

CALF MANAGEMENT
BY
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1. What is a Calf?
 - a. The general age, under twelve months.
2. Importance of early care, first twelve months especially
3. Value of right parentage.
 - a. Pedigree, Individuality
 - b. Selection of sire
 - x. Beef sire
 - Baby Beef and Farm Bull.
 - Range Bull
 - y. Dairy Bull.
 - c. Selection of dam
 - x. Difficulty and value.
4. Parental Influence.
 - a. Age of Parents
 - x. Mature vs. Immature.
 - b. Condition at Breeding time
 - c. Proper Foods.
 - d. Time of year to breed for
 - w. Breeding purposes
 - x. Dairy purposes
 - y. Baby Beef purposes
 - z. Range purposes.
5. Management of Dam at Calving
 - a. Shelter, bedding, out of doors.
 - b. Food, water
 - c. Assistance.
6. Care of Calf the first day.
 - a. Value of Colostrum
 - b. Premature calves.

7. Ways to rear calves.
 - a. Calf with cow.
 - w. With cow constantly
 - x. With cow at intervals
 - y. With nurse cow
 - z. Calf given a part of milk
 - b. Milk or its products.
 - w. Whole milk
 - x. Skimmilk
 - y. Butter milk
 - z. Whey
 - c. Milk substitutes.
 - x. Hay tea
 - y. Grain mixtures.
8. Calf with cow constantly
 - a. Best on large farms, ranches, scarce labor.
 - b. Some gain to expect
 - c. Gains made
 - d. Treatment of dam and calf.
 - e. Weaning treatment.
9. Calf with cow at intervals.
 - a. Advantages and disadvantages.
 - b. Extent of practice
 - c. Best for show and breeding calves
 - d. Feeding grain
 - e. With cow twice or thrice daily
 - f. Shelter or lots.
10. Nurse Cows.

- a. By whom practiced and why
 - b. How to select nurse cow
 - c. Treat calf as in preceeding discussion
 - d. The general plan for nurse cow
 - e. Gains with nurse cow.
11. Calf given a pint of milk
- a. Objections
 - b. General results
 - c. Effect on cow.
 - x. How to overcome if so spoiled
12. Two calves to one cow.
- a. Calves to put together
 - b. Cow to select
 - c. Treatment of cow
 - d. Treatment of calf
13. Rearing calves by hand
- a. Getting to drink, precautions
14. Whole milk
- a. First two and three weeks of all calves
 - b. Beef calves.
 - c. Expensive.
- 15 Skim-milk.
- a. Value of and composition
 - b. Some results
16. Butter milk
- a. Composition
 - b. Old calves.

17. Whey
 - a. Value of
 - b. Poor
18. Hay tea
 - a. Cost of making and method
 - b. Kind of hay, leguminous or not
 - c. Effect on calves.
19. Grain mixtures
20. Milk from Tuberculosis Cows.
21. Feeding milk
 - a. Buckets, trough, care of
 - b. Calf feeders, advantages and disadvantages
22. Care of milk and hay tea in summer time
 - a. Butter milk, whey
23. Feeding grain
 - a. Age will eat
 - b. Value of for supplement
 - c. How to feed
 - d. Value of different kinds:- Corn, Kafir-corn, wheat, bran, corn bran, middlings, rice meal, corn hearts, flax-seed, flax-seed meal, wheat, rye, oats, barley, cotton seed, cotton seed meal.

Condiments:- Dried blood, cod-liver oil, cotton seed oil.
24. Feeding roughness.
 - a. Value of on digestion
 - b. Age will begin to eat
 - c. How to feed
 - d. Value of different kinds:- Prairie hay, orchard grass, timothy, etc. clover, alfalfa, vetch, crimson clover, cow pea hay, soy bean hay, corn fodder, ensilage, pasture.

25. Water for calves
 - a. How to give
 - b. Precautions
 - c. Salt, earth
26. Shelter
 - a. Calf ties
 - b. Rope
 - c. Stanchions
27. Dehorning
 - a. How, value and precautions.
28. Diseases
 - a. Scours, constipation, blackleg, ringworm, lice, ticks, Texas fever.
29. First winter care
 - a. Dairy and beef.
 - b. Care of baby beef bull calf
 - c. Care of range bull calf
 - d. Care of dairy bull calf
- 30 Acknowledgements.

The practical experience of the writer along the lines of calf management and the importance of this work on the cattle industry are the leading reasons for the writing of this thesis along this line.

WHAT IS A CALF: It is well in the first place to consider the question, What is a calf? and at what age it ceases to be such.

In this treatis the age will be limited to twelve months because of its general usage in this way both by the general public and public fair authorities. A few contend that this age is too great, in view of the fact that the calf looses its baby form at eight months of age, but twelve months is the most universal division of ages and is likely to remain so for a long time.

The first twelve months of a calf's life determines largely its future usefulness and value, and no greater problem confronts the stockman than that of the rearing of calves and how to secure the best results with them. Improper care and insufficient nutrition are detrimental to old animals but doubly so to calves. If there is any stinting of feed to be done, let it be with those over twelve months of age. Under twelve menthos is the best for cheap and effective development and no later care, no matter how scientific or practical, can completely replace that quality lacking because of improper early management. If a calf is not given proper attention, its time and development is extended, ii ever it reaches the maximum development it should, again a good healthy condition in calf-hood helps to ward off the diseases calf flesh is heir too. Not only does this matter of early development effect the animal itself, but if a breeding animal, its progeny as well, causing them to give less returns for food consumed, whether for beef or dairy. Many a promising calf at birth is e'er long reduced to the class of common stock by injudicious treatment.

If the best is desired then corresponding attention must be given not only after the calf is born, but before. Scrub care makes

scrub stock even out of pure bloods, but no amount of care will make pure blood out of a scrub, so breed pure blood stock. An animal may be a pure blood and have the most approved and gilded pedigree and yet not be any better than a scrub.

ANCESTRY:- While the rearing of the calf is the most important question it is only one of many considered by the best breeders of to-day in the production of the very best cattle. The ancestry of the calf must be considered to see that the inherited tendencies are right for the sire and the dam. The beef calf needs a different ancestry from that intended for the dairy. Even the calf intended for the range needs parents different from the one intended for 'baby beef'. Two calves reared the same but with different ancestry will not develop the same. One may be fit for beef production, the other for butter and milk; one may be fit for 'baby beef', the other need two years on the range for development before becoming marketable. So ancestry is a feature needing attention, and in this selection the sire is the one chiefly to be considered because he determines the future calf, and not the future of one only but of those of the entire herd. In other words, he determines half of the herd and often the better half, according to his breeding and the breeding of the dams. A pure blood bull in a scrub herd is more than half the herd. A bull's influence does not stop at the first generation, but it influences the second generation, and if one line of breeding is kept up he in a few years determines the future herd. So great is the influence of a bull, good or bad, that his mark may be traced for ten or twelve generations.

In selecting the bull good individual merit is always desirable, but this good individuality should come from a good ancestral line of like kind and root from any accident or expert feeding for the former is transmitted while the latter two most likely will not be

but reversion will be the result. Reproduction from sports, as the latter two, is always doubtful and generally unsatisfactory, "The stamp of ancestry will impress itself upon the offspring."

SELECTION OF PARENTS:- A bull should give his calves a strong character and constitution enabling them to carry out what ever blood characteristic he may have transmitted, be it beef or butter. A study of his pedigree will foretell quite correctly whether he will do this or not. The pedigree is not infallable because runts appear among the pure bloods of all breeds, but when strong constitutional vigor and splendid individuality are coupled with the pedigree then success is most fully assured. Be satisfied as to the pedigree of the bull before buying. See the dam and sire and more relatives if in reach. A strong family resemblance should make a good impression and if the buyer is not well informed secure some honest breeders advise.

The properly bred bull gives size, color and conformation sought. A bull for use on a general farm or for 'baby beef' purposes should be blocky, low set, broad backed, deep bellied, thick fleshed, short quartered and of a quiet disposition; while the one intended for range purposes should be very masculine, appearing vigorous, having plenty of bone and even, if possible, a little rough as it will do no harm because the average range cow will overcome this in the calf.

In selecting the dairy bull constitution is the first essential to be sought, after which minor points come. The disposition should be good; the head should be small and refined; the chest broad and deep, especially broad and deep through the heart girth; the back should be strong supporting a large abdomen with strong walls; the pelvic bones broad and the tail good length. The skin in front of the scrotum should be loose and in folds; the rudimentary teats large, even and well placed, and the milk veins prominent. These indicate

udder capacity, shape of udder and teats and quality of milk, respectively, in heifers.

The selection of the dam, while of value, is not so generally considered because of her limited influence in a herd and the difficulty of selecting her. Every one has the cows and only those with moderate means can afford to select her, it being cheaper to breed up. However, in selecting the dam the various valuable points should be looked to carefully, conditional with the purpose for which the dam is intended. Suffice it to say that largely to her are to be found the transmitting of peculiarities of disposition, temperament and smaller points. With a satisfactory dam the chances of the offspring being a prize winner are greatly enhanced. Show cows if properly treated will produce show calves.

A beef cow should give enough milk for her calf at least and as some one has said "a cow that is not a good milker is not a good breeder and of little good in any herd; they are engines without safety valves."

AGE OF PARENTS:- In breeding, mature animals should be used as stronger off-spring are obtained. It is injurious to breed from immature ones, for in the long run weaker and smaller calves are the result. This is especially true on the range. Here a young bull's breeding powers and his future usefulness are seriously injured. It is best not to breed dairy heifers before fifteen to sixteen months, and beef heifers twenty to twenty-one months or even longer. The bull should not be used before a year, and twenty months is the earliest he should be turned on the range. It is too common a custom among the unknowing people to use the bull at too early an age and too freely. There is no reason a bull properly handled should not last for many years in place, of only four and five as many do.

CONDITION OF PARENTS:- The sire and dam should be in good breeding condition at the time of impregnation, yet with dairy stock the condition should not be one with too much flesh, but flesh is highly desirable in beef cattle. Thos. Wilhoit of Indiana says, "thick fleshed cattle breed thick fleshed cattle" and since the foetus partakes of the same nature of the cell from which it springs, this condition should be kept in beef cattle.

This flesh should be kept up by cooling, soothing feeds that build up bone, muscle and fat in right proportions and not by corn which is heating and destructive to good tissue. The foetus is a nitrogenous product and the intended mother should be fed correspondingly and not on carbonaceous food so starving the embryo calf. Also should plenty of food be given to feed both, for the coming mother now has herself and another to support. If sufficient food is lacking then one or the other has to suffer. If the cow loses flesh on her back the baby calf comes into the world too weak to lift itself, so care must be exercised to see that the food is abundant enough, of the right nature and that the cow makes proper use of it.

TIME OF BREEDING:- The time to breed cows varies according to the conditions and purposes. The dairy cow should calve in September or October; the range and general farm cow in January. By having the dairy cows calve in September or October the greatest yield is obtained for the year and the strongest milk flow at a time when the product sell best. Cows having calves in the fall go into the winter quarters flush and when spring comes with green grass a fresh flow is obtained to increase the years production. . To have the calves come at this time the cows should be bred in November and December.

The range cow drops her calf after the severe winter weather is over and before she has a large flow of milk from the grass for

the calf cannot and does not need to take much milk at first. When the grass comes she increases in milk and the calf is better able to take the increased amount. The calf gets this grass all the first summer and until frost comes grows as well as any other calf. After this he should be fed to keep growth in place of losing flesh and becoming a runt. If range calves come in the fall the cows would not give enough milk and the grass would be all gone to help sustain growth. The well bred general farm calf comes ready to go onto the grass in the spring; is weaned in the fall; put into the feed lots; liberally fed and turned into the market the next spring or fed well through the winter to go on spring grass again and grow into a fine specimen ready for feeding to fatten and turn out as Christmas beef at a price swelling the seller's purse; with a finish suiting the eye of the buyers and with a delicacy tempting the appetite of the consumer.

By having the calves intended for show purposes or for breeding stock come in January they become of sufficient size by September or October to be in good show and sale condition and are ready for breeding purposes by the next spring, so have a readier sale than later born calves. If intended for the show ring all the better for young calves do not show as well as older ones because of insufficient size and difficulty of telling what they will develop into. From this it is seen that having January calves the show ring farmer and ranchman's needs are catered to and catering to the trade always pays.

CARE AT CALVING TIME:- The dam should have a rest of from six weeks to three months before calving to prepare that trying event. The time varies according as she is a dairy or beef producer. To give this time is often very difficult in case of the dairy cow. In such cases the cow should be milked right along. At any account give laxative foods just before calving. These keep the bowels in good condition,

giving better health to the cow and the calf when it comes. Such foods as alfalfa, clover, ensilage, roots, cowpea hay, clover bran and oil-meal are good for this purpose. By having the cow in good condition milk fever and kindred diseases will not be prevalent. Good attention prematally always pays in the more satisfactory results.

In summer time it is usually safe to allow the cow to calve in the free open meadow but if the calf is dropped in cold weather the dam should be placed in a good, clean, warm, well bedded box stall and in severe weather even blanketed. Be on hand at calving time to give any assistance necessary. With old cows assistance is rarely needed but it is often best with heifers with the first calf. No animal should be allowed to strain for over one and one-half hours as they exhaust themselves so are weak when help does come.

As soon as the calf comes remove it out of harms way; usually up next to its mothers head. Wipe it off dry and in a short time see that it sucks. See that the cow has luke warm water to drink soon after birth because the loss of blood makes her thirsty, but never give cold water as this is likely to cause contraction of the womb and retention of the afterbirth which should be discharged in twelve to fourteen hours after calving. If not away then remove it by hand. Continue laxative foods for a week or longer. If the cows udder is inflammed or caked, apply clothes rung in hot water to it for thirty minutes thrice daily, each time rubbing dry and applying camphorated glycerine and sweet oil.

The calf should be left with the cow the first two days and longer if the dams udder is caked as its rubbing while getting its food tends to reduce the inflammation of the udder. See that the udder is emptied twice daily as stagnant milk in the udder is injurious to the cow and to the calf's digestive system. Always let the calf have

its mothers milk for the first week for the colostrum, as the first milk is called, is a powerful aperient or physic, also a tonic and is intended to free the calf from the foetal matter in its bowels in the foetal stage. Unless this objectionable matter is removed the calf has little chance for useful life.

If the calf comes very weak it may have to be blanketed and removed to a warm room and fed with a bottle or spoon. Especially is this true of calves born prematurely. Sometimes a stimulent of very weak whisly is good to help the calf along. Such small calves can stand a temerpature of 95° to 100°F. without any discomfort or ill effects whatever. The treatment of all calves is the same for the first day or two and varies afterward but later treatment will be spoken of afterward.

There are various ways to rear calves of which the following are several. The methods will be described later.

- 1.- Calf with Cow.
 - a.- With cow constantly.
 - b.- With cow at intervals.
 - c.- With a nurse cow.
 - d.- Sucks a part of the milk
 - e.- Two calves on one cow.
- 2.- With milk and its Products.
 - a.- Wholemilk
 - b.- Buttermilk
 - c.- Skimmilk
 - d.- Whey
- 3.- Milk Substitutes
 - a.- Hay tea
 - b.- Grain mixture.

These ways fit almost every case one may desire and fill all gradations from the poorest to the best.

THE CALF WITH THE COW CONSTANTLY:- The calf with the cow means only beef production and is the most primitive and often the best way. This finds its best patrons on the farms and ranches where the acreage is large and cheap and labor scarce. A well bred calf running with its dam on grass will weigh four hundred to six hundred pounds at six months. The Alabama Experiment Station in several trials at weighing of native calves on the pastures in the vicinity found them to make a daily gain of about one pound each. These calves were of scrub stock and not on good pasture. The Kansas Experiment Station reports a daily gain of 1.77 pounds each on Hereford calves running with their dams in a pasture near at hand. This period covered one hundred and thirty-nine days.

If possible the calf should be kept up for one or two weeks and then allowed to run with the mother continually. Thus it becomes strong enough to get about. It is advisable even then to get the cows up twice daily that they may be fed a little grain and the calves taught to eat and at the same time become accustomed to being handled. Oats, bran and shelled or ground corn are good feeds to give. Of course on the range no such treatment can be given but in the fall at weaning time they should have plenty of food to keep in growing condition and not loose their first flesh. .

They can be raised on the ranch and shipped at weaning time to more productive locations for fattening or winter keeping. The first winter is the stunting or making period. Under present conditions the range is the cheapest place to raise calves and with as good breeding those raised there are equal in every respect until weaning to those of thick farmed districts when treated in the same way. The

dams, on the range, give sufficient milk for the calf and no more as it causes her to loose more flesh, suffer from spoiled udders and consequently fail to raise her calf.

CALF WITH COWS AT INTERVALS:- Some breeders prefer to keep the calves away from the cows except two or three times a day. Generally they are with the mother three times daily for the first week and afterward twice daily. The calves should be taught to eat grain at two to three weeks of age and allowed to run on a small pasture with good dark, cool shelter from the ilies. In their reeding give them some nice bright hay as they will eat a surprising amount of it even when on pasture. They should never be allowed to become hungry before reaching maturity, not that feed should be kept before them continually. By this treatment the calf will secure the very best growth and development.

That this method is worthy of investigation is proven by the fact that many of the best breeders of beef cattle do this. Calves to be so treated are best dropped in January and nursed by their mother until nine months old when they can either be weaned and well fed or placed on a nurse cow and carried on for show purposes. The mother should not be allowed to suckle her calf over nine months as she will need three months for recuperation before suckling another calf.

NURSE COW:- This is a much discussed subject and a practice very good in its place but too often much abused. Too often we have seen nine hundred to one thousand pound animals still suckling their foster mothers or oftimes two foster mothers when one did not supply the desired amount of milk. It is no uncommon sight to see a lot of forlorn looking cows tied near the show stables or sale barns, these are the nurse cows.

If a nurse cow is to be used from the very first she should

freshen the same time the calf is born, as this gives the natural condition of milk besides the cow will more quickly own the strange calf as her own. If she does not do so at first, persevere for perseverance will usually win. For weak calves allow them to have only the first part of the milk at their ^{first} few weeks because the last milk is too rich and liable to cause indigestion. In using the nurse cow turn the calf to her two or three times a day, also give the calf grain, hay and shelter the same as under the preceeding outline of Calf with Cow at Intervals.

To four bull calves on nurse cows at the Kansas Experiment Station the following grains and hays were fed in varying proportions to suit conditions; the nutritive ratio remaining 1:4, Bran, shorts, corn, oats, oil-meal and soy-bean meal. The roughness were as follows: prairie hay, alfalfa hay and mangles, the nutritive ratio remaining near that of grasses.

It took less of this mixture to produce the desired results than that of ordinary foods. The largest amount of grain fed to the calves under eight months was two pounds daily.

The following table gives the breed, age, weight and daily gain of each of the four bull calves:

Breed	Age days	Daily gain, birth weight included.	Daily gain, without birth weight.
Angus	120	2,733	2,133
Hereford	240	2,357	2,101
Shorthorn	210	2,702	2,333
Red Polled	237	1,857	1,675

Possible the use of the nurse cow is justifiable where the mother is used in the show-ring or is to be fitted for sale. Often by the use of a \$30.00 nurse cow a \$250.00 calf can be raised and surely

such conditions pay. The greatest draw back is the liability to nuisance of the nurse cow.

CALF SUCKING A PART OF THE MILK:- In years gone by calves were seldom fed by hand, but allowed to suck one-fourth or one-half of the milk from the cow and then pulled off and tied with a rope while the milker drew the remaining portion, or beaten away with a stick which caused bumps and knots of various sorts. In some cases the loss of an eye or a broken leg or jaw can be traced to just such methods. Such crude operations are carried on to-day by many people. When the dam gives plenty of milk the calf does well enough, but the method is very objectionable and unbusiness like as the following reasons will show:

- a.- It is lots of trouble to the milker both mentally and bodily.
- b.- It injures the cow for dairy purposes.
- c.- It is an expensive way to feed.

Often the cow is milked of the first portion and the remainder left to the calf to finish up. No wonder such calves thrive while the dairy business tags because a pint of the last milk will make five times as much butter as the first pint. Some think the cows will not give down their milk unless the calf is present, but such ideas are unsound. True old spoiled cows will give trouble and will not yield as much milk the first lactation after the calf is taken away as she would otherwise but the second lactation finds this objection gone.

After once trying the best way of drawing all the milk by hand without the calf to bother with one will not likely return to the old method as it has no good features to recommend it except laziness on the part of the milker. It certainly is worthy of recommendation to one who wants to get out of milking and be out of pocket money.

TWO CALVES ON ONE COW:- This method of rearing calves is often practised and is better than the former method as here one cow is left to be milked, the other turning her attention to the two calves.

Under this method the calves should be even in size, kept up to be turned to the cow at intervals when one can watch to prevent one from robbing the other. Otherwise the treatment is the same as in the former division under Calv with the Cow at Intervals.

WHOLE MILK FOR CALVES:- With the advent of the creamery, means had to be secured to prevent the calves sucking and still grow. Under such a demand calves on whole milk drawn by hand will be raised. Such calves will be better suited for beef than dairy purposes on account of the extra amount of flesh laid on because of the fat in the whole milk. One of the greatest objections to this method is the heavy cost of the milk, for milk testing 4% butter fat with butter at 25¢ per pound is worth \$1.16 per 100 pounds. Such being the case it is much more economical to feed skimmilk which is valued at only 15 to 30¢ per hundred pounds.

Ten calves fed on whole milk at the Kansas Experiment Station made a daily gain of 1.95 pounds per head during a period of twenty-two weeks. In this time they consumed 23,287 pounds of fresh milk, 835 pounds of corn chop, 835 pounds of Kafir-corn meal and 835 pounds of alfalfa hay. Charging butter fat at creamery prices, the feed cost of raising these calves amounted to \$15.72 per head. Each 100 pounds of gain cost \$5.46 for feed consumed. These calves had good shelter and plenty of fresh hydrant water from a Dewey waterer. When weaned the lot was in as good condition as one could well ask for. The Iowa Experiment Station found that whole milk calves were interrupted more in their growth by weaning than skim-milk calves, however this was not practically noticeable in the Kansas Experiment, although the skimmilk

calves did better when out into the feed yards immediately after weaning to make "baby beef."

SKIMMILK FOR CALVES:- Dairying to-day when followed with intelligence is the most profitable business the farmer can engage in, but to secure the best results he must be able to not only dispose of his cream and butter to his best interests, but also see that the erroneously so called, 'by-products' as skimmilk, the greatest by-product, when improperly handled causes a great leak in the profits of dairying and most generally because the dairyman is ignorant of its true value. This is proven by the readiness with which whole milk is sold for city consumption and condensing factory uses, thus losing both its fertilizing and feeding value, and again by the poor care it receives in being handled and fed. Different people value skimmilk at various prices, from nothing, saying it isn't worth having, to 30¢ per hundred. The average value as stated by those that know its great value is 20¢ per hundred pounds.

Its feeding value is of prime importance to the dairyman because it is a strictly business proposition to him to know how to get good young cows and by using skimmilk in rearing his calves he has solved the proposition, besides skimmilk if properly fed will make as good calves as the unskimmed milk and at a much less cost. For instance the Kansas Experiment Station reared skimmilk calves at a cost for feed of \$5.27 per head to weaning time and whole milk calves at a cost of \$15.72 per head for the same time, figuring butter fat at creamery prices. The former gained 1.51 pounds per head per day and the latter 1.95 pounds per head per day. As the dairy calf should gain about 1.5 pounds per day from birth it is readily seen from this experiment that skimmilk solves a great problem for the dairy farmer.

Since the calf needs plenty of protein and ash to make

muscles, tendons and bones, the framework for future filling in, notice the composition of skimmilk when viewed from the standpoint of digestible nutrients per 100 pounds feed: Protein 3.9; carbohydrates 4.9; fat 1; ash 7; with a nutritive ratio of 1:1.2. Here it is seen how rich it is in protein and ash the necessary food principles for growth in young animals. This shows that skimmilk is a valuable feed from the standpoint of composition and the above experiment verifies this fact.

A calf intended to be placed on skimmilk should be taken away by the second day and placed out of hearing of its mother then left alone for twenty four hours, then take two quarts of the mothers blood warm milk and give to the calf, by backing it into a corner, straddling its neck and placing its head in the vessel containing the milk, starting it to sucking by the inserting of a finger in its mouth. If it refuses to drink at the end of twenty-four hours try it twelve hours later, a.e. at the end of thirty-six hours when it will be almost sure to drink, at any rate never turn it back to its mother for it will then be spoiled and will not drink from the bucket without an extra amount of trouble.

Calves should be fed thrice daily the first week, then twice daily. The first week feed two quarts at the morning feed, one quart at noon and two quarts at night. Increase this amount as the calf can use it.

Generally the earlier the calf is removed from its mother the better it is for both mother and calf, for a calf allowed to suck for two or three weeks will usually lose in weight the first week when taken from his mother. While if taken away at once it will gain from the start. It might be well to say that a calf reared on whole milk would be treated the same as a skimmilk calf until the change to skimmilk begins which is at two weeks depending on the calf. To make

the change from whole milk to skimmilk replace at first one half pound of whole milk with one-half pound of skimmilk and increase the amount of skimmilk one-half pound per feed at the same time reducing the amount of whole milk correspondingly until no whole milk is being fed. The calf's stomach is very delicate so make all changes very slowly that the calf may gradually become accustomed to the difference in feed.

Give the calf a little grain in its mouth at seven to ten days also a little hay where it can nibble at it, for it is surprising how much hay a young calf will eat and how soon it will begin. In fact it is better for them when on skimmilk than green grass or pasture. The best grains to use are ground flax-seed, shelled corn, oats and ground Kafir-corn. Bran and shorts are good, particularly the latter. Feed all grain dry except the ground flax-seed which is best made into a jelly and mixed with the milk.

For a steer give all the corn it will eat and for the heifer give one-half oats. There is no danger of giving too much corn and oats provided it is eaten up clean. Henry Wallace gives the following amounts of skimmilk for calves at different ages:

One month old, 12 to 14 pounds

Two months old, 18 pounds

Three months old, 20 to 22 pounds.

The amount of skimmilk for a three months old calf is a little high for the average calf.

Do not try to raise calves on skimmilk alone, besides keep everything clean that is in anyway connected with them

BUTTERMILK FOR CALVES:- The dairyman who does not feed buttermilk to his hogs can find a good market for it by feeding it to his calves and the same might be said of sour milk for they are so nearly alike

in every way. Buttermilk has very near the same composition as skim-milk and if fed properly will give practically as good results. Many calves on the small farms after they reach a month old receive nothing else than sour clabbered milk with some grain and pasture and thrive upon it. Some of the best hand raised calves the writer has seen were just such calves.

In the first place calves started on buttermilk should be older than the calves started on skimmilk because the change is greater. It is not advisable to start calves under a month old on buttermilk, and then it is best to start them on skimmilk at two weeks in place of whole milk, but the latter method can be used successfully especially if the calf is a strong one or of good age. In making the change proceed as when changing from whole milk to skimmilk. Some calves do not take at all readily to buttermilk, refusing to drink at times. For these the best plan is to cut down the amount given them or mix in a little whole milk or skimmilk until they will drink, then start them again but more cautiously than the first time and they will generally come to drinking the desired amount.

Buttermilk should be fed as fresh as possible and fed from thoroughly clean vessels. Old, sour fermented buttermilk is unfit to feed any animals much less calves. Have the tanks and all utensils any way connected with the buttermilk washed thoroughly each time before any fresh milk is placed in them, thus, the sour taint can be kept away. Buttermilk seems to have a tendency to scour the youngest calves and when once started is very hard to check. Clean vessels will do much to keep away this malady.

Buttermilk is best fed cold because when so fed the whey and curd are not so badly separated as when the milk is heated up to 95°. In changing from warm to cold milk, whether sweet or sour, change only

a degree or two a day and do not go below 70° or 60° at the most. The writer has fed cold sweet skimmilk to calves with excellent success and without disorders of any kind. The older the calf when changed to cold milk the better. In feeding milk do not feed warm one time and cold the next but keep the same temperature be it high or low. Feeding of milk cold is best for those who cannot or do not have a fit place for warming it, however, if possible warm the milk as it is more satisfactory as a rule than cold feeding.

WHEY FOR CALVES:- While it is easy enough to raise calves on skimmilk or buttermilk it is a much more difficult problem when whey is the feed to be fed because of its poor feeding value and its effect on the digestive organs of the calf. For this reason many people hesitate about going into the business of cheese production.

Henry says the following concerning whey: "In the cheese districts, calves are frequently raised on whey, which feed is a poor substitute for even skimmilk. When used, whey should be fed in not too large quantity and amended with the abstracted constituents by the addition of pilmeal, ground oats, etc. Care should be taken to feed the whey while as nearly sweet as possible, and all vessels holding it should be scalded daily so as to be free from a sour taint. While none too good in itself any nutritive qualities whey may possess are rendered or still less worth by allowing it to ferment or by feeding in dirty vessels." "Whey kept in filthy tanks or vessels is unfit for feed Graef testing the relative value of whey and skimmilk secured a gain of two pounds per day, while those fed whey gained from one to one and four tenth pounds only."

HAY TEA FOR CALVES:- Stewart says, "This old expedient to rear calves without milk had an excellent basis as do most common practices. The soluble nutritive constituents of the hay are extracted by boil-

ing and this extract contains all the food elements required to grow the animal, besides as being as digestible as milk." He reports a gain of over two pounds per head per day for a period of sixty days where the calves received two gallons of hay tea and a jelly of flaxseed and wheat nibblings.

The Kansas Experiment Station, the summer of 1900, fed two lots of ten calves each on alfalfa hay tea and mixed hay tea. The mixed hay was a combination of blue grass, orchard grass, red top and a little red clover grown on the College farm. The hay tea was supplemented by linseed meal jelly, wheat nibblings and equal parts of corn meal and ground Kafir-corn with hay, the same as that of the tea they received. The calves on alfalfa hay gained only about .51 pounds per day per head and those on mixed hay tea averaged about .74 pounds per day per head, a little better but poorly enough. Both lots were started on the experiment when not over four weeks old and fed until six months old when they were weaned. Toward the last they could manage the hay tea better than when younger.

In these experiments the hay tea was found to be very loosening and especially the alfalfa hay tea. The calves were effected with scouring more or less during the entire experiment. Some of those on alfalfa hay tea became very weak and were saved by replacing a part of the hay tea with whole milk. The calves did not take to the hay tea readily and two refused to drink except occasionally. Although the hay tea was not relished, the calves mourned for it when they were weaned, yet after the week of weaning they made far better gains than they had made during any previous week while in the experiment.

The station in making the tea used a large oblong galvanized watering tank placed over an excavation in the ground and fired much as a boiler. The following is an itemized account furnished by

C. H. Clark, then a college student, of the cost of making 100 pounds of hay tea and the necessary amounts per 100 pounds hay tea:

	Amount per 100 pounds tea	Cost per 100 pounds tea
Coal at \$4.00 per ton - - - - -	19.102 lbs.	\$.0382
Hay at \$4.00 per ton - - - - -	12.5 "	.025
Labor at 10¢ per hour - - - - -	27 minutes	.045
Total cost 100 pounds hay tea		\$.1082

These figures are an average for a period of twenty three days during which time 11590 pounds of hay tea was made and 2214 pounds of coal used in the making. In starting to make the tea enough water was added to cover the hay when weighed and it was found that seventeen pounds of water was necessary for each pound of hay used. From this eight pounds of tea was secured. The hay was drained after thoroughly boiled but when drained as much as practicable it still held four pounds of water per pound of hay, the hay being well dried after drained. The tea was made fresh three times a week to keep it from souring and even then precaution was necessary to keep it in good condition. About six hundred pounds of hay tea was made each time.

The conclusion from the two experiments is that it does not pay to raise calves on hay tea. As good calves cannot be raised on hay tea as on skimmilk nor can they be raised as cheaply

GRAIN MIXTURES:- Where the milk from a dairy is sold for total consumption the need of a practical and complete milk substitute is very apparent if the herd is to be kept up to anything like a standard. To try to do this the Pennsylvania Experiment Station tried several mixtures quite satisfactory.

- Wheat flour - - - - - 30 pounds
- Cocoanut meal - - - - - 25 pounds
- Nutrium - - - - - 20 pounds

Linseed meal - - - - - 10 pounds
 Dried blood - - - - - 2 pounds

The cost of this calf meal is 3.2 cents per pound. The conclusions which they say seems warrented are as follows:

"There is little difficulty in raising prime dairy calves without milk after they are two months old."

"Calves from high class, well breed dairy stock, when raised in this way, are worth more than they cost, and afford the only means by which a milk dairyman can raise his herd to a high standard of excellence."

In commenting upon the first conclusion the author of the bulletins says, "It is well known that the digestive tract of the young calf is of such a delicate nature that it is next to impossible for it to take anything as a complete substitute for milk, either whole or skimmed, for the first ten days after birth. As the milk produced during this time is not considered fit for the milk market, it can be put to no better use than that of food for calves. Consequently it is not until the calf is ten days of age that there is a demand for a milk substitute. Fortunately at this age the calf is strong enough to digest a few carefully selected foods other than milk, and by skilful management may be brought along as rapidly and as satisfactory without any milk as his stall companion who is supplied with an abundance of skimmilk supplemented by some pallatable grain." "One pound of the mixed meal was added to six pounds of hot water, and, after stirring for a few moments allowed to cool to 100°F., when it was fed, either out of a pail or from a calf feeder. The calves gained about 1.0 pound per day for one hundred and five days.

TUBERCULOSIS COWS MILK:- Storr's Agricultural Experiment Station tried an experiment with calves fed on milk of tuberculosis cows with

no udder affection and found that they were not liable to acquire the disease from this source. In the tests made at that station calves were fed for periods of five to sixteen months upon the milk of cows which it is reasonable to suppose were tuberculosis, but without the disease having appeared in the udder, and in no instance did the calves show symptoms of the disease either by the tuberculin test or physical examination but made rapid growth and appeared vigorous and healthy.

WEANING:- The best age at which to wean calves on skimmilk is at six months as they then are old enough to live easily on hay and grain alone. If there is plenty of skimmilk it can be fed with excellent results after this age but with calves intended for the dairy the amount of fat will quite likely be a serious objection as the object with such calves is to keep them growing well and not get too fat.

Calves intended for beef and running with the cow can best be weaned at nine months as the milk after six months will put on fat and make growth which is so essential.

The most important thing to see to at weaning time, whether the calf has been reared by hand or otherwise, so that the calf is eating grain and hay. This is important because this period is always a losing period, as all changing periods are, and if the calves know how to eat this loss is lessened. It generally takes two weeks to get a weaned calf used to eating grain if it never has seen it before.

In weaning the calf raised by hand the best practise is to cut down the amount of milk gradually, say one-half pound at a feed and increase the grain or hay as the calf will take it. Calves with their dams are best weaned at once, thus the trouble is over with and the sooner the better. The dams should be milked after weaning time then gradually dried off or if the number is too large as on the ranges, they should be fed lightly on feeds not conducive to a good

milk flow, as hay and fodders are put on scant pasture for about a week to be dried off.

FEEDING MILK:- Natures way of feeding a calf is undoubtedly the best but that not being convenient or economical the next best method has to be resorted to, that of feeding from a clean bucket or something to hold the milk. It would be and is impracticable to feed calves out of a trough for each should have its own milk ration measured out for itself. Some calves drink very fast while other drink very slowly, some times taking twice as long to dispose of the same amount of milk and it is not at all uncommon even among a small number of calves to find some drinking three times as fast as others.

The results of feeding calves from a long trough as pigs are fed is evident - that the fast drinkers get too much and scour, and the slow ones get too little and starve. The calf is by nature a very greedy animal and if this tendency is not curbed natural consequences - scours - follow. It is very hard to keep from feeding a calf more milk than he needs.

A tin pail or other pail that can be thoroughly washed is the best, and these pails should be cleaned after each usage. Many of the worst cases of scours are caused by unclean utensils about the milk and it is not saying too much when it is said that this with overfeeding causes nine-tenth of all cases of indigestion in calves.

Some think the calf should suck the milk from a rubber nipple which is attached to a bucket holding the milk. This method, however, does not always suit, the nipple becomes old and get dirty too quick quite often causing sickness and perhaps death, besides the time it takes for one calf to get its ration by this method, is sufficient to portion each calf of ten its ration and have them drink it, in other words it takes ten times as long for a calf to drink its milk by the

use of one of these calf feeders as it does to drink its milk from a bucket. The only advantage they have is that a weakly calf is made to get its food more slowly and not gulp it down. By taking its food more slowly scours are prevented to a certain extent but if the time wasted in using the feeder was employed in studying the calf and its wants, as good results would be secured and with less trouble. This is the experience of the writer and other parties have confirmed this statement.

The bucket is better than the trough because each calf gets the measured amount and is better than the calf feeder because a saver of time, is easier cleaned and does not get worn out, or out of condition so easily.

In feeding the milk have it the same each time, if cold one time continue to feed it cold, if warm continue to feed it warm, if sour feed it sour and keep it up but make all variations gradual and do not change from one to the other. Feed the milk at the same temperature always for a change will be sure to upset the calf's digestive system. The best calf feeders use a thermometer to tell the temperature. It is not safe to trust to guessing or trying the temperature with the finger, for what may seem warm to the finger may be too cold for the calf's stomach. It is usually as easy to try the temperature with the thermometer, and the results will be much more satisfactory. No one can expect to raise calves by hand and not pay any attention to the temperature of the milk fed.

KEEPING MILK:- In feeding skimmilk it is best to keep it sweet or if fed sour as whey or buttermilk, to keep it as sweet as possible. One of the best ways to keep skimmilk sweet is to have it sterilized at the creamery, brought home and cooled at once to below 60°F. Cool with running water in a tub or if not with running water see that the water is changed occasionally until the milk is the desired temperature.

Whey may be treated the same way but not buttermilk as the curd is cooked into chunks so is poor feed, otherwise treat buttermilk as other milk. Hay tea should be kept cool to prevent its souring, for fed sweet it is a poor feed and fed sour it is even worse.

FEEDING GRAIN:- Calves will begin to eat grain at ten to fourteen days of age and it is proper that they should have it at this time and the sooner they can be made to eat the better. In starting a calf to eating grain after he has had his feed, throw a handful of the dry ground grain into his mouth that he may become accustomed to it and gradually learn to like it and go to the boxes for it. At first they eat very slowly, but, as their digestive system becomes adapted to the grain diet they eat more, until by the time they are a month old they will eat one-half to three-fourth of a pound per day and at three months, two to three pounds per day. Never mix any grain with the milk. The starch of the food must be changed to sugar before it is digested. This change takes place chiefly in the mouth by the action of saliva. When the grain is gulped down the starch is not so changed and cannot be acted upon by the gastric juice in the stomach. It remains unchanged until it reaches the intestines of the calf are comparatively short complete digestion is impossible.

Experiments show that grains rich in oil or starch can be used successfully in supplementing the fat removed from milk by skimming. The value of several grains and feeds are treated in the next few lines. Keep the grain boxes clean and free from old grain.

SHELLED CORN:- In most localities this is the cheapest food that can be found and it has another still greater advantage in that it is one of the best feeds for calves. Calves like the corn shelled better than ground and when the two are mixed together they will eat the shelled corn, leaving the ground corn. The Kansas Experiment Station

in Press Bulletin No.89 describes two experiments in which the relative value of shelled corn and corn-chop with skim milk were tested. The shelled corn lot gained 1.74 pounds per head per day for the nineteen weeks under experiment, and the corn-chop lot averaged 1.59 pounds per head per day, and at a greater cost per hundred pounds gain than the shelled corn lot. Shelled corn is very palatable and as the calves have time to and enjoy grinding the kernels it is best for them to do so.

CORN CHOP:- This feed is best fed to very young calves to get them started to eating grain. If the corn is hard, old and flinty it is best to grind it otherwise the older calves cannot crush it. Sometimes the corn-chop is preferred because of the readiness with which it mixes with other feeds. Unless for one of these three reasons, never grind corn for calves as the operation is too expensive and does not increase its feeding value.

CORN BRAN AND CORN HEARTS:- These feeds are not palatable at first but soon calves become accustomed to them and do well.

KAFIR-CORN:- The Kansas Experiment Station comes out with an experiment testing this feed and in this whole vs. ground Kafir-corn was tested with two lots of ten calves each. The calves receiving ground Kafir corn gained 1.41 pounds daily per calf. Each lot received similar treatment except in the matter of grains fed. Here it is shown that grinding pays because of the large amount of grain passing through the system whole, also better gains were made by grinding. If grinding is expensive it may be did away with after three or four months by substituting whole Kafir-corn for ground Kafir-corn and the gains not to be seriously affected if affected at all.

GROUND KAFIR-CORN:- The former cited experiment speaks of its feeding value. The greatest objection to it is the cost of grinding

It is an excellent feed to start young calves with and when fed in connection with shelled corn is hardly surpassable. All corn is constipating so prevents scours to a certain extent.

OATS:- These are the best growing feeds one can feed because of their high percent of protein and ash. They are as good fed whole as ground and cause no trouble besides the calves relish them. Oats are generally too costly to feed in any great extent but because of their good effects should not be withheld altogether but fed to add a variety.

The Iowa Experiment Station fed oat-meal with a gain of 1.68 pounds per head in a lot of four skimmilk calves. Four calves similarly treated but fed corn meal gained 1.72 pounds daily per head. Calves fed oil meal gained 1.63 pounds daily per head. These experiments show that oats and corn can be substituted for the high priced oil-meal in calf feeding.

BARLEY:- Although no experiments are at hand to show the value of barley for calves it has been used in some experiments and with no bad effects. Its composition and value as a feed for dairy cows point that it would be valuable for calves, however, when so fed should be ground and a little bran or shorts mixed with it would prove still better.

RYE:- Rye can be treated in the same manner as barley when fed to calves. It is usable for calves, at least no reasons are known why not. A mixture of one-third ground rye, oats and corn gives satisfactory results, especially if fed in connection with good hay or other roughage for growing stock. If unfavorable results are noted it may possibly be due to rye, but evidence should be found before it is condemned.

WHEAT:- This grain is best fed to calves ground because of its shape. If ground they can utilize it better. Wheat is a satisfactory

food for calves when it can be bought cheaply enough but otherwise as good results can be obtained with cheaper feeds. It like most other feeds is better relished when fed in connection with other feeds to give variety.

WHEAT BRAN:- This feed is rich in protein so not so good for skim-milk calves but good for them after weaning time when supplemented with such feeds as corn. Calves fed on whole milk can be fed bran and corn with success and for growing stock it is hard to excell. The greatest objection to its use is its cost.

WHEAT MIDLINGS:- The Alabama Experiment Station fed Jersey calves with equal parts of wheat bran and midlings in connection with skimmilk and received again of 1.5 pounds per head per day. Midlings need some lightening or loosening feed to go with them to keep it from forming a doughy mass. It is a better feed than bran for calves on skimmilk and is as palatable, or even more so, than bran.

FLAX-SEED:- It is generally considered that flax-seed or oil-meal make the best addition to calves' rations to replace the fat removed from the milk, the flax-seed being best because richest in this. The Iowa Experiment Station showed that the most satisfactory results are obtained by feeding oats or corn-meal in place of flax-seed or corn-meal. This experiment is given under the treatise on oats.

This same station fed two lots of calves ninety-one days to test the reeding value of whole milk vs. skimmilk and ground flax-seed. The whole milk calves made a total gain of 412 pounds or 2.26 pounds per day per calf at a cost of \$.076 per pound. The skimmilk and flax-seed lot gained 326 pounds, or a daily gain of 1.82 pounds per head, costing \$.05 per pound. The authors in commenting say that the experiment indicates that a ration of skimmilk and ground flax-seed compares favorably with new milk for calves and while the largest gains came

from the whole milk calves it was due probably to the individuality of the calves.

OIL-MEAL:- This oil-meal by-product is too rich in protein to be fed to skimmilk calves and does best for calves running with the dams or raised on whole milk, however, as good results can be secured with cheaper feeds as corn and oats or bran and shorts and at a less risk of scours. The best way to feed oil meal with milk is in the form of a jelly made with hot water.

COTTON-SEED:- When the large amount of fat this seed contains is considered it seems that it would be the ideal supplement for skimmilk and it does very well as such after six months but not before because of the excess amount of oil it contains. Calves will do especially well on it for a short time then stop making gains and are hard to start off again. The best method is not to touch it until after six months and then sparingly. After nine months of age the calves can stand more of the seed but even with older cattle it must be remembered that the abundance of oil is hard on the digestive system and is likely to cause scours when as overfeed is given. Bran is valuable to feed with cottonseed and helps to lighten it making it more digestible.

COTTON-SEED-MEAL:- Of this Soule says, " This is entirely too rich a food for suckling calves as it produces indigestion followed by scours. After calves have been weaned and learned to eat small quantities of cotton seed meal may be fed, say one-eighth to one-fourth pound per head per day, until they become thoroughly used to it, in conjunction with some bran, ground wheat, oats or corn. More cotton-seed meal than this may be fed to advantage sometimes, it depends largely upon the disposal to be made of the animals and the intelligence and skill of the feeder. It is not advisable to feed breeding animals large quantities of cotton-seed meal as it is a very strong food and

might derange the digestive system which affects the reproductive system. The same might be said of the cotton-seed but not to as great a degree as cotton-seed meal.

COTTON-SEED OIL:- The Alabama Station tried this method of supplying fat in skimmilk for a short time only because circumstances prevented their continuation but while the trial lasted very satisfactory results were obtained. If this oil can be used for such purposes it will prove a boom to the south where corn is scarce and high in price.

COD-LIVER OIL:- A popular magazine says the following about cod liver oil for calves: "Successful experiments are said to have been ^{made} at Yorkshire College, in England, in the feeding of calves with cod-liver oil. Not that there is hope of inducing such animals to partake of this delectable fish product on a large scale, but merely that it can be made to take the place of cream in the milk diet intended for them by nature. Supplied with plenty of skimmed milk, plus two ounces of cod-liver oil per diem the calf is satisfied and waxes fairly fat and healthy.

It will be realized that there is much economy in this idea for the farmer, who runs his milk through the separator, sells the cream, and feeds the skimmed milk to his calves, the place of the butter-fat of the cream being taken by the fish oil. The animals it is stated, 'soon get accustomed to it' and the cost per head for oil is only two cents a day." It is not likely that calves will be fed largely on this oil which is so distasteful. It has no practical value to the farmer.

BLACHFORD'S CALF MEAL:- The Kansas Experiment Station fed one lot of skimmilk calves on this feed in connection with equal parts of shelled corn and ground Kafir-corn; as a check to this another lot of ten was fed the same grain without the calf meal. The lots gained

practically the same. The former gained, for a period of 105 days, 1867 pounds and the latter 1863 pounds, a daily gain for both of 1.77 pounds per head per day. The calves on the calf meal ate during the period 2705 pounds of grain and calf meal and the check lot 2096 pounds but the check lot ate 145 pounds more hay. This shows that this calf meal is of little or no value to the stockman as a calf food and the same might be said of almost all prepared foods. They cost more than their feeding value justifies.

DRIED BLOOD;- This is a by-product of the packing houses and can be obtained from any of them, but in ordering it should be stated that it is wanted for feeding purposes.

At the time Blachford's Calf-Meal was tried at the Kansas Experiment Station another lot of ten skimmilk calves was fed shelled corn, ground kafir-corn and dried blood, these made a daily gain of 1.69 pounds per head, not as good as the check lot which gained 1.77 pounds per head per day. The feeding value of dried blood is nothing remarkable but it has another valuable property, that of a tonic for calves.

The Kansas Station has used it as a tonic for weak calves with excellent results. Prof. D. H. Otis in Press Bulletin No. 90 relates two cases of scours that were saved by the use of dried blood. In the first case a cow gave birth to an eighty-six pound calf, which was allowed to suck for several weeks, to assist in reducing the inflammation in the dam's udder. On account of poor quality and quantity of milk, the calf did so poorly that to save its life it became necessary to remove him from the dam. With the ordinary treatment he grew worse and worse, and when seventy-nine days old weighed only ninety pounds, or four pounds heavier than at birth. Although no one would have given ten cents for the calf at this time, and effort was

made to bring him out. He was given castor oil, laudanum, fresh eggs, calf meal, and, as a last resort, dried blood. With the blood the calf commenced to improve and in a short time was gaining at the rate of nearly fourteen pounds per week, and not frequently as high as seventeen to eighteen pounds per week. When a year old he weighed five hundred and seventy-eight pounds - a pretty good record for a calf that gained only four pounds in the first seventy-nine days of his existence. The dried blood consumed during parts of three months amounted to seven and one-half pounds.' 'Later, a heifer dropped her first calf which was small and sickly, and for the first few weeks did very poorly, losing two pounds the first month. For a few weeks its life was doubtful but when induced to eat a little dried blood with its milk it began to improve and make fair gains."

'Dried blood is not only good for a weak calf but is an excellent remedy for any calf subject to scours. Frequently calves purchased by the station arrive badly affected with scours; a little dried blood always brings about a cure. A test was made with five calves that happened to be scouring at the same time. With two the dried blood was fed after reducing the regular feed of milk. With the other three the dried blood was fed without changing the supply of milk. In the former case the calves recovered from the scours after two feeds; in the latter after three feeds. In seventy head of young calves under experiment there was not a single case of scours that dried blood failed to check.

In feeding dried blood, a teaspoonful at a feed is a great plenty. This should be continued until the scours disappear. In case of a weak calf, the allowance may be gradually increased to a tablespoonful at a feed. To prevent the dried blood from settling to the bottom of the pail, where the calf will be unable to get it, it may

be stirred in the milk while the calf is drinking, or the milk and blood may be fed immediately after being thoroughly mixed. Since dried blood is such a cheap and effective remedy, it will pay anyone who raises young calves by hand to have a little available whenever a calf shows digestive disorders.

In feeding any kind of grain it is well to remember that a variety gives better results and satisfaction than one feed alone. Never give more than the calf eats up clean as it does not like grain after it has slobbered over it or that has remained in the boxes until stale.

FEEDING ROUGHNESS:- Calves begin to nibble at hay, at least pick it up in their mouths, when only a few days old and begin to use it at the same time they commence to eat grain; about two weeks old according to the individuality of the calf. It is remarkable what a large amount a little calf will eat. At two months they will eat at least a pound a day. The hay should be kept clean and fresh to give better results. It does not pay to feed a calf poor feed, it better be fed to the older animals.

It is necessary for best development that the calves receive some sort of roughness to fill out the bowels so that they may perform properly. The Illinois Experiment Station tried several experiments to find out the importance of coarse feed in the growth of cattle. Calves were used and in every case they showed the desire for something that would fill. "All had a ravenous appetite followed by enlargement and stiffening of joints, spells of dizziness and difficult locomotion, all followed by periods of relief and finally by a settled feeling of indifference to food. This indifference could be removed temporarily by any change of food, but permanently by coarse food only, which never failed to effect a restoration to normal conditions."

No more positive proof of the need of bulk in food could well be shown and still seem reasonable.

ALFALFA HAY:- For young calves this hay proves too loosening, especially when on skimmilk. After the calves are older it can be gradually worked into the ration. For calves running with their dams it is excellent as it is rich in bone and muscle growing material. After calves are weaned they may be given all the good alfalfa they will eat. It displaces bran and oilmeal and is a natural complement of corn furnishing protein and ash the very things that corn is lacking in. Alfalfa will serve well to keep calves or any young stock going through the winter but is best not fed alone because of its high nitrogen content which is somewhat of a tax on the digestive system when fed alone.

OTHER LEGUMES:- Crimson clover, red clover and Hairy Vetch are almost as valuable as alfalfa hay and the calves eat with great relish and do well on them. The pasturing of all legumes is attended with more or less danger with remnants and must be at the owners risk. In pasturing any legume it should be dry when the calves are first turned on and they should not by any means be hungry. At first they should be left on the pasture but a short time during mid-day, and this should be gradually lengthened until they become thoroughly accustomed to the pasture.

Cowpea hay and soy bean hay prove satisfactory feeds for calves but the percent of waste matter is greater than in any of the other legumes mentioned, because of the coarser stems.

HAY FROM GRASSES:- Under this head comes timothy, prairie hay, red top, blue grass, orchard grass and several other. They all make good feeds especially for young calves as they are not as loosening as the leguminous hays. For calves on skimmilk these hays are the very best and should be largely fed until the calves are weaned as they offset

the tendency of skimmilk to scour. The calves relish clean, bright hay and eat large quantities of it.

Some times there is considerable difficulty to get calves on pasture without scouring, especially is this true of skimmilk calves but to some extent with calves suckling their dams. This can largely be overcome by feeding a little green feed before making the change. Give a forkful the first feed, two forkful the second feed and so on until the calves get all the green feed they want, when they can be turned on the pasture without injury. Never make sudden changes as evil results are sure to follow.

CORN FODDER OR STOVER:- Because of the coarseness of this food it is not readily eaten by young calves, but if clean and bright it is a very good feed but needs to be fed with other feeds as alfalfa or bran to furnish the necessary amount of protein for growing animals. Corn fodder or stover fed in connection with oats make a combination suited well for growth, and for fattening a little corn in addition is beneficial. For simply carrying young stock through the winter corn stover and alfalfa hay are good enough, however, better gains will be made if a little grain is thrown in.

CORN SILAGE:- For calves four months old and over this is a good feed although they do not eat as much as one might think. It helps to gloss the hair and put on that finish one likes to see in thrifty calves. Wheat, bran, middlings or alfalfa hay should be fed with it for best results.

STRAW:- This is of little value for calves except for bedding. The feeding value is so low that too large quantities have to be fed to get the amount of nourishment needed.

WATER:- Calves should have access to clean, fresh water at all times as it is a serious mistake to suppose that they do not need it

while nursing for here they will drink freely and many times a day. To find out the amount of water calves would drink thirteen calves at the Kansas State Agricultural College in seven days in June drank 868 pounds of water or an average of 9.5 pounds a day. The weather during this time was warm for the first three days and cooler the last four days. In addition, the calves were given an average of fourteen pounds of skimmilk besides hay and grain.

The calves drank several times a day, not much at a time, but often. Several times they took only one or two swallows. Frequently they would take a few mouthfulls of grain, go and gets two or three sups of water then back to their grain again. Even after their ration of milk they would take a few swallows of water.

This shows that calves need water in addition to their milk ration, it also shows that they like it often and not so much at a time.

The best devise to keep the water clean is a hog waterer, attached to a barrel which keeps only a small but constant quantity before them thus insuring the best always. The barrel should be kept clean and covered. For a large number of calves a trough would be best because of the greater freedom of access. The waterers could be attached to this if desired and fresh untainted water given.

While water is a necessity and plenty should be present at all times, yet, with a young calf taught to drink milk from a bucket precaution is necessary or it will drink too much. A calf forms the habit of drinking all the milk given it and does the same with water when placed before it in a bucket. Frequently, a calf supposed to be thirsty is allowed to drink soo much that death results. The writer has seen small calves that would drink three to four gallons of water at a time and not seem satisfied although they had received their allowance of

skimmilk only a short time before. The distress and evil effects are quickly seen if too much water is allowed.

Too much water dilutes the intestinal fluids and consequently lack of bodily nourishment resulting in the calf wasting away. The remedy is reduction of the supply of water for large calves, and with small ones, give only a little at a time for several days until the calf learns what it is, which generally will not take long. This trouble only occurs with calves reared by hand a.e.fed out of a bucket and watered the same way.

The water should be warmed in the winter season as calves will not flourish on ice water. Where the water is ice cold the calves will not drink as freely as they should, many times going for twenty-four hours without water, then filling up with too much causing scours and other digestive troubles. In the very coldest weather calves coming from water that has had the chill taken off walking along looking comfortable and feeling good, making a striking contrast to those miserably drawn up ones which have to drink ice water.

The cheapest and best way to warm the water is by means of a tank heater. At the Kansas Experiment Station the average cost of running six heaters from December 1st to April 1st was \$3.45 per heater; with an average consumption of coal per heater per day of 14.66 pounds costing \$.029. At this small cost anyone raising stock can afford one, besides the time for firing is no item. On an average winter day two firings a day will do and at the most three per day.

TIES AND QUARTERS:- Along this line Prof. Ed H. Webster says, "One of the reasons for failure in rearing calves on skimmilk is the lack of proper quarters for the calves. The old way of feeding a calf from a pail in an open lot may do if there is but one calf. Where there are two calves in the lot together, the trouble begins; if there are

more than two, the trouble multiplies with each additional calf. We may tie them with ropes, but in this, as in many others, time is money, the ropes are gone half the time, and the calves will not always want to come without persuasion.

When a neat, strong, and efficient stanchion can be made there is no use for the old 'happy-go-luck' way of doing things. For successful work in rearing calves one must have a shed for them in stormy weather and in hot weather.

We grant that the dairyman has this shed, and that it is at least sixteen feet wide and closed tight on the north side and the ends. It may be built out of any kind of material, even to a straw roof if nothing better can be afforded. It may be any length so that it affords sufficient room for our calves. Under this shed, three and one-half or four feet from the back wall, can be built our stanchions. The lumber for a section of ten stanchions are as follows: Thirteen pieces one by six by fourteen feet, three pieces one by four by fourteen feet, two pieces one by twelve by fourteen feet, and two pieces one by twelve by sixteen feet. Other material would be twenty bolts, three and one-half by three eighths, four six inch strap hinges, four hooks, and the necessary nails to put all together. Common fencing boards can be used for the four and six inch staff, and hard pine sheeting, free from knots, for the feed boxes and partition between them.

The stalls and stanchions are two feet wide between the partition and three and one-half feet high. The board along the front of the feed boxes is hinged so it may be turned down and the boxes thoroughly cleaned out. The three and one-half foot alley between the front of the stall and the wall gives plenty of room for the feeder to work in feeding milk and grain."

If space must be used economically eighteen inches is wide for

stanchions and stalls.

With stanchions calves learn to eat grain more quickly than in an open lot and the feeding can be done quickly. One man can keep four buckets going and be able to turn calves out in fifteen minutes after being fed. With the milk, hay and grain ready to feed one can attend to the feeding at the rate of one to one and one-half minutes per calf.

In the summer time shelter should be provided that is cool and dark to rid the calves of flies and keep them comfortable. If flies get too bad some good fly dope will prove beneficial. It is needless to say that growing stock should have warm places for the cold winter months. The sheds above described do very well.

DEHORNING:- To-day horns play a small part in the utility of an animal, but most breeders of this class of cattle seem to think them essential to type and will continue to breed horns on pure blood stock as long as there is a demand for them, then take steps for their removal.

It is always desirable to remove horns from all cattle except pedigreed ones kept for breeding purposes. The simplest and most humane method of destroying the horns is to prevent their growth when the calves are only a few days old or as soon as the button can be felt. No danger accompanies this operation but where the horns are cut or sawed off death may occur from bleeding or from the presence of maggots in the wound, this latter is a very serious objection to dehorning in southern states where it is exceptional to have a herd of cattle dehorned and not have some of them infested with this parasite.

There are two general methods of preventing growth of horns. One is to gouge the bottom out with a knife and the other is to apply some chemical which eats away the tissues, so destroy the embryo horn.

The latter method is most commonly used because it is cheap and can be purchased at almost any drug store.

To use this the hair is clipped away from the young horn to aid in the neatness of the work. Some persons grease the regions about the spot to be worked upon to prevent undue spreading of the caustic. While this helps, it is not necessary if care is taken in the application. The stick of caustic is wrapped in a piece of paper, one end being left exposed. This end is slightly moistened and rubbed on the growing horn for a few seconds or until the skin is fairly started and the entire surface of the horn is covered. If the application is not sufficient the horn will continue to grow, although it may be dwarfed, while if too much caustic is applied it eats too deeply even eating through the skull and running down the face with the blood, making an unsightly appearance if happily it does not get into the eyes. While it is best to apply the caustic in five or ten days, success may attend its application later, provided the horn is not too large. If the horn is through the skin and caustic is to be applied the small horn is cut off flush with head with a knife and then the caustic applied. This method, while not as advantageous as the early application is usually successful.

After the application of caustic a thick dry scab forms which soon begins to curl up around the edges and in the course of a few weeks falls off leaving the poll smooth and clean.

The practice of dehorning has stood the test of time and is generally practiced as is shown by the small numbers of horned cattle marketed at the great packing centers.

COMMON AILMENTS:- While the calf is not subject to many diseases a few of them as scours and blackleg are quite serious and often causes death. It is a good general policy in treating any young animal

or older one either, to leave it to nature's cure unless positive knowledge of the disease and its treatment is known. Doping or dosing unless done intelligently does more harm than good in almost all cases.

SCOURS OR DIARRHEA:- This is treated first because of its frequent occurrence and because of all calf ailments none are more trying or require more skill to manage than this and none cause greater mortality. It causes more deaths than all other ailments combined and the successful reeder of calves successfully cope with this disease. Its attacks are most serious before the age of five months, that is, before the calf becomes strong enough to successfully withstand conditions, and are due to irritation in the bowels and is an effort of nature to remove this. The irritation may be due to bacteria or their products, improper food, unclean udders, sudden changes of food, very cold water or too much water after several hours of thirst; cold, sour or too rich milk when not accustomed to it; feeding grain with milk, unclean feed buckets or boxes, unclean or unhealthy quarters, exposure, too much exercise, lack of salt, or any other disturbing condition. It attacks calves nursed by the mother as well as those fed by hand or may attack calves that have never partaken of food of any kind

That diarrhoea is caused by a germ in many cases is admitted without question and such cases are and should be treated as an infectious disease and the premises where it occurs dealt with accordingly. The writer has had occasions to notice this form of diarrhoea and in each case the disease came on soon after being placed in the infected quarters. Such cases usually occur in quarters improperly ventilated, lighted or cleaned. Sunlight is the cheapest and best infectant, and no building for stock should be built without ample provision for its entrance.

Prevention is the easiest cure and careful watching will usually prevent serious troubles. An intelligent and observing feeder will notice the symptoms of this disease as soon as they appear and these should be looked for everytime before the calf is allowed any food. Almost every ^{one} has a remedy which is infallible in their hands, but a list of these would be too long and bulky for any use whatever. If possible locate the cause and remove it. At the first indications of the disease the food should be cut down one-half, or even stopped entirely for one or two feeds or longer if some nourishment is received in the treatment, such as; eggs, gruels or scalded milk which are often excellent. With nursing, generally the milk is too rich or too great in quantity. If so, it will be necessary to partially milk the cow, letting the calf have only a portion, preferable the first or less rich portion. As the calf gets older it may be able to take the milk. If the udder is filthy, see that it is kept clean.

It is usually a good plan to give a dose of castor-oil, one to two ounces followed by medicines less severe. After the bowels have moved through give opium in some form, as laudanum ten to twenty drops. Never give laudanum at first because being such a powerful astringent it lock up the irritating matter in the bowels and makes matters worse. Milk diluted one-fourth by lime water is good.

AMPHLO PHLEBITIS:- This is a form of scours from which little calves when only a few hours old and may not have sucked its mother. It gets weak and dies. This disease is due to the infection of the bowels through the raw naval. In a case of this kind or where it is suspected the naval should be cut off and tied up and a 50% solution of carbonic acid or creolin applied, after which apply a powder made by mixing equal parts of,

Calomel

Tannic Acid

Burnt Alum.

This powder tends to dry up the raw sore so prevent infection. This treatment should be applied two to four times daily. The calf should be allowed to remain as quietly as possible. A preventive measure is to thoroughly clean out the place of calving, disinfect with some disinfecting solution and put in plenty of fresh clean bedding. Burn all litter and old bedding about the stall.

CONSTIPATION:- The opposite of scours is constipation which is often quite bothersome and dangerous among young animals. If any mistakes are made in feeding it is first shown in constipation and if this is not relieved by the feeder, nature relieves it by her own cure for scours, that is, scours. The usual causes are improper food, lack of exercise or lack of some digestive fluids.

The well known symptoms are a hard and dry feces; the animal is stupid, looks out of condition; the coat is rough and harsh; the eyes look hard and dull and the action is sluggish.

The best treatment is to give proper laxative foods and give more exercise. An enema of warm soap suds is often given with a small syringe and sometimes mild purgatives as oil, but this is generally avoided because of the liability of the animal becoming "fast" or "bound up" again.

BLACKLEG:- In regions where this disease is present many head of young stock are lost by cattle men by it. Its ravages attack herds and often cause a loss of over six percent of their number. It is due to the presence of the black-leg germ in the tissues, causing death in one to five days. Young animals between the ages of six and eighteen months are most liable to the disease, however, the disease may occur

at any age. Just why suckling calves are more or less immuned to the disease is not known.

All sorts of preventives are used but the only method of preventing blackleg that has stood the test of time and of practical application is preventive inoculation or vaccination. By this method is reduced to one-tenth of one percent. .

Immunity produced by vaccination lasts about one year, the time varying with the age of the animal at the time of vaccination and with other conditions. All animals above three months old below the age of thirty to thirty-six months should be vaccinated every year. If cattle begin dying before the end of a year after vaccination, re-vaccinate immediately.

The cattle grower cannot afford to run the risk of loss by this disease and unless this preventive measure is taken one is almost sure to have loss where large number of young cattle are kept together. While blackley is not abundant in all states, according to the United States statistics its spread is so rapid as to be alarming, hence the advisability of farmers every where being versed and ready to cope with it. This year (1903) several cases have occurred in the state of Alabama for the first time. This shows something of its spread over the United States.

PINKEYE:- This is a contagious inflammation of the eye and is not fatal but occasionally causes the loss of an eye. The best treatment is to bathe the eye several times daily in warm water and drop a solution of three drachus of boracic acid in three ounces of water in the eye. Use only a few drops at a time. A dark place is preferred by the calves while affected with this disease. To keep it from going through the herd it is best to isolate the affected cattle.

RING WORM:- This infectious disease especially attacks young

stock appearing first on the head, generally about the eyes, then attacking other parts of the body. It attacks long haired calves sooner than those with less bodily covering. While it does not injure the animal in any way its presence is unsightly and for this reason should be removed if for no other. The best treatment is to wash the scab that forms with good soap and water, and soaking up the scab until it can be entirely removed and the place cleansed of all dead tissue. Apply a ten percent solution of creolin or carbolic acid with a little oil to the spot and repeat in a few days until the spot ceases to grow. This remedy is usually quite effective.

LICE AND TICKS:- These are annoying to the calves and should be removed except in the case of ticks where it is best to allow a few to remain to insure against an attack of Texas Fever.

For the removal of all such parasites the coal tar products as creolin and zenolium are good and effective when used in two or three per cent solutions. Lard and sulphur smeared on affected parts does very well. Kerosene emulsion used in a fifteen percent solution is satisfactory and does the work thoroughly. This solution is made by mixing

Kerosene	2 Gallons
Water (rain)	1 Gallon
Soap	1/2 pound.

The soap should be thoroughly dissolved in boiling water. Then add kerosene while the emulsion is warm, and violently agitate until it reaches a creamy consistency. For use dilute one part of the emulsion with seven parts of water and apply with a brush, rag or spray pump. In place of kerosene any other oil may be used with as good results.

From the above remedies it is plainly seen that cleanliness and proper care are the cheapest and best preventives of disease and that if nature is given a fair show she will right herself.

In managing calves a man must have a practical knowledge of his task, born from years of experience if he would succeed. A judicious man will be able to bring about excellent results with certain feeds and conditions and make these subject to him, but a lazy or new man with exact directions for every procedure will fail because of lack of judgement. In handling young stock experience is the thing that counts.

The man with his eye to business and a definite purpose will not feed a calf intended for the dairy on as rich foods as the calf intended to reproduce "baby beef", nor will he feed the calf intended for the range as he would that intended for the small farmer. He would develop a capacity for the handling of bulky feeds in the dairy and range calf and not this capacity in the "baby beef" fellow. The last named would need the ability to assimilate more concentrated foods, thus variations must be made and in this line of work, as in almost all others, no definite line can be put down to be hewn too for individuality, circumstances, and purposes differ from time to time. The man with rare judgement and with the ability to apply this is the man who reaches the best in any line, especially the line of calf feeding and their development.

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-47-

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