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University of Minnesota<sup>1</sup>  
Agricultural Extension Division<sup>2</sup>  
\*Special Bulletin No. 91<sup>3</sup>

\*Raising the Dairy Calf When Whole  
Milk is Sold

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The University of Minnesota  
AGRICULTURAL EXTENSION DIVISION  
Special Bulletin No. 91

University Farm, St. Paul

September 1924

Published by the University of Minnesota, College of Agriculture, Extension Division, F. W. Peck, Director, and distributed in furtherance of the purposes of the co-operative agricultural extension work provided for in the Act of Congress of May 8, 1914.

## RAISING THE DAIRY CALF WHEN WHOLE MILK IS SOLD

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It is a well established fact that the safest and best way to get good dairy cows is to raise them yourself. Dependence upon the purchase of cows to replace animals discarded seldom results in herd improvement. Only too often cows that are for sale at reasonable prices are culls which the seller himself does not want. They are usually inferior in both type and producing ability and are often diseased.

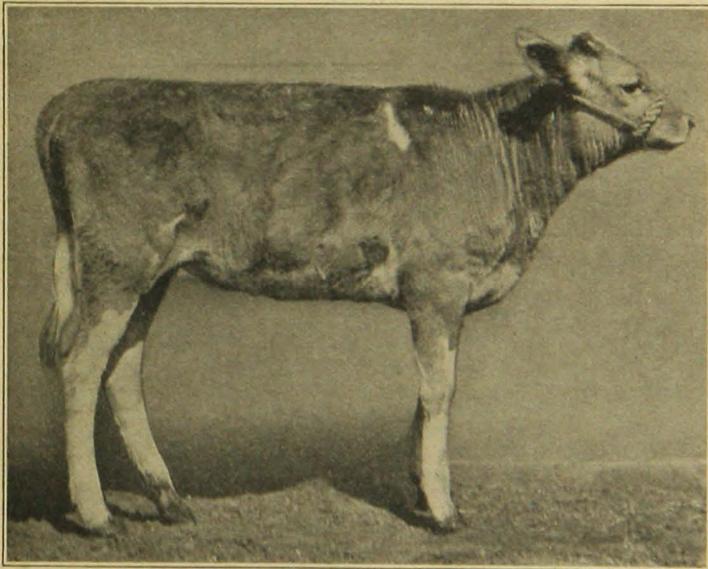


Fig. 1. Grade Guernsey Heifer, Age Six Months  
Received whole milk and skimmilk until weaned at 60 days of age.

Weight at six months 240 pounds. Her daily gain in weight to six months of age was only a little less than the gains made by calves of this breed fed skimmilk to six months of age. Feed received up to six months: Whole milk 449 pounds, skimmilk 88 pounds, grain 412 pounds, alfalfa hay 295 pounds.

## DIFFICULT TO RAISE CALVES WHEN SKIMMILK IS NOT AVAILABLE

The farmer who has plenty of skimmilk has little difficulty in raising calves. It has been fully demonstrated that equally as good calves can be raised on skimmilk as on whole milk. Skimmilk is for this reason considered the standard food for raising dairy calves from the time they are a few weeks old until weaned at four to six months of age. But it is difficult for the dairyman who sells whole milk to raise calves. He has little or no skimmilk available and because of the relatively high cost of the milk ordinarily used in raising a calf it is impracticable for him to follow this method of maintaining the herd. Instead, cows must be purchased to replace worn out animals, and herd improvement suffers as a consequence.

## USE OF CALF MEALS AND MILK SUBSTITUTES

Many attempts have been made to develop methods of raising calves without milk. Patented calf meals and so-called milk substitutes have been used with more or less satisfactory results. Several such preparations are now on the market. To be practical, a good calf meal must be comparatively cheap and made up of ingredients that are easily and readily digested. If the proper ingredients can be obtained, as good a calf meal can be prepared at home as can be purchased ready mixed, and the cost will usually be considerably less. One of the most widely used and perhaps the one that has given the most satisfactory results of any milk substitutes so far tried is the well known Purdue mixture. This mixture is made up of equal parts by weight of hominy feed, linseed oilmeal, red dog flour, and dried blood. It is fed as a slop, being mixed in the ratio of one part meal to seven parts warm water. This meal, however, like all others used, is not satisfactory except when supplemented by considerable quantities of milk during the first four months. In general the consensus of opinion of those who have used any of the various calf meal preparations is that none of them gives results equal to those obtained with milk feeding.

## RAISING CALVES ON THE MINIMUM AMOUNT OF MILK

A practical plan for raising calves has been developed at University Farm that can be adopted with good success by dairymen selling whole milk. This plan does not require the use of high priced calf meals and so-called milk substitutes. Instead, it is based on the principle that while the calf must receive some milk for a time, only a comparatively

small amount is required when supplemented by the proper grain and hay ration such as is easily prepared and is available on every dairy farm.

Two general methods have been developed according to this plan: (1) Raising calves on a minimum amount of milk using either whole milk entirely or whole milk and skimmilk during the period of milk feeding. (2) Using whole milk for a short period followed by some form of condensed or dried milk. This may be powdered skimmilk, semi-solid buttermilk, or powdered buttermilk, in all cases using the minimum amount possible consistent with good results.

The first method does not differ greatly from the one followed when calves are raised on skimmilk on the average farm except that the period of milk feeding is considerably shorter.

### CARE AND MANAGEMENT OF CALF AFTER BIRTH

There are no well-defined rules that can be applied in caring for the calf during the first two weeks of its life. This period, however, is probably the most critical one in its whole life. The future development of the calf depends a great deal upon the care and attention received during this stage.

It is best to leave the calf with its mother for several days after birth. Whole milk should be fed during the first two weeks. Do not overfeed at any time.

The length of time the calf should be left with its mother will depend upon the condition of the calf and the mother at time of calving. In general, the calf should be left with its mother for one to three days after birth so that it may receive the colostrum or "first milk." Colostrum possesses certain properties which stimulate the action of the digestive tract and furnishes a temporary immunity to various common calf diseases.

After the calf has been removed from its mother it should be put in a pen by itself and taught to drink milk from a pail. A calf with a full stomach is a poor pupil, therefore let it go hungry for 10 or 12 hours before attempting to give the first lesson at the pail. In feeding the calf the feeder should use the same judgment as would be exercised in caring for the human infant. Cleanliness and regularity must be observed in everything concerned with feeding and care. The milk should be sweet and fed at a temperature of 95 degrees F., and given

regularly in small quantities. Care must be taken not to overfeed at any time. Feed from six to twelve pounds of whole milk daily, depending upon the size and vigor of the calf. Milk very rich in butterfat should be diluted with water or partly skimmed. During the first week or ten days feed three times daily; afterward two feeds daily will be sufficient.

#### Skim milk in the Ration

Whole milk may be fed during the entire period of milk feeding. However, results obtained at University Farm indicate that if calves are in good physical condition practically as good results will be secured if skim milk is fed beginning the second or third week. The transfer from whole milk to skim milk should be gradual. As the calf grows the amount of milk fed should be increased, but care should be taken not to overfeed and cause indigestion or "scouring."

#### Grain and Hay Feeding

It is of course very essential that calves raised according to the minimum milk plan learn to eat hay and grain at an early age. The best way to teach the calf to eat grain is to put a little grain in its mouth after it has had its milk. This can be done when the calf is about two weeks old. It will like the taste of the grain and will soon learn to eat it from the feed box. The calf should receive all the grain and hay it will eat during the first three or four months. The grain fed during the first few weeks may be either cracked corn or crushed oats or a mixture of the two. Later a mixture of four parts by weight of cornmeal, one part wheat bran, and one part linseed oilmeal should be provided. It is best to feed the grain dry. The hay should be good quality alfalfa or clover hay. Timothy hay is not as satisfactory for calves as are the legume hays and when fed should be supplemented by a grain mixture containing a larger proportion of linseed oilmeal than is found in the ration given.

There is no substitute for milk. A calf must receive some milk to make it grow. A large amount is not needed if the proper hay and grain ration is provided. A healthy thrifty calf may be weaned when about 70 days old.

#### When to Wean

Calves raised according to this method may be weaned at about 70 days of age provided they are thrifty and healthy and eating consider-

able quantities of grain and hay. Ordinarily with good management a calf to that age will not require more than 200 pounds of whole milk and 600 pounds of skimmilk besides all the hay and grain it will eat. Good results may sometimes be obtained from weaning earlier. However, unless calves are unusually vigorous it not advisable.

### **Feed and Care After Weaning**

Weaning time is another critical period in the life of the calf. Unless proper precautions are taken all previous work may be undone through lax methods and indifferent feeding and care. Weaning should be a gradual process. Milk should be withdrawn at the rate of one pound a day. After weaning, calves should not be turned out to shift for themselves on pasture or other coarse feeds. Not before calves are at least six months old should they be turned out on pasture. Pasture grass is entirely too bulky for the small stomach of the young calf. After weaning and until the calf is six months old a large part of the ration must be grain. However, care must be taken not to allow the calf to eat too much grain in proportion to the roughage. Experiments at University Farm have shown that calves receiving mostly grain do not thrive as well as when a considerable part of the ration is made up of some legume roughage. For this reason no additional grain should be fed after 5 pounds a day per head is reached, until the calf is six months of age.

Following weaning the same grain mixture should be fed as before together with good quality alfalfa or clover hay. In addition to the grain and hay a supply of fresh cool water should be available at all times. Calves raised in this way should be kept in clean, well-lighted and well-bedded stalls in the barn, where they are protected against the intense heat of the sun and not tormented by flies.

### **Amount of Milk Required and Daily Gains Made by Calves Raised on Minimum Amount of Milk**

As has already been stated, 200 pounds of whole milk and 600 pounds of skimmilk is enough to raise a calf according to the minimum milk plan. The amount required will of course depend largely upon the size and vigor of the calf. Whole milk may be fed during the entire 60 to 80 days of milk feeding. Experiments at University Farm, however, showed that calves receiving skimmilk during part of this period, when six months of age were practically equal in weight and vigor to those fed whole milk. Also the daily gains made during the first 180 days by calves raised on whole milk and skimmilk according to this plan were almost equal to those made when skimmilk was fed to six months of age. A group of Holstein

calves fed whole milk and skimmilk to 70 days and hay and grain thereafter, gained at the rate of 1.25 pounds daily during the first 180 days; those fed skimmilk to six months of age gained 1.46 pounds. Another group of Guernsey calves fed in the same way gained 1.03 pounds as compared with 1.16 pounds, the average daily gain of Guernsey calves fed skimmilk during the first 180 days. In groups fed according to this method, there was less sickness than with calves raised in the ordinary way.

### **POWDERED SKIMMILK AND BUTTERMILK PRODUCTS FOR CALF RAISING**

Some farmers selling whole milk may hesitate to feed the amount of whole milk required even when kept to the minimum according to the plan described, or the demand for milk may require the sale of all produced. Under these conditions another plan for calf raising is suggested which has given good results and which is less expensive than using whole milk to the age of 70 days, as recommended under the minimum milk plan. This is the use of powdered skimmilk or concentrated buttermilk products.

Experiments conducted at University Farm show that powdered skimmilk or powdered or some other form of concentrated buttermilk can be used instead of skimmilk. These products are comparatively low in price, an amount equivalent to 100 pounds of ordinary skimmilk costing about half as much as 100 pounds of whole milk. At times lower grades can be obtained at still lower prices. Powdered buttermilk and other concentrated buttermilk products are usually available at considerable lower prices. The results obtained from the various experiments have been entirely satisfactory.

#### **Composition Almost Same as Ordinary Skimmilk**

The good results obtained in these experiments are due to the fact that the concentrated products do not differ greatly in composition from ordinary skimmilk. No ingredient originally present, except water, is removed or decreased during the process of concentration. Neither is the digestibility or the vitamin content of the original fluid seriously affected by the condensation and drying. As water is the only substance removed, all that is necessary to restore them to their original condition and prepare them for feeding to the calf is to add an amount of water equal to that removed.

## PREPARATION AND FEEDING OF THE PRODUCT

### Powdered Skimmilk

Powdered skimmilk contains from 90 to 95 per cent dry matter or milk solids and from 5 to 10 per cent water. In preparing it for feeding to calves it should be dissolved in the ratio of one pound of the dry product to 9 pounds of warm water. The dried milk should first be made into a thick paste with water and all lumps stirred out, then the rest of the water added and the mixture thoroly stirred, and fed immediately in the same way and the same amounts as ordinary skimmilk. In fact, trials showed that it could be fed alternately with ordinary skimmilk without affecting the digestive system of the calf.

Skimmilk is the standard food for a calf after the first two weeks. When it is not available, powdered skimmilk or powdered buttermilk may be used with equally good results. These products when mixed with nine times their weight of warm water have almost the same composition as ordinary skimmilk. They should be fed in the same way as skimmilk.

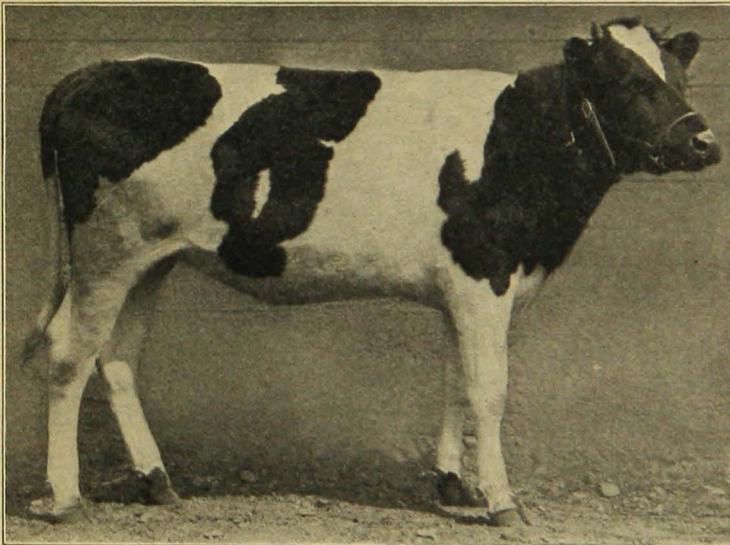


Fig. 2. Grade Holstein Heifer, Age Eleven Months  
Raised on powdered skimmilk to 70 days of age.

Weight at six months 300 pounds. Daily gain in weight to six months 1.14 pounds. This is slightly less than the average daily gain made by Holstein calves raised on skimmilk to six months of age. Feed received up to six months: Whole milk 134 pounds, powdered skimmilk 70 pounds, grain 389 pounds, alfalfa hay 417 pounds.

### **Powdered Buttermilk**

Powdered buttermilk has practically the same composition as powdered skimmilk. It contains about nine times as high a percentage of dry matter as common buttermilk. Consequently it must be mixed with about nine times its weight of warm water to prepare it for feeding to calves.

### **Other Concentrated Buttermilk Products**

Other buttermilk preparations are sold on the market under various trade names as condensed buttermilk and semi-solid buttermilk. These are essentially buttermilk from which a portion of the water has been removed. The other product used in our experiments was sold under the trade name of semi-solid buttermilk. These products are naturally in a pasty condition, containing from 60 to 70 per cent of water and 30 or 40 per cent milk solids. To give them the proper consistency for feeding they should be mixed with about three times their weight of warm water and thoroly stirred.

The buttermilk mixture as prepared from the powdered and condensed forms has almost the same composition as ordinary skimmilk except for the higher acid content. This acidity, however, does not affect their value for calf feeding. It only makes it necessary to exercise greater care in getting the calves started on these products. In all other respects they should be fed in the same way and the same amounts as ordinary skimmilk.

## **SELECT HEALTHY CALVES AND GIVE THEM A GOOD START**

Whether powdered skimmilk, powdered, semi-solid, or any other form of condensed buttermilk is to be used in raising calves, the first consideration should be to have healthy calves. Much time and effort will be saved and better results obtained if the calf is carefully selected. After the calf is selected attention should be directed toward giving it a good start. This is extremely important, because its entire success depends on it. In general, most of the practices followed in raising calves in the ordinary way should also be followed under these conditions.

It is usually good practice to leave the calf with its mother during the first few days after birth. After this hand feeding should begin. During the first few weeks after the calf has learned to drink from a bucket, digestive troubles are likely to appear as the result of over-feeding and unsanitary methods. Such troubles should be guarded against. Too much milk should not be fed and only strictly fresh milk of proper temperature (95°F.) should be given. The cleanli-

ness of the milk buckets is also important. Buckets should be washed thoroly with hot water after each feeding. The calf should be kept by itself in a clean, airy, and well-bedded stall with plenty of room for exercise.

#### When to Begin Feeding the Prepared Mixture

The change to any of the mixtures should not be made until the calf is at least two weeks old. This is especially important if buttermilk is to be fed. Because of its high acid content the change from whole milk to the prepared buttermilk mixture, if made too soon, may cause serious digestive troubles. Likewise, as has already been pointed out, care must be taken not to make the change from whole milk to the prepared products too suddenly. A satisfactory plan is to withdraw one pound of whole milk from the ration each day and substitute for it an equal amount of the prepared mixture. In this way the stomach of the calf is able to adjust itself to the change without any digestive disturbance. The change from whole milk to powdered skimmilk will not have any noticeable effect on the digestion of the calf, but calves transferred to the buttermilk ration will show more looseness of the bowels, a characteristic which will remain during the entire period of milk feeding. This, however, is not serious unless it becomes extreme.

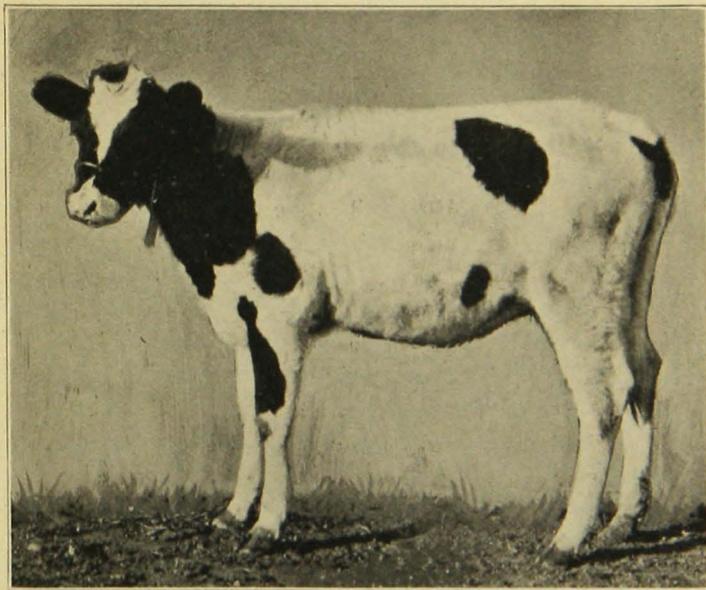


Fig. 3. Grade Holstein Heifer, Age Six Months  
Received powdered buttermilk to 70 days of age.

Weight at six months 327 pounds. Daily gain up to six months 1.27 pounds. This is only slightly less than the average daily gain made by Holstein calves raised on skimmilk to six months of age. Feed consumed to six months: Whole milk 201 pounds, powdered buttermilk 65 pounds, grain 497 pounds, alfalfa hay 500 pounds.

### Feed Grain and Hay Early

During the period of prepared milk feeding the calf should be taught to eat grain and hay. The sooner this is done and the more grain and hay consumed, the better prepared will the calf be to withstand the shock of weaning. The grain and hay ration has been described.

Calves raised on the minimum amount of milk must begin to eat hay and grain at an early age. Only good quality alfalfa or clover hay should be fed. A good grain ration to feed is a mixture of 4 parts cornmeal, 1 part wheat bran, and 1 part linseed oilmeal.

### When to Wean

Calves should not be weaned unless they are healthy and vigorous. Ordinarily 70 days is the minimum age except in the case of unusually vigorous calves. When weaned the calf should be eating about two pounds each of grain and hay daily. After weaning the same precautions should be observed in the feeding, care, and management as with calves raised on the minimum amount of whole milk and skimmilk.

The calves raised on these products at University Farm were thrifty and made good growth. They were unusually free from sickness. At six months of age they were equal in most respects to calves of the same age raised on skimmilk on the average farm.

The amount of whole milk and concentrated products required to raise calves according to this plan will vary a great deal, depending on the size and vigor of the calf as well as the care it receives. In general, however, the amount of whole milk need not exceed 200 pounds. For the concentrated products, about 70 pounds of either powdered skimmilk or powdered buttermilk and 125 pounds of the semi-solid buttermilk will be sufficient for the average calf to weaning time. With the price of powdered skimmilk about half as high per hundred pounds as market whole milk; and powdered buttermilk and semi-solid buttermilk at lower prices, it should be practical to use these products on farms where whole milk is sold.

The use of powdered skimmilk and powdered buttermilk for calf raising is practical on farms where whole milk is sold. Powdered skimmilk costs about half as much per hundred pounds as market whole milk. Powdered buttermilk is usually cheaper.

No one of the products is superior in all respects to the others as a calf feed. Powdered skimmilk, when mixed with the proper amount of water, because of its similarity to ordinary skimmilk has certain advantages over the others. Trials at University Farm showed that powdered skimmilk can be alternated with skimmilk without injury to the calf. Powdered skimmilk may be fed one day and ordinary skimmilk the next and so on without affecting the digestive system of the calf. This is a distinct advantage to farmers marketing whole milk in small towns and villages. The market demand for whole milk usually changes from day to day and hence the available supply of skimmilk for calf feeding. Under such conditions calf raising is impossible and the skimmilk on hand is largely wasted. But with powdered skimmilk to use during the periods of shortage, the skimmilk normally on hand can be economically utilized and calf raising made possible. Powdered skimmilk costs considerably more than either semi-solid or powdered buttermilk and except for the special use mentioned is no better than either as a calf feed. Powdered buttermilk is recommended as better than the semi-solid. Trials did not show any marked advantage of one over the other in the growth of the calves. However, from the standpoint of convenience in handling and having the products about, especially during fly time, there is a decided advantage in favor of the powdered form. The difference in cost is usually insignificant.

TABLE I  
FEEDING SCHEDULE FOR RAISING CALVES ACCORDING TO THE MINIMUM MILK PLAN  
DURING THE FIRST 180 DAYS

Age	Whole milk	Skimmilk*	Grain	Alfalfa hay
Weeks	Lbs.	Lbs.	Lbs.	Lbs.
1 to 3		Leave calf with mother		
3 to 18	8 to 12		All the grain and hay it will eat	
18 to 25	12 to 1	1 to 12	" " " " " " " "	
25 to 60		12 to 15	" " " " " " " "	
60 to 70		15 to 1	" " " " " " " "	
70 to 90			2 to 4	Free access to hay
90 to 120			Not to exceed 5	" " " "
120 to 180			" " " "	" " " "

\* When either powdered skimmilk or powdered buttermilk or any other form of buttermilk product is used, the same amounts of the prepared milk mixtures from these products should be fed as is indicated for skimmilk.

**Rules for Raising Calves on the Minimum Amount of Milk**

1. Leave the calf with its mother for one to three days after birth.
2. Feed whole milk during the first two or three weeks. Be careful not to overfeed.
3. Always feed the milk at the same temperature, 95°F., and from clean utensils.

4. Do not change abruptly from whole milk to skimmilk, powdered skimmilk, or any of the buttermilk products. Change gradually.
5. Mix one part by weight of powdered skimmilk or powdered buttermilk with nine parts of warm water for feeding to calves.
6. Mix the semi-solid and condensed buttermilks with about three times their weight of warm water for feeding.
7. Feed the prepared milk mixtures to calves in the same way and in the same amounts as ordinary skimmilk.
8. Begin to feed grain and hay when the calf is two or three weeks old.
9. Wean from milk when about 70 days old. Do it gradually.
10. Do not feed more than 5 pounds of grain mixture daily until after six months of age.
11. Feed all the alfalfa or clover hay the calf will eat at all times.
12. Keep the calf in the barn in a roomy, clean, well-lighted stall.
13. Provide the calf with plenty of clean fresh water at all times.