calves are being weaned at the same time they can be allowed to nurse the cow at the other milking, otherwise the cow should be hand milked at this time.

By the time calves are 2 weeks old they should have free access to hay and a proper grain mixture. Usually by the time the calves reach weaning age they should be consuming approximately 2 pounds of meal mixture daily. As the weaning period proceeds, hunger—due to the decrease in milk consumption—will force the calves to take more meal and hay. At the close of the weaning period the calves should be consuming enough dry feed that growth will not be checked greatly.

If skimmilk is available, recommended amounts can be fed

directly to the calves as soon as they stop nursing. After a calf has learned to nurse a cow it frequently is difficult to get it to drink milk from a bucket.

DRY MILK METHOD

The increased number of plants which produce powdered milk in the dairy sections of the United States has made available to most dairymen both dry skimmilk and dry buttermilk. Where farmers are selling whole milk instead of cream these products can be successfully used in place of separator skimmilk in rearing calves. Dry skimmilk is preferable to dry buttermilk to use for feeding calves, but price should be the deciding factor.

To remake dry skimmilk into liquid skimmilk use 9 parts by weight of water to 1 part powdered milk. Several methods have been suggested for thoroughly mixing the dry milk in the water, but the method that has given the best results on the Iowa State College Dairy Farm is to put the dry milk into water and then vigorously stir it with a wire whip. A wire whip may be made by folding baling or a similar wire into several large loops and then binding one end into a handle.

Ordinarily the water should be sufficiently warm that the remade milk will be about 100° F. so that it can be fed immediately to the calves. Though older calves seem to do equally well on warm or cold milk certainly the milk should be warmed for very young calves, as milk prepared with cold water does not coagulate as readily in the stomach.

USE OF CALF MEALS

Trials have shown that calves can be raised by feeding milk until they are only 1 to 2 months of age. From that time on they are fed a meal mixture containing dry skimmilk or soluble blood flour. Mixtures containing dry skimmilk tend to cake on standing, though caking has no harmful effects on the feeding value. Such calves will not grow quite as rapidly as do calves fed milk a longer time, but later in life they tend to recover this lost growth.

Apparently one of the reasons why calf gruels are less successful than milk products is because the former are washed into the intestinal tract by the water in the gruel before they have been acted upon by the stomach's digestive juices. Some companies are now preparing their calf feeds in cube form so that the calf must eat them more slowly. Similar results can be obtained with home mixed feeds if the meal is mixed with a small amount of milk instead of water. Formation of milk curd will tend to hold the grain in the stomach until partial digestion

occurs. Calves fed in this way should be fed water between feedings of gruel. Perhaps as easily prepared and successful a calf meal as any consists of cooked oatmeal supplemented with a small amount of dry skimmilk (table 1).

TABLE 1. AVERAGE NUTRIENTS IN USEFUL FEEDS FOR CALVES*

Feeds	Nutrients in 100 pounds		
	Digestible protein	Total digestible nutrients	Fiber
Milk and its products			
Cow's milk.....	3.3	16.2	—
Cow's milk, colostrum.....	16.5	27.0	—
Buttermilk.....	3.3	9.1	0.4
Buttermilk, dried.....	32.1	85.5	—
Skimmilk, centrifugal.....	3.5	8.6	—
Skimmilk, dried.....	33.1	84.1	—
Whey.....	0.9	5.8	—
Slaughter house by-products			
Dried blood.....	85.2	87.5	0.6
Grains and grain by-products			
Corn, grade no. 2.....	7.1	80.6	2.2
Corn gluten meal.....	36.5	81.8	2.5
Linseed oilmeal, old process.....	30.6	78.2	8.0
Oats.....	9.4	71.5	10.6
Oatmeal.....	14.7	92.5	2.8
Soybeans, cracked.....	32.8	86.2	4.5
Soybean oilmeal.....	37.7	82.2	5.6
Wheat bran.....	13.1	70.2	9.5
Wheat middlings.....	15.0	79.5	4.4

*All data except for colostrum taken from Morrison's "Feeds and Feeding," 20th edition.

SUPPLEMENTARY FEEDS FOR CALVES

Grain—Calves should be induced to eat grain at a very young age. If grain is given immediately after each time the calf is fed milk, it will soon learn to eat. Feeding grain at this time will lessen the desire of the calves to suck each other.

A good grain mixture for calves is:

Yellow corn	3 parts
Oats	3 parts
Wheat bran	3 parts
Cracked soybeans ²	1 part

This mixture can be modified to meet local conditions by substituting other grains, but each modification should contain decreasing rather than increasing amounts of fiber if the mixture is fed to young calves. For instance, do not use corn and cob meal in place of ground corn. Oat meal on the other hand, in place of ground oats, will improve the quality of the grain mixture. Calves usually prefer coarsely ground feeds to feeds

² Either soybean oilmeal, linseed oilmeal or corn gluten meal may be substituted for cracked soybeans.

Water—Water, other than that found in milk is not needed until the calf is about 6 weeks old. From this age on the need of water increases rapidly; thus, provision should be made that water is always available to the calves. Experiments at several experiment stations demonstrate that calves able to drink water when they desire will grow faster, look better and make cheaper gains than when water is withheld from them.

Minerals—Flaked salt should be available to the calves at all times. If goiter is prevalent the use of iodized salt will be beneficial. As a general rule calves do not need other mineral supplements. In rare cases where mineral is needed, bone meal probably supplies most of the requirements of the calf.

Vitamins—Ordinarily the necessary vitamins, with the possible exception of vitamin A, are supplied in ample quantity by the milk, hay and grain ration. Recently it has been shown that if the dams are fed a low grade hay during the gestation period their calves do better if supplied extra amounts of vitamin A. Results from the ordinary Iowa methods of curing roughage indicate that in many cases very young calves should be fed a vitamin A supplement. Usually 1-2 teaspoonfuls of crude cod-liver oil (animal grade) daily per calf should be a sufficiently large dose.

Yeast has no practical value in calf feeding.

GROWING THE CALF AFTER WEANING

After the calf is weaned from milk it should be kept in a thrifty, growing condition. It will be necessary to include in the ration sufficient protein to replace that which was eliminated with the milk. Usually a ration similar to that fed milking cows will give the proper balance for healthy growth. Healthy, well grown heifers can be bred at a younger age without harmful effects than can poorly fed, undersized animals.

HEALTHY CALVES COME FROM HEALTHY COWS

Infectious abortion (Bang's disease) is prevalent in many herds and when present calves frequently are born prematurely. At times the premature calf lives, but in such cases it can be raised only with extreme care and good fortune. A clean, healthy herd of cows can be obtained by regularly testing the herd for this disease and eliminating the infected animals as soon as discovered.

Tuberculosis is becoming a less serious problem each year because of eradication measures being taken. This disease is not inherited, so healthy calves from tubercular cows can be raised, providing the calf is guarded from infections after birth. Calves should be born in sanitary quarters. The maternity pen should

be clean, light, comfortable and well ventilated. Calves born in dirty, ill kept places are very liable to serious infections. Calves must be removed from diseased cows immediately after birth to clean sanitary quarters. No milk which comes from diseased cows should be fed to calves unless it is first pasteurized.

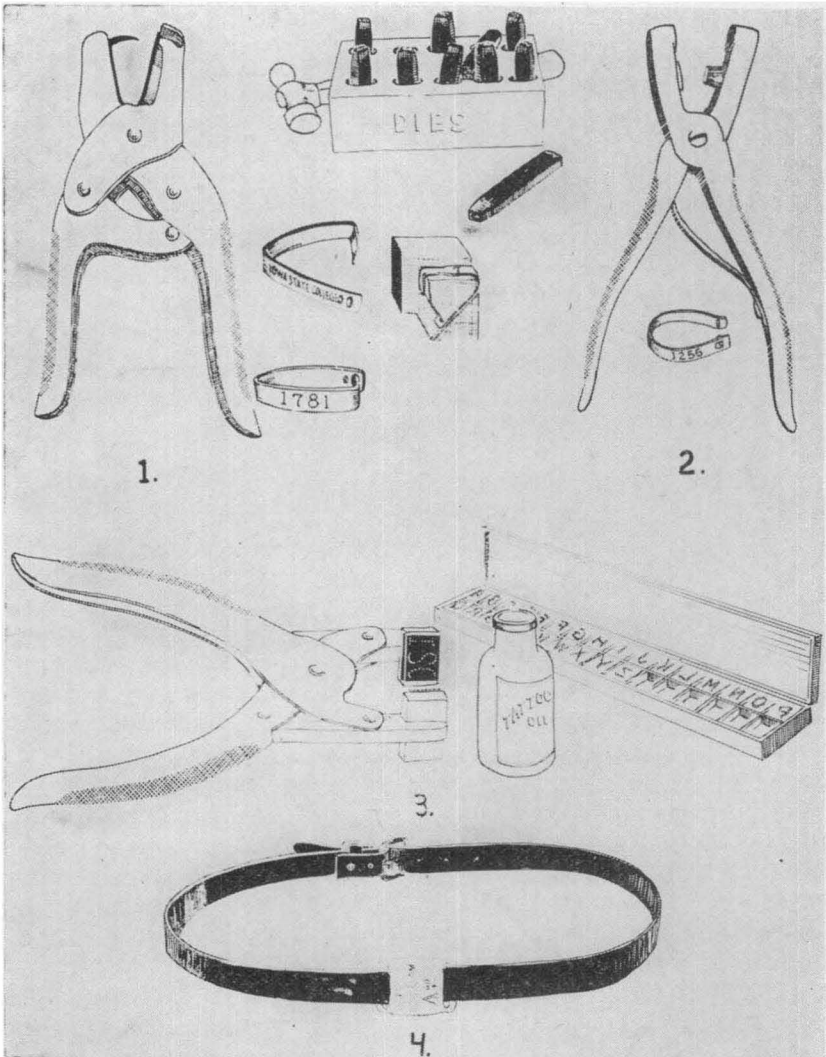


Fig. 4. Good management requires that all calves be properly identified. Two types of ear tags (1), (2). Tag (1) is self piercing, the pliers being used to attach and clinch it. With tag (2) the pliers are used to cut a hole in the ear, into which the tag is inserted and locked. Blank or numbered tags of either type can be purchased. (3) Tattoo marker, letters and ink for tattooing the ears of calves. Leather strap and brass identification tag (4).



Fig. 5. An easy way to dehorn calves is by using caustic potash.

IDENTIFICATION OF CALVES

Good management requires that a complete record be kept of all the animals in the dairy herd. This is important whether the animals are grades or purebreds. Important items that need recording are breeding dates, birth dates and identification marks. If the dairyman knows when the cow was bred and the calf expected he can dry off the cow and make other necessary preparations for the arrival of the calf. When more than one or two cows are in the herd it is easy to forget these items. In a large herd, history of the young animals and their identification can easily be confused if adequate records are not kept.

With broken colored animals pictures or drawings of the spots on them are used for identification. Many dairymen use metal ear tags which carry identifying numbers; others tattoo a number in the ear of the calf. Tattooing is a requirement in registering Brown Swiss and Jerseys. Any of these methods can be used with satisfaction.

DEHORNING CALVES

An easy way to dehorn a calf is by using caustic potash. This should be done before the calf is a week old. Clip the hair over and around the horn scurs and rub them vigorously with the moistened end of a stick of caustic potash until they get red and appear about to bleed. Care must be taken not to use an excessive amount of water with the caustic potash as it will run down the face and remove the hair. There is also danger

of its getting into the calf's eyes. A paper wrapped around the stick of caustic potash will protect the operator's hands from burns.

REMOVING EXTRA TEATS

Rudimentary or extra teats on the udder are unsightly and detract from the appearance of the cow's udder. They generally secrete no milk, or only a very small amount, which may cause annoyance if the teat leaks. These extra teats can be easily removed if done before the calf is 1 year old. The best method is to throw the calf, apply iodine or any good disinfectant to the teat, then clip it off with sharp scissors. The operation is not painful and the wound seldom bleeds.

TWIN CALVES

The question is often asked: "Are twin calves fertile?" Where the twins are of the same sex, no differences are found in their breeding ability from that of animals born alone. When a bull and a heifer are born together, the heifer is apt to be sterile. This occurs in about 87 percent of such cases. These sterile heifers are called "free-martins."

CARE OF THE MATURING HEIFER

The heifer should receive good care and be adequately fed from weaning time until she freshens. During this period many dairymen put their growing heifers in the feed lot or pasture to subsist on an inadequate and poorly balanced ration.

Balanced feeding is more essential for the growing heifer than heavy feeding. The growing body's demand for building nutrients is intense, and any curtailment will check growth. There is no need for the animal to carry excessive amounts of fat through this period except at the end of the gestation period when the heifer is approaching her first parturition.

Adequate quantities of silage and legume hay with small amounts of a grain mixture will provide the necessary balance and amount of nutrients to keep heifers in thrifty, growing condition through the winter feeding period. This grain mixture³ may consist of:

Corn	4 parts
Oats or bran	4 parts
Cracked soybeans	1 part

³ Substitutions

1. Corn and cob meal can be replaced with an equal weight of ground corn or barley. Wheat can also be substituted for corn but should not make up more than one-third of the grain mixture.
2. Ground oats can be replaced with an equal weight of bran.
3. Cracked soybeans can be replaced with an equal weight of linseed oilmeal, soybean oilmeal, cottonseed meal or gluten meal. When cottonseed meal is fed it is preferable that a succulent roughage, such as silage, be fed.

When the heifers are turned to pasture either there must be an abundance of grass or supplementary feeding should be done. The grass supply may be adequate in the early summer but deficient in July and August. In this case additional feeds such as silage and grain should be fed.

A well grown, thrifty heifer may be bred to calve at 2 years of age without harm. Large cows, in general, produce more heavily than small cows. There is no doubt that the heifer that is properly fed up to the time of first freshening will yield more milk during her first lactation than if she had been inadequately fed; this enlarged production will repay the extra cost of growing her.

DISEASES OF CALVES⁴

Frequently a high mortality with calves, especially young ones, causes considerable loss to the dairy farmer. Good management and feeding practices will reduce these losses, but some are caused through common diseases. An understanding of these diseases and the necessary treatment when they appear will help to save calves that otherwise would be lost. If the trouble is serious, call a competent veterinarian. "Cure-alls" should be avoided. The suggestions which follow are simple and effective helps.

Simple coryza or cold—Colds or simple coryza (inflammation of the upper respiratory passages, especially the membranes which line the nasal cavity) should not be looked upon as being comparatively trifling in importance for they may lead to serious disturbances such as bronchitis and pneumonia. Even if the condition does not prove serious insofar as the calf's life is concerned, it may interfere with normal development and growth, and the animal may remain in poor condition. Proper feeding and clean, well ventilated stalls will do much toward preventing colds.

Pneumonia—Pneumonia in young calves causes heavy losses to farmers each year. One of the chief factors in lowering the calf's resistance is a damp and cold environment. This lowered resistance permits microorganisms to enter the respiratory tract, producing changes in the normal tissues which results in unthriftiness or death. The disturbance is most frequently observed in late fall, winter and spring. It may occur, however, in the summer when conditions seem favorable to the good health of the calf.

In some cases the building occupied by calves becomes laden with disease-producing germs; then the disease is extremely difficult to control. In an infected group some retain their

⁴ This section was prepared by F. E. Walsh, professor of veterinary obstetrics, Iowa State College.

health, some have only a sore throat, while others suffer from a lung disturbance of varying degrees. In severe cases every calf upon the farm may contract the disease and die. Like many disease processes, a variety of causes may produce a common group of symptoms or very similar symptoms; thus, making a diagnosis (which is imperative if benefits are to be had) is not a simple thing. Remedies used to correct the disturbance may vary widely, depending upon what particular organism is responsible and the amount of respiratory tissue involved.

Drugs, vaccines or serums have value if properly used. Prophylactic vaccination for hemorrhagic septicemia has given benefits when that germ is present and injurious. It is important that the animal be kept warm and that the bowels be kept open with a mild laxative, judiciously used.

Constipation—At birth the calf's digestive tract contains meconium, a yellowish brown, gluey substance, which must be removed before the digestive tract can function normally.

The first milk of the cow contains a laxative substance (colostrum) which is nature's agent for removing any offensive material from the intestinal tract and should never be withheld from the calf. Occasionally when a calf fails to receive this substance, the intestines fail to function properly and evacuate their contents. Injection of a watery solution of soda into the rectum will usually relieve this condition.

Indigestion—Indigestion may occur from many different causes, such as stasis of bowel content the first day or two following birth; too liberal milk supply; too rich milk; irregularity of feeding; allowing calf too long time between meals; the milk being consumed too quickly, which clogs the stomach; feeding from dirty pails; too rapid change in feed; milk from cows with diseased udders; housing calves in cold, damp, dark, filthy places or overfeeding artificial mixtures which would be satisfactory, however, in smaller amounts. Licking hair from themselves or from other calves may cause hair balls in the stomach. These balls in many instances produce serious disturbances in the digestive system.

Cause of the trouble should be determined and corrections made. In addition, the contents of the bowels should be evacuated. This is best accomplished by administering a mild laxative.

Scours, diarrhea, dysentery—Scours is a common result of indigestion. Constipation may be marked at first but soon gives way to a diarrhea, which is nature's method of relieving the digestive tract of offensive material and restoring health. If the indigestion persists, the fermentation continues in the undigested bowel contents, and the condition becomes more serious

and active and what was at first a simple irritated bowel becomes a serious contagious disease. One or more of many germs may be operating. Such contagions in a calf barn may persist for many years. They also may be introduced into a barn by the purchase of a calf from a herd where infection exists.

There are many predisposing causes—overfeeding is one of the most common. This rarely occurs when calves are permitted to nurse, since the calf only consumes a small amount of milk at a time. The environment of the calf is a powerful influence. Calves kept indoors suffer more frequently than those running on pasture where they have the benefits of sunshine, air and exercise. Continued crowding in filthy, bad smelling buildings is especially injurious. The bad odor may be caused by gases which are poisonous to the animal. This lowers the general health and impairs digestion by causing ingested material to remain static, resulting in offensive fermentation within the calves' organs; this produces irritation, poisoning and diarrhea. The whole system becomes weak and no longer can resist or overcome disease. Fermented or sour milk, nursing cows with diseased udders and feeding from dirty pails, are all contributing factors.

Calf scours is a very common occurrence. It can be prevented in clean surroundings and where proper care and feeding are exercised. The feeding and care of the calf are not a simple thing if properly done. The digestive system is weak at the time of birth and easily disturbed by feeding milk too rich in fat content or too large quantities at a time. When the disease is first observed the milk ration should be reduced to 1½ pounds per day, to which is added two well beaten eggs. The amount of milk should be increased as the calf improves. The bowels should be evacuated by the administration of 3 or 4 ounces of mineral oil. Further treatment would depend upon the cause. If the condition is contagious it is necessary to learn what germ is present and a vaccine for that specific organism may be all that is needed. The stall in which the calf was born should be thoroughly cleaned. The veterinarian consulted would be guided by a number of factors in determining the proper treatment to be employed.

Abscess of the navel—As a result of irritation, such as irritative drugs, licking with the rough tongue of the dam, or through infection from a dirty stall, inflammation may attack the stump of the navel cord. A firm swelling appears as large as a fist, which may finally burst and discharge pus. The opening is usually small and may close rather quickly so that abscess after abscess forms. It is never a safe procedure to open the enlargement until you are certain it is an abscess and not a rup-

ture. It occasionally happens that an abscess and rupture exist at the same time. Ruptures are rather common in this region of the calf's body. The whole mass should be removed surgically, bearing in mind there is always the possibility of a fatal hemorrhage resulting from the cut blood vessels, unless suitable instruments are available to control the bleeding.

Hemorrhagic septicemia and blackleg—These two diseases are infectious and contagious, caused by two separate specific germs. Sometimes it is difficult to differentiate between the two diseases by symptoms alone. It may be impossible to cure a sick calf, but the prevention of further spread of the disease is important. At the outbreak of either disease a veterinarian should be consulted.

Ringworm—Ringworm is a contagious skin disease caused by a fungus. It is rather common in cattle during the winter months, especially when the cattle are stabled. The fungus lives in the hair follicles, causing the hair to fall out and also within the hair shaft which causes the hair to break off. Infection is spread from animal to animal by contact or by rubbing on posts, partitions, etc., on which infected animals have previously rubbed. The disease may be kept from spreading by separating the healthy from the diseased animals. A positive diagnosis can be made only with a microscope. The affected areas should be painted with 1 part salicylic acid to 10 of alcohol.

Lice—Lice are blood sucking parasites and are most prevalent on cattle in winter. They may become so numerous as to cause the animal to lose flesh. It has been said that one pair may produce in 3 months about 100,000 individuals. They may be found on any part of the body although they first appear on the neck. Calves infested with lice are generally unthrifty. Treatment may be given by washing the calf in a 2 percent creolin solution. Caution should be exercised to prevent the solution from getting into the eyes of the animal.

Warts—Warts appear on the skin in various parts of the body, especially in the regions of the eyes and lips. Sometimes they may be made to disappear by rubbing with castor oil each day. Since tumors which tend to spread and become serious may be mistaken for warts, it is best to consult your veterinarian.

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Fig. 3. Feed young calves a balanced grain mixture and good roughage.

which tend to become gummy in their mouths. The essential thing, though, is to feed a balanced mixture—one containing an adequate amount of protein.

Hay—Calves when about 2 weeks old will start eating hay in appreciable quantities, so it should be available at all times. Certain nutrients or food elements found in hay but not found in milk are essential to the health and vigor of the calf, so liberal amounts must be supplied. Hay should be bright and clean. If possible both legume and grass hay should be available. Allow the calf's appetite to guide him in the quantities of each it consumes.

Silage and roots—Many practical feeders use corn silage liberally with good success in feeding calves. At the Iowa Agricultural Experiment Station calves which received a limited amount of silage grew as well or better and made cheaper gains than those not fed silage. Calves should not be fed silage until 6 weeks old and should not be fed excessive amounts at any time.

Roots and beet pulp when fed in proper amounts may be used successfully as substitutes for silage in the calf's ration.