

# AGRICULTURAL EXPERIMENT STATION

KANSAS STATE COLLEGE OF AGRICULTURE  
AND APPLIED SCIENCE  
MANHATTAN, KANSAS

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DEPARTMENT OF DAIRY HUSBANDRY

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WHEN DO WE EAT?

## RAISING DAIRY CALVES'

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To put dairying in Kansas on a more sound economic basis, the average production of milk and butter fat per cow must be increased. It is folly to hope to make this improvement by the purchase of cows from other states. Good cows are not for sale, or at least can be secured only by careful selection and at a high price. Purchase even under these conditions often leads to disappointment and there is always danger of introducing serious disease into the herd.

It should be the ambition of every careful dairy farmer to show a higher average production of milk and butter fat on his herd from

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1. Contribution No. 73 from the Department of Dairy Husbandry.

year to year. This can be accomplished only by replacing those cows which have ended their period of usefulness with heifers having greater ability than that of the cows they replace. This superior ability in the heifers will be obtained chiefly by mating the cows to high-class pure-bred bulls, but the method of feeding and rearing the heifer calf will have an important influence on her ability when she comes into production.

A number of years ago a study of the cost of raising calves by different methods was made by the Kansas Agricultural Experiment Station.<sup>2</sup> One group of calves was fed on skim milk, another on whole milk, and still another was allowed to nurse the dams. Table I shows the results of this test.



FIG. 1.—Heifers that have been raised on skim milk.

TABLE I.—EFFECT OF METHOD OF FEEDING ON COST OF RAISING CALVES

METHOD OF FEEDING.	Number of calves	Number of days fed	Average daily gain.	Cost per 100 pounds of gain
Skim milk . . . . .	10	154	1.51	\$2.26
Whole milk . . . . .	10	154	1.86	7.06
Running with dams . . . . .	22	140	1.77	4.41

From these figures it is evident that raising calves on skim milk is by far the most economical method. (Figs. 1 and 2.) In the whole-milk districts the dairymen have been raising very few calves because of the lack of skim milk and the high cost of whole milk. As a result many herds which have been established for years have shown absolutely no improvement in quality. The more progressive dairymen now realize the necessity of raising their own calves, and

2. Otis, D. H. Kansas Agricultural Experiment Station Bulletin 126, 1905.

are interested in the problem of raising them on a minimum of whole milk. Especially under these conditions the high cost makes it advisable to raise only the best calves. In the average herd there are many calves that are not worth raising. Only those sired by a well-bred bull and out of cows of good type and production should be considered.

According to the latest available figures there are about 700,000 cows in Kansas that are used for dairy purposes. As the period of profitable production for the average cow is only about five years, the replacement of this cow at seven to eight years of age is necessary. Simply to maintain the present number of cows will require the raising of approximately 140,000 heifer calves each year besides some 10,000 bull calves for service in the herds of the state.

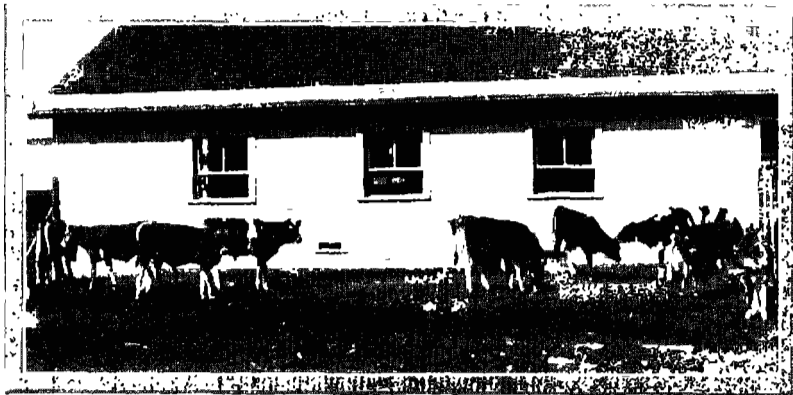


FIG. 2.—A group of bulls being raised on skim milk.

#### PREPARATION OF COW FOR CALVING

During heavy milk production the materials stored in the body of a cow are depleted, so an opportunity should be given her to build up the supply again. A rest of six weeks to two months between lactation periods will usually provide for this. The average length of time that a cow carries her calf is 283 days, so by keeping a record of the date of breeding the time of calving can be closely estimated and the cow dried up in sufficient time to give her the needed rest.

Even the persistent cow can be dried up easily if the right method is followed. Reducing the feed and water is the first essential. Feed only a dry roughage such as prairie hay, cane hay, or stover of some sort and limit the water to 2 or 3 gallons per day. Milk only once daily for two days, then every other day. When the milk flow is reduced to a gallon or less a day, milking may be stopped. It is a good plan to disinfect the teats and seal the opening with a drop of col-

lodion. The udder will fill tightly, but should not be touched. After a few days it will soften, reduce in size, and need no further attention.

As soon as the cow is dry she should be fed an abundant ration of legume hay, silage if available, and some grain. It is a good plan to include steamed bone meal in the grain ration, especially where no legume hay is available. A mixture of 4 parts each of ground corn, ground oats, and wheat bran and 3 parts of linseed oil meal is very satisfactory. Feed 5 to 8 pounds of grain daily, as this is not wasted but is stored in the body for use later. The amount of grain fed will depend upon the condition of the cow. At calving time the cow should be in good flesh but not excessively fat. Two weeks previous to calving all corn should be taken out of the grain mixture and the grain reduced in amount. A good cooling and laxative mixture to use at this time is made up of 3 parts of ground oats, 3 parts of wheat bran, and 1 part linseed oil meal. Two weeks before freshening a cow should be separated from the rest of the herd, if possible, and should be handled gently at all times to avoid danger of abortion from accident.

At calving time the cow should be in clean, dry, comfortable quarters. A grassy pasture is an excellent place, but since the fall is usually the best season in which to have cows freshen, a clean well-bedded box stall should be available. The cow will usually require no assistance at calving time, but some one should always be available in case of necessity. If the bowels of the cow are in a laxative condition there is less liability of trouble. Bran in the form of a warm mash makes a very desirable feed just before and just after calving.

The time of calving can be closely estimated by the appearance of the cow. A few days before the calf is born a swelling of the vulva will be noted. About 24 to 36 hours before calving the teats will fill with milk and there will be a marked relaxation of the muscles, especially of the rump, and a sinking at the sides of the tail head.

#### MANAGEMENT OF THE YOUNG CALF

##### CARE OF THE CALF AT BIRTH

As soon as the calf is dropped, attention is necessary to see that breathing is established. Mucus should be removed from the mouth and nostrils and if the calf does not breathe readily a sharp slap on the side with the hand or with a sack wet in cold water may be required. The cow will usually lick the calf dry, but in cold weather it may be well to assist her by rubbing the calf briskly with a sack or other material.

To avoid danger of infection the navel of the calf should be painted at once with tincture of iodine or disinfected with a 5 per cent cresol solution. Boric acid or alum powder dusted on the navel cord will dry it up quickly.

A normal calf will within an hour or two be on its feet and nurse

the mother. It is necessary that the calf receive the colostrum milk, which is the milk produced by the cow for two or three days after calving. This milk is high in albumin, which is easily digested and very nourishing. It acts as a laxative, cleaning out the digestive tract of the calf, and also keeps down undesirable bacterial growth in the intestines. If necessary the calf should be supported while nursing or be fed colostrum milk out of a bottle.

#### TEACHING THE CALF TO DRINK

When the calf is to be raised by hand there is some difference of opinion as to the length of time it should be left with the dam. Some remove the calf before it has had any opportunity to nurse the cow; others allow it to nurse once or twice; and some leave it with the mother for several days or at least until the milk is good for use. The sooner the calf is removed the easier it can be taught to drink and the less the dam will worry over its removal. It has been the general practice with the station herd to leave the calf with the dam for about 24 hours and this has proved satisfactory. Regardless of when the calf is removed, it is of course necessary that it receive the colostrum milk for the first two or three days, after which herd milk may be used.

Some calves learn quickly to drink the milk from a bucket while others are stubborn. Before attempting to teach the calf to drink it is advisable to let it go several hours without food so it will be hungry. In this condition the calf will usually suck one's fingers readily and often the head can be drawn into a bucket containing a small amount of milk, and the calf will learn that the sucking process draws milk into the mouth. If the calf is stubborn it is well to back it into a corner, stand astride its neck while facing forward and literally force its head into the bucket of milk while it is sucking on the fingers. If allowed to get hungry enough the most stubborn calf can eventually be taught to drink from the bucket.

#### FEEDING CALVES

##### FEEDING WHOLE MILK

Until about three weeks of age the diet of the calf should consist almost entirely of whole milk. The newborn calf, if with the dam, takes a small quantity of milk several times daily. Because of the small capacity of the calf's stomach it is advisable in hand feeding to divide the milk into three feeds per day for the first week or 10 days. To avoid over-feeding a small calf should be started on not over 6 to 8 pounds of milk a day and the large calf on not over 8 to 10 pounds. Table II will show the approximate rate of milk feeding at different ages.

TABLE II.—MILK FEEDING SCHEDULE

AGE OF CALF.	Pounds per day.			
	Holstein or Ayrshire.		Jersey or Guernsey.	
	Whole milk.	Skim milk.	Whole milk.	Skim milk
2-3 days (mother's milk)	8	0	6	0
4-7 days	9	0	7	0
8-20 days	10	0	8	0
21 days	9	1	7	1
22 days	8	2	6	2
23 days ..	7	3	5	3
24 days ..	6	4	5	3
25 days .	5	5	4	4
26 days .	3	8	3	6
27 days .	3	8	3	6
28 days .	2	10	2	7
29 days ..	1	11	1	8
30-34 days..	0	12	0	9
5-6 weeks...	0	13	0	10
7-8 weeks	0	15	0	12
9-11 weeks	0	16	0	14
12-14 weeks	0	16-18	0	14-16

With young calves care must be taken not to overfeed as this often starts digestive troubles. It is better to somewhat underfeed at first as the healthy calf can soon make up for this when its digestive system has developed more ability to handle food. A bad case of scours will often set a calf back several weeks or even months in growth. Milk scales or an accurate measure should be used to determine the amount to be fed.

All milk should be fed to the calf at about body temperature, 100° F. Milk is best fed just after it is drawn from the cow, but where calves are being fed three times a day milk may be saved over for the extra feeding. In this case it should, of course, be reheated to body temperature before being fed. It is best to use a thermometer to judge the temperature of milk as it is the only sure way to secure the correct temperature.

Regularity and cleanliness are two other essentials for success in calf raising. (Fig. 3.) The feeding should be done at as regular intervals as possible. Where calves are being fed three times a day they may be fed early in the morning and the last thing at night. The extra feeding will then come around the middle of the day. Buckets and other utensils used for the calves' milk should always

be clean. They should be washed, sterilized, and sunned just the same as the milking buckets. This will help to keep the calf thrifty and free from scours.

**FEEDING SKIM MILK**

In most sections of Kansas the product of the cow is marketed in the form of cream, so skim milk is available for raising the calf. It has been definitely proved that just as growthy and thrifty calves can be raised on skim milk as on whole milk. All of the food constituents of whole milk are found in the skim milk except the fat. The fat in milk is not the most important part for the nourishment of the calf. Heat and energy, which the fat supplies, can easily be



FIG. 3.—Typical heifers from four dairy breeds.

secured from a much cheaper source such as corn or other grain supplements high in carbohydrates and fat.

Since whole milk is expensive it is desirable to get the calf on to a less expensive feed as soon as its development will stand the change. If the calf seems thrifty the change to skim milk may be started at the end of the third week. The change should be made gradually, substituting about a pound of skim milk daily for a pound of whole milk. This will require about 10 days to complete the change. It is necessary that the skim milk, as well as the whole milk, be fed at near body temperature. Older calves can stand somewhat cooler milk, but the temperature should be uniform from day to day. Except in very cold weather, milk separated immediately after milking is usually satisfactory. Where the skim milk is not available on the farm but is obtained from some other source it should be uni-



formly sweet and should be heated to 90° F. before being fed. The amount of skim milk fed may be gradually increased until the calf is three months old, but even with the largest calves the amount should never exceed 20 pounds per day. Where skim milk is plentiful it may be fed until the calf is six months or more of age. The age of weaning will depend to some extent on the amount of food, other than milk, that the calf is consuming. In any case weaning should be gradual, using about a week to complete it. Water may be gradually substituted for skim milk, in somewhat the same manner as skim milk was substituted for whole milk.

#### FEEDING GRAIN

Whole milk alone is a satisfactory feed for the very young calf, but when the change in feed from whole milk to skim milk is made some other feeds are necessary. The calf should be encouraged to take solid food at an early age. Usually it will start eating some hay and even grain by the time it is two weeks old. The grain is especially necessary to supply nutrients to take the place of the butter fat, when the change to skim milk is made.

To induce the calf to eat grain a small amount of ground corn or bran should be placed in the bucket or rubbed in the calf's mouth as soon as the milk is finished.

Since the skim milk and legume hay furnish an abundance of protein the grain used should have a rather high proportion of carbohydrates. Corn is an excellent source of carbohydrates and is often used as the only grain for a few months. Usually, however, a grain mixture containing 10 to 12 per cent of digestible protein is preferred because it is more palatable. Kafir and other sorghum grains may be used in place of corn with satisfactory results. At the Kansas station a grain mixture which has proved satisfactory consists of 3 parts of ground corn and 1 part each of ground oats, wheat bran, and linseed oil meal.

The calf will probably learn to eat ground grain somewhat more quickly than unground, but after it is eating well grinding is unnecessary. Experiments have shown that the calf actually prefers unground grain after three months of age.

For the first three months the calf may be allowed all the grain it will clean up, but after this time it should be limited on grain. Up to six months the calf need not be fed more than 3 to 4 pounds of grain daily, especially if it is getting silage and legume hay.

#### FEEDING ROUGHAGE

Even before the calf starts eating grain it will learn to eat hay. Good mixed hay is probably best for calves, but straight prairie hay or alfalfa hay is satisfactory. Where alfalfa is used good bright hay is advisable, but it is best not to use the finest leafy grades of alfalfa. Too large an amount of alfalfa leaves may cause digestive disturbances. Up to weaning time the calf may be allowed all the hay it will clean up.



Silage is not a satisfactory feed for young calves, but if of good quality it may be fed in limited quantities to calves over three months of age. Up to this age the calf has not developed sufficient capacity to handle this bulky feed, and it has some tendency to cause digestive disturbances. At six months of age the calf may be fed as much as 2 to 3 pounds daily.

#### PASTURE FOR CALVES

Pasture makes an excellent feed for calves but is not much of a factor with fall calves until after they are weaned. The essential thing is to see that the calf is getting sufficient nourishment for satisfactory growth. Pasture grass is high in water content, so a rather large amount of grass must be consumed to supply the requirements. Until the calf is sufficiently used to pasture to consume this amount, the grain supplement should be continued. Calves should not be turned on pasture until they are about three months of age, as it is too laxative a feed for young calves.

#### WATER AND SALT

Even though the calf is consuming quantities of milk high in water content it needs a supply of water. This is especially true in warm weather. The calf herd should be given free access to a supply of clean pure water at all times. During cold weather water not colder than about 50° F. should be offered to the calf twice daily.

The young calf does not crave salt, but as soon as it is taking any considerable amount of grain and hay it should have access to salt. A small sheltered box containing a supply of loose salt should be available to the calf in the pen or lot. One pound of salt may also be mixed in each 100 pounds of the calf grain mixture.

#### LIMITED MILK FOR RAISING CALVES

There is no really satisfactory substitute for milk in the raising of calves, but near whole-milk markets, where skim milk is not available, a limited use of milk is desirable from an economic standpoint. The plan commonly followed is that of feeding whole milk at first and as soon as possible changing to a substitute. Dried skim milk makes a good substitute for skim milk, but it is rather expensive. It may be fed dry or in solution, using 1 pound of skim-milk powder to 9 pounds of water. The substitutes usually used are commercial calf meals or home-made mixtures. A common recommendation is to make the meal up into a gruel, using 1 pound of meal to about 8 pounds of water. This mixture is gradually substituted for the whole milk, starting when the calf is about a month old. For feeding as a warm gruel the United States Department of Agriculture recommends a mixture of 50 parts finely-ground corn, 15 parts linseed oil meal, 15 parts finely-ground rolled oats, 10 parts dried blood flour, 10 parts skim-milk powder, and  $\frac{1}{2}$  part salt.<sup>3</sup> This should be mixed

3. United States Department of Agriculture Farmers' Bulletin 1336.

to a smooth consistency with a small amount of cold water, then 8 pounds of hot water should be added for each pound of dry calf meal used, and the mixture allowed to stand for several hours. It should be warmed to about 100° F. before being fed.

Under this plan difficulty is often experienced from scours, and better success may be obtained by feeding a dry meal. Young calves, being slow to acquire the habit of eating grain, gain slowly for a time, but at six months of age may be normal in weight.

Bender and Perry report good success in raising calves by the dry grain method where the milk was discontinued after 30 days. The grain mixture used consisted of yellow corn meal, 25 parts; ground oats, 37.5 parts; wheat bran, 12.5 parts; linseed oil meal, 12.5 parts; soluble blood flour, 12.5 parts, to which was added 1 part each of steamed bone meal, ground limestone, and salt. After the first week alfalfa hay and the grain mixture were kept, before the calves at all times.<sup>4</sup>

Especially with show calves or valuable bull calves, for which as rapid growth as possible is desirable, the limited milk, confinement method of raising calves has been recommended. Under this plan the young calf is allowed 1 pound of whole milk for each 10 pounds of body weight. As soon as possible the calf is started on alfalfa hay and a grain mixture of equal parts of ground corn, ground oats, wheat bran, and linseed oil meal. When the calf is eating dry feed well it is gradually changed to skim milk, feeding this at the same rate as the whole milk. The skim milk is limited to not over 15 pounds daily for Jerseys or Guernseys and not over 16 pounds for Holsteins or Ayrshires, so they will have more appetite for grain and hay. The calves are confined at all times in a box stall until at least weaning time.

#### FURTHER SUGGESTIONS ON CALF MANAGEMENT

**Housing.**— To raise healthy calves they should be kept in a clean, light, dry, well-ventilated place. (Fig. 4.) A calf can stand a good deal of cold weather if it is dry and protected from drafts. An individual pen is best for the young calf, but this is not always possible. At least there should be an individual stanchion where the calf can drink its milk unmolested and avoid the danger due to calves sucking one another. All feed troughs and boxes should be kept clean and sweet, as any sort of filth picked up by the calf is liable to cause scours. Hay should never be fed on the ground or floor but should be kept in racks available to the calves where it will not become soiled or be wasted.

**Lots.**— Calves will gain in weight faster if they are rather closely confined, but some exercise is beneficial. A well-drained lot containing shade from the hot summer sun makes an ideal place for the calf after it is a few weeks old.

4. New Jersey Agricultural Experiment Station Extension Bulletin 73. New Brunswick, N. J. 1929.

**Marking Calves.**—For purposes of identification the calf should be marked as soon as it is dropped. A neck strap with a numbered tag makes a satisfactory method of marking. Tattooing a number in the ear is an excellent system, but it is suited only to breeds with light-colored ears.

**Removing Horns.**—Horns add somewhat to the beauty of an animal but have many disadvantages if cattle are closely housed. If horns are to be taken off it can best be done when they first appear.

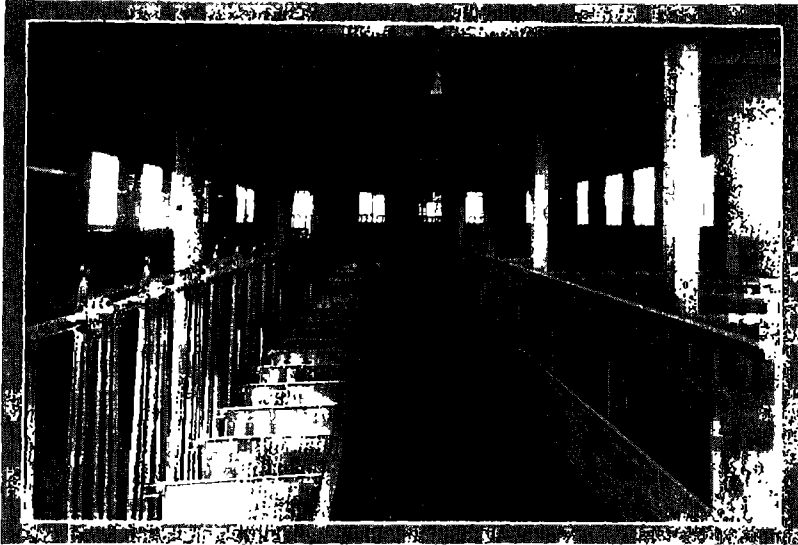


FIG. 4.—A suitable barn for housing young calves and heifers. (Individual pens for small calves at right.)

At about one week of age the horn button can be felt on the head of the calf and can be easily killed with caustic potash. The hair should be closely clipped over the button and a spot about the size of a 10-cent piece scraped with a knife until the blood serum oozes through. Rub carefully but thoroughly with a stick of caustic potash, being sure that the horn button is completely treated. One treatment is sufficient.

#### COMMON DISEASES OF CALVES

**Scours.**—This is a digestive disorder common among calves. It may be caused by a number of things such as overfeeding, use of dirty feed buckets, damp dirty pens, or the feeding of cold or sour milk to a calf that is used to warm and sweet milk. As soon as the trouble is noted the feed should be reduced by one-half. Castor oil in 3-ounce doses, given as a drench, is a rather satisfactory treatment. In the early stages of the disease raw eggs may help

to control the trouble. A tablespoonful of a 1-per-cent solution of formaldehyde in each feeding of milk will often aid in clearing up the disorder.

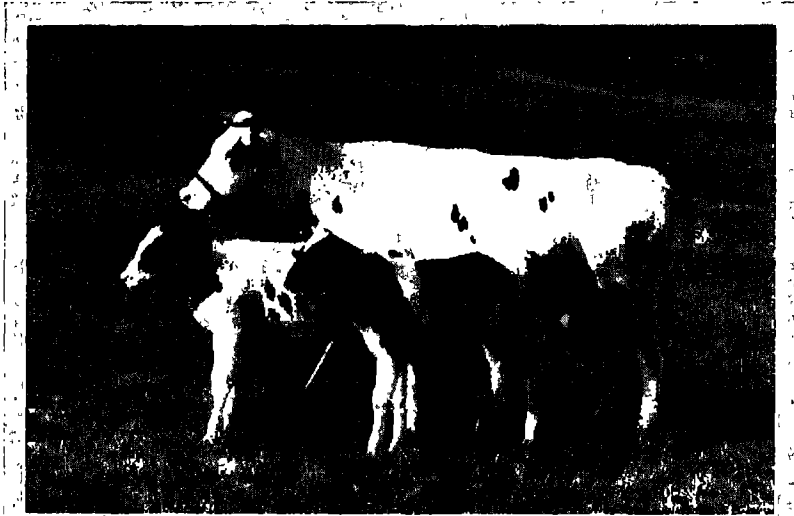
Common scours from indigestion should not be confused with white scours, which is a germ disease. White scours may be recognized by the calf's dull, sunken eyes, extremely weak appearance, and light-colored, pastelike droppings with a very offensive odor. The disease usually occurs in young calves and is generally fatal. It may be advisable with especially valuable calves to use antiscour serum, which is now on the market. This serum is injected hypodermically at birth. As white scours is highly contagious great care must be taken to isolate the affected calves. The dead calves should be destroyed, the bedding burned, and the pens thoroughly disinfected.

**Pneumonia.**— Often when weakened by scours a calf contracts pneumonia. This disease may also be caused by exposure or poorly ventilated quarters. The symptoms of the disease are loss of appetite, high body temperature, rapid breathing, and some coughing. The calf should be placed in a dry, warm place and covered with a blanket. A dose of 3 ounces of castor oil should be given. Antipneumonia serum will aid in combating the disease, but a valuable calf should have the attention of a competent veterinarian.

**Ringworm.**— Ringworm is common, especially in large groups of calves. It is recognized by round scurfy spots, free from hair, especially about the head and neck. Although it spreads readily from one calf to another it can be cured by persistent treatment. The spots should be scraped free from the scurfy material and be given regular applications of iodine ointment or tincture of iodine.

**Lice.**— Lice are a serious pest and if present in large numbers will sap the calf's vitality and prevent growth. The hair and skin will be in an unthrifty condition and often patches of hair will be rubbed off the neck or body. Probably the most efficient treatment is a thorough soaking of all parts of the animal with a 2-per-cent solution of coal tar dip. This will kill practically all the lice present, but may not destroy the eggs, so the treatment should be repeated in about 10 days. This method is not suited to cold weather unless the calf can be put in a warm place and rubbed dry.

Regular treatments with a good commercial louse powder will control lice fairly well. A mixture of  $\frac{1}{2}$  pint of kerosene and 1 pound of lard rubbed over the worst infected areas with a stiff brush will kill a majority of the lice.



WHAT OF THE FUTURE!

Inka Hijaard Walker with her twin calves. These two calves and their dam have formed the foundation of the Holstein herd at the Kansas Agricultural Experiment Station. The light-colored calf at mature age produced 22,699 pounds of milk and 850 pounds of butter fat. The other calf when mature produced 18,634 pounds of milk and 648 pounds of butter fat in a year. The cow has produced in eight lactations, 133,622 pounds of milk and 4,780 pounds of butter fat.