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A Test pf Calf Rations -- Methods of Controlling Contamination of Milk during Milking

A. L. Haecker
University of Nebraska-Lincoln

C. W. Melick
University of Nebraska-Lincoln

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A TEST OF CALF RATIONS.

BY A. L. HAECKER.

METHODS OF CONTROLLING CONTAMINATION OF MILK DURING MILKING.

BY A. L. HAECKER AND C. W. MELICK.

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A TEST OF CALF RATIONS.

BY A. L. HAECKER

INTRODUCTION.

Through the recent general use of hand separators by farmers and dairymen of the state, the interest in calf rearing has been greatly increased.

This industry is by no means a small one, as some twenty thousand hand separators are now being used throughout the state and each hand separator represents a farm where calves are reared on skim-milk. To use this valuable by-product to the best advantage is a problem worthy of much study and investigation.

Since the spring of 1899 the Department of Dairy Husbandry has been conducting experiments in calf rearing by using hand separator skim-milk and light rations of grain.

The first test was published in Bulletin No. 68 of this Station and dealt with a comparison of calves reared by hand with those sucking their dams. The hand-fed calves were reared on skim-milk, ground flaxseed being used to replace the lacking butter fat. This test resulted in a fine lot of calves reared at a very low cost, but it also brought out the fact that much more data were needed in the way of comparing rations to be used with skim-milk.

THE EXPERIMENT.

THE FOODSTUFFS THAT WERE COMPARED.

In the fall of 1901 an experiment was planned to test some rations rich in fat to replace the absent butter fat in skim-milk. Owing to complaints from feeders that flaxseed-meal was often difficult to obtain, it was thought advisable to use

the commercial oil-meal for one ration, this being a product easy to procure in almost any part of the country. The two other feeds were by-products of glucose factories, corn-germ oil-meal being one and corn-oil the other.

The corn-oil is pressed from the corn-germ and resembles a light oil in appearance but has a strong corn flavor. The corn-germ oil-meal is what is left after the oil has been pressed from the germ. This meal contains about ten per cent fat and resembles corn-meal but has a more uniform grain and a higher per cent of digestible nutrients.

MARKET PRICES OF FOODS USED IN THE EXPERIMENT.

The market prices of foodstuffs used in the experiment are here given and represent about the average for eastern Nebraska during the two years:

Whole milk, $1.00 per hundred.
Skim-milk, 15 cents per hundred.
Oil-meal, $25.00 per ton.
Alfalfa hay, $6.00 per ton.
Pasture for calves, ten cents per week.
Germ oil-meal, $27.50 per ton.
Corn-oil, 6½ cents per pound.
Shelled corn, 60 cents per hundred.
Oats, 90 cents per hundred.
Bran, $15.00 per ton.

THE THREE GROUPS.

For convenience the calves are arranged in three groups, each group including eight calves fed a certain ration. Nearly two years were required to complete the test owing to the necessity of securing a number of calves nearly the same age and the convenience in feeding one group at a time.

Each calf in all groups was weighed at birth and allowed to suck its dam for two or three days or until it was in a strong condition and the cow's milk fit for use. The calf was then taken from its mother and fed whole milk for ten days or two weeks, at which time it was gradually changed

to skim-milk. This changing required several days, by increasing the skim-milk and decreasing the whole milk gradually.

The rations of whole milk for the first two weeks were about five pounds to a feed, while the second two weeks, when the calf was on skim-milk, six or seven pounds were given. During the second period the calf received eight pounds at a feed and from then on ten pounds were given.

The corn and oats were fed ground and the calf generally taught to eat the feed at six weeks old. The rations were given in such quantities as the calf would eat up clean. Hay or grass was supplied at all times and the animals were given free access to salt and water.

GROUP I.

In Group I, at the time the calf was changed to skim-milk a little linseed-meal was added to the milk and stirred in. The meal was fed in small rations, starting with a teaspoonful and increasing until the fifth period, when the animal received about one-half teacupful at a feed. The linseed-meal was stirred in the milk for the first three months, after which it was mixed with the corn and oats and fed after the milk ration.

GROUP I.—*Eight calves fed linseed-meal as a fat substitute in skim-milk.*

Name of calf.	Breeding of calf.	Weight at birth.	Wt. at end of sixth period.	Gain during test.	Cost per pound of gain.
		Pounds.	*Pounds.*	*Pounds.*	
Polo.....	Jersey grade.....	68	285	217	$ .044
King.....	Holstein-Friesian.	90	340	250	.045
Charlie.....	Angus, Shorthorn-Jersey.....	78	300	222	.044
Billy.....	Jersey.....	52	275	223	.044
Dime.....	Jersey.....	42	285	243	.042
Sam.....	Jersey.....	50	270	220	.048
Mermaid...	Holstein.....	70	310	240	.048
Comanche..	Jersey.....	68	285	217	.049
Average per calf.....		64.75	293.75	229	$ .046

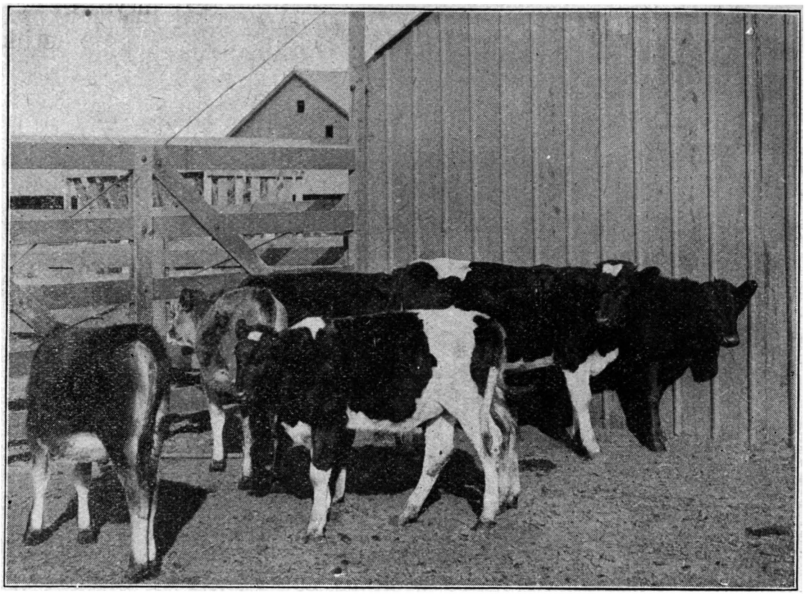

FIG. 1.—SIX ANIMALS OF GROUP I. GROUP I WAS FED SKIM-MILK WITH LINSEED-MEAL.

The eight calves in Group I were fed about alike, and referring to the ration of the calf "Polo" it may be seen how the various feeds were given:

Ration of Polo, a calf in Group I.

Periods of four weeks each.	Whole milk.	Skim-milk.	Lin-seed-meal.	Corn.	Pas-ture and hay.	Oats.	Cost for period.	Wt. at end of period.	Gain in wt.	Cost of 1 lb. of gain.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*		*Lbs.*		*Lbs.*	*Lbs.*	
1st period.	210	140	1.00	.....	.....	.....	$ 2.32	92	24	$ .098
2d period.	.....	448	3.00	4.00	.....	4.00	.77	130	38	.020
3d period.	.....	560	6.00	12.00	.....	12.00	1.10	180	50	.025
4th period.	.....	560	8.00	16.00	48	16.00	1.32	220	40	.034
5th period.	.....	560	10.00	18.00	60	18.00	1.41	255	35	.048
6th period.	.....	560	10.00	18.00	80	18.00	1.48	285	30	.049
Total ...	210	2828	38.00	68.00	188	68.00	$ 8.40	.....	.....	.....

GROUP II.

The germ oil-meal lot, or Group II, was fed about the same in every way as Group I, corn-germ oil-meal being used instead of linseed-meal.

GROUP II.—*Eight calves fed corn-germ oil-meal as a fat substitute in skim-milk.*

Name of calf.	Breed of calf.	Weight at birth.	Wt. at end of sixth period.	Gain during test.	Cost per pound of gain.
		Pounds.	*Pounds.*	*Pounds.*	
White	Jersey	54	290	236	$ .042
Cobbler	Jersey grade	40	265	225	.049
Hobo	Jersey grade	38	240	202	.048
Alick	Holstein grade	78	320	242	.040
Max	Jersey	45	290	245	.050
Beauty	Jersey	54	280	226	.050
Bud	Hereford grade	85	330	245	.051
Katy	Holstein	102	380	278	.044
	Average	62	299.37	237.37	$ .047

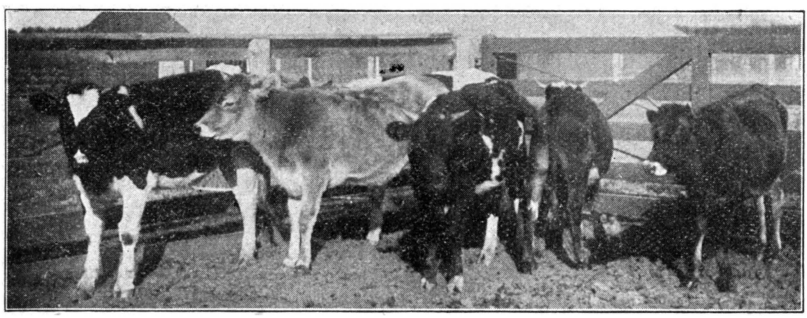

FIG. 2.—SIX ANIMALS OF GROUP II. GROUP II WAS FED SKIM-MILK WITH CORN-GERM OIL-MEAL.

The ration of the calf "White" may be used for reference in the detail feeding of this Group.

Ration of White, a calf in Group II.

Periods of four weeks each.	Whole milk.	Skim-milk.	Germ oil-meal.	Corn.	Oats.	Pas-ture, days.	Cost for period.	Wt. at end of period.	Gain in wt.	Cost of 1 lb. of gain.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*			*Lbs.*	*Lbs.*	
1st period	245	60	.50	.....	.....	.....	$ 2.55	85	31	$ .082
2d period	.....	448	3.00	4.00	4.00	14	.98	120	35	.030
3d period	.....	448	6.00	8.00	8.00	28	1.27	170	50	.025
4th period	.....	448	8.00	12.00	12.00	28	1.35	205	35	.039
						Hay, Lbs.				
5th period	.....	560	10.00	12.00	12.00	60	1.36	235	30	.045
6th period	.....	560	10.00	14.00	14.00	100	1.58	290	55	.029
Total	245	2524	37.50	50.00	50.00	.....	$ 9.09	.....	.....	.....

GROUP III.

The corn-oil lot, or Group III, was given corn-oil in place of the oil-meals of the other Groups. The ration of the calf "Rose" represents this Group.

Some difficulty was experienced in using this feed. It was first attempted to produce a milk having about a three per cent fat, by simply pouring in the oil and stirring to mix it with the milk. This could not be done, as the oil was much lighter than the milk and would not mix by such a slight agitation. A twenty-gallon barrel churn was then used to emulsify the oil and milk by churning. This was successful, and a very palatable emulsion could be made by churning from four to five minutes. The emulsion was not lasting but would hold for about twenty minutes which was long enough to last while the calves were being fed.

It was found necessary to make a two per cent mixture instead of three as the food proved too laxative and even at the lower per cent it was difficult to feed.

GROUP III.—*Eight calves fed corn-oil mixed with skim-milk to substitute butter fat.*

Name of calf.	Breeding of calf.	Weight at birth.	Wt. at end of sixth period.	Gain during test.	Cost per pound of gain.
		Pounds.	*Pounds.*	*Pounds.*	
Rose	Jersey	65	265	200	$ .061
Bebe	Jersey	45	260	215	.060
Ellen	Holstein grade	85	320	235	.058
Bo	Angus grade	69	285	216	.060
Beatrice	Holstein-Friesian	115	360	245	.057
Olive	Holstein grade	94	314	220	.063
Bold	Angus grade	78	310	232	.058
Cora	Jersey	45	275	230	.059
Average		74.5	298.62	224.12	$ .059

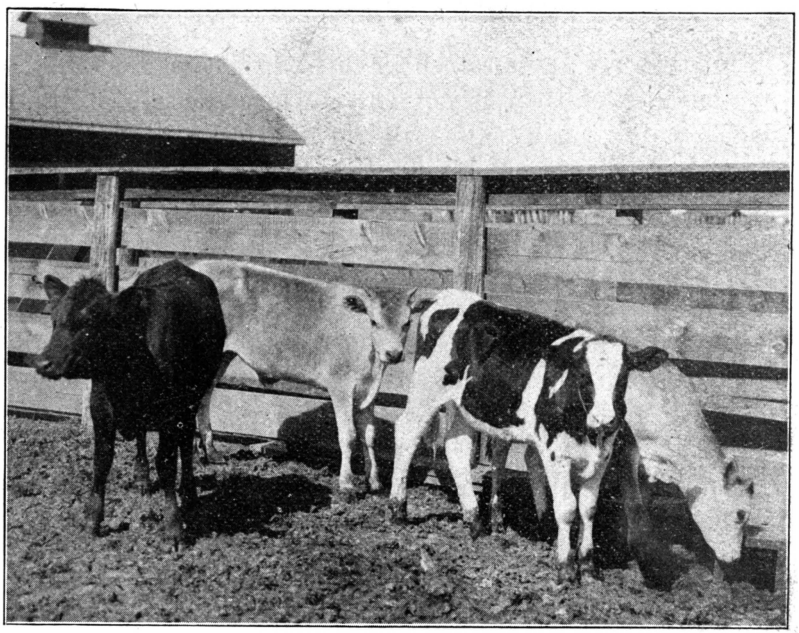

FIG. 3.—FOUR CALVES OF GROUP III. GROUP III WAS FED SKIM-MILK WITH CORN-OIL.

Ration of Rose, a calf in Group III.

Periods of four weeks each.	Whole milk.	Skim-milk.	Corn-oil.	Corn.	Oats.	Days pasture.	Cost for period.	Wt. at end of period	Gain in wt.	Cost of 1 lb. of gain.
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*			*Lbs.*	*Lbs.*	
1st period.	240	60	.....	.....	.....	.....	$ 2.49	85	20	$ .124
2d period.	.....	448	9.00	4.00	4.00	7	1.42	110	25	.056
3d period.	.....	448	9.00	8.00	8.00	28	1.77	145	35	.050
4th period.	.....	460	9.20	8.00	8.00	28	1.80	180	35	.051
5th period.	.....	460	9.20	8.00	8.00	28	1.80	222	42	.042
6th period.	.....	500	10.00	12.00	12.00	28	1.97	265	43	.045
Total ...	240	2376	46.40	40.00	40.00	119	$11.25	.....	.....	.....

REMARKS AND CONCLUSIONS.

From the results obtained in this experiment it is safe to say that linseed-meal is not only an excellent food for replacing butter fat in skim-milk for calf feeding, but also an economic food in comparison with others.

Germ oil-meal gave about as good results as linseed-meal and may be recommended as a calf food.

Corn-oil in this test proved too expensive and required too much work for profitable calf rearing. A two per cent oil mixture proved rather laxative for obtaining the best results.

The calves fed linseed-meal and germ oil-meal were in good condition at the end of the test and most of them were weaned.

The cost of rearing the calves varied from $8.35 to $12.00 for the twenty-four weeks of the feeding experiment.

METHODS OF CONTROLLING CONTAMINATION OF MILK DURING MILKING.

BY A. L. HAECKER AND C. W. MELICK.

Pure milk is a subject of public interest, and of all our common foods perhaps none is more easily contaminated. The recent custom in Nebraska of grading cream by the acid test has aroused added interest in preventing the product from souring or accumulating bad flavors.

Milk contamination takes place largely during the process of milking, especially when the cows are kept in the barn. It was, therefore, thought best to start with investigations along this first and most troublesome source of infection, namely, milking.

The plan of the experiment was to test a number of advocated methods of lessening milk contamination. To do this, four cows were selected from the University dairy herd, all uniform in breed, weight, and time of lactation, so as to avoid, as much as possible, variation among individual animals. They were treated before each milking in the following manner:

The udder of cow No. 1, Diana, was sponged with water. The udder of cow No. 2, Annie, was sponged with a five per cent solution of carbolic acid. The udder of cow No. 3, Hattie, was rubbed with vaseline. The udder of cow No. 4, Cora, was not treated, but the dust merely brushed off with the milker's hand as in the usual way.

The animals were tested both in the barn and out-of-doors. Exposures were also taken to compare cement and wood floors with and without bedding. Exposures were also made in the barn, both when the cows were present and when they were absent, to determine the condition of the air. In all, some two hundred plates were exposed, developed, and examined for bacteria with the microscope.

METHOD USED.

The exposures were made on sterile petri dishes containing 78.5 square centimeters and taken for one-half minute in all cases. Great care was used in making the exposures to avoid extreme cases. The petri dishes were kept in a specially made case, in which they were also transported to and from the barn.

FIG. 4.—METHOD OF EXPOSING PLATES.

Fig. 4 illustrates the method of making the exposures, the milker simply going through the motions of milking but not extracting any milk, to avoid danger of splattering small drops on the plate.

The agar medium covering the bottom of the petri dishes was made in the following way: First, the dishes were

washed and sterilized in dry air at a temperature of 374° F. for thirty minutes, then twenty grams of agar was added to twenty grams of peptone, ten grams salt, five grams beef extract, and two liters of distilled water. This mixture was sterilized for one-half hour at 212° F. for three consecutive days to kill any bacteria germinating from spores which might exist in the medium.

After making the exposures, the plates were allowed to remain in the University bacteriological laboratory for twenty-four hours at a temperature of 70° F., after which they were placed in an incubator and developed for twenty-four hours at 100° F. This was to give the different species of bacteria whose favorable temperature varied a chance to develop. After the plates were thus treated, the colonies were counted in each case and the predominating species determined.

The following are condensed tables made by averaging one hundred exposures under the methods named:

TABLE I.—*Showing the average of exposures made in barn under each of the treatments.*

	Colonies
Dishes exposed under udders treated with 5 per cent carbolic acid (see fig. 6)	344
Dishes exposed under udders treated with vaseline	346
" " " " " " water	483
Dishes exposed under udders not treated (see fig. 5), about	20500

TABLE II.—*Showing differences between cement and board floors, with and without bedding, cows present and absent.*

	Colonies
Dishes exposed on cement floor, cows present, bedding present	120
Dishes exposed on board floor, cows present, bedding present	272

Dishes exposed on cement floor, cows absent, bedding present 42
bedding absent 16
Dishes exposed on board floor, cows absent, bedding present 83
bedding absent 40

TABLE III.—*Showing the average of exposures made in pasture under each of the treatments.*

	Colonies
Dishes exposed under udder treated with 5 per cent carbolic acid	86
Dishes exposed under udder treated with vaseline	92
" " " " " " water	120
" " " " not treated	310

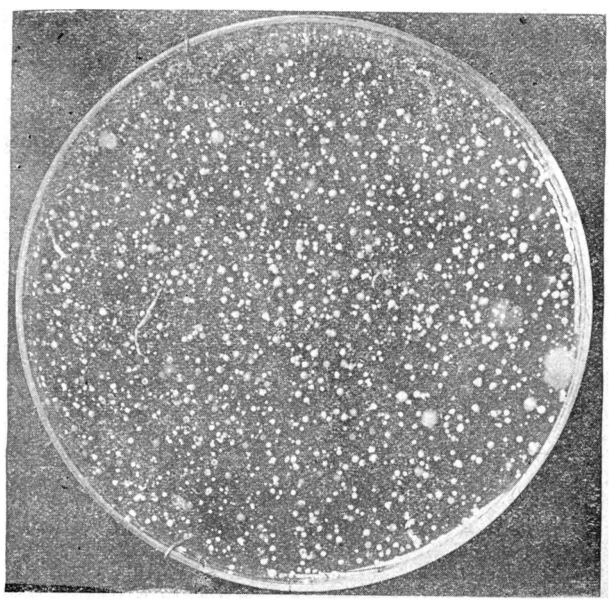

FIG. 5.—SHOWS A PLATE EXPOSED ONE-HALF MINUTE UNDER COW'S UDDER TREATED BY MERELY BRUSHING WITH THE HAND. EACH OF THE LITTLE SPOTS REPRESENTS A COLONY OF SOME KIND OF BACTERIA.

REMARKS.

By comparing the four methods of treatment, in Table I it will be seen that udders treated with the five per cent solution of carbolic acid showed less contamination than by any of the other methods. The vaseline treatment was about the same as the carbolic acid, while the sponging with water showed but a slight increase.

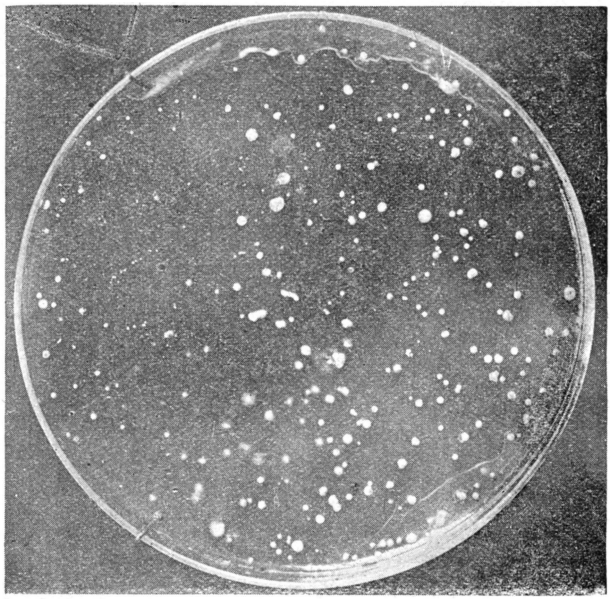

FIG. 6.—SHOWS A PLATE EXPOSED ONE-HALF MINUTE UNDER A COW'S UDDER TREATED WITH A 5% SOLUTION OF CARBOLIC ACID. THE ANIMAL WAS ON A CEMENT FLOOR WHEN BEDDING WAS PRESENT. IT WILL BE NOTED THIS PLATE IS QUITE AN IMPROVEMENT OVER PLATE SHOWN IN FIG. 5.

The untreated udders are in striking contrast to those treated. Many of the petri dishes were so covered as to render counting impossible, but the average of those counted showed over twenty thousand.

In the comparison of cement and board floors (Table II) it will be seen that cement floors showed less than half the contamination of the board floors. The exposures in this

case were taken in the center of the barn between the two rows of cows and simply tell the condition of the air in the cow stable.

When cows were absent, a better air existed in the barn, as might be expected. The condition was also improved by the absence of bedding.

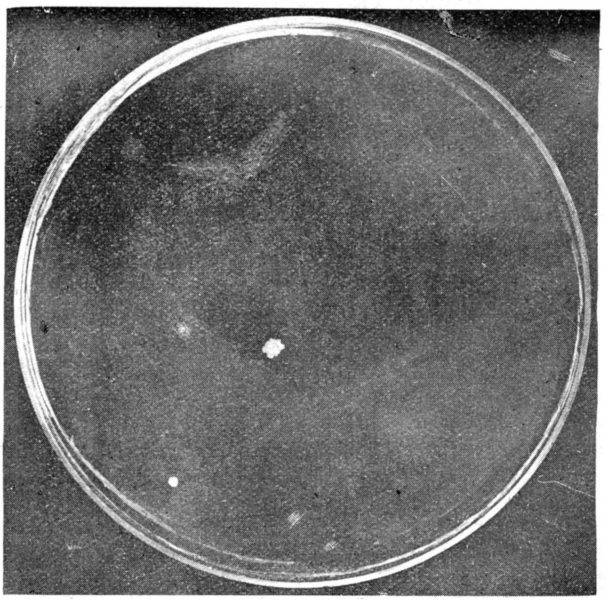

FIG. 7.—SHOWS A PLATE EXPOSED IN PASTURE WHERE THE AIR MUST HAVE BEEN VERY PURE AND FREE FROM SPORES.

The open air milking (Table III) showed much better results than those obtained in the barn, the untreated condition being even better than the treated cases in the barn.

While in nearly all cases the bacteria found were harmless, the quality of the milk both as to flavor and keeping quality was injured by their presence.

The records obtained in this experiment, while giving the desired comparisons, show conditions very much above the average, for in all cases the cows would be considered clean and the stable well kept.

CONCLUSIONS.

It is safe to conclude from the foregoing experiment that some means of preventing milk contamination during milking should be employed.

The work required to sponge an animal's flank and udder is but a trifle, and great improvement can be made on the milk and its products.

The acid solution costs two cents per gallon, which is enough to treat ten cows. The only objections to this method are the disagreeable odor and the bother of mixing.

The vaseline costs about the same as the carbolic acid and serves as a good preventive for chapped or sore teats. It is also to be recommended for cows with short teats which have to be milked by the stripping method. This treatment will not answer when the cows have dirty udders.

The water treatment is to be recommended for general use above the other three, as it is cheaper and does the work practically as well. This method can be used on any farm with little or no inconvenience and the results obtained would more than compensate for the extra time required.

Cement floors are not only easier to keep clean, but are also less favorable to the growth and development of bacteria.

While it is necessary to use bedding in winter, in summer when cows are kept in the barn only during milking and feeding time it may be dispensed with to the betterment of the milk.

Milking out of doors in clean yards or pasture gives better results than in clean barns, even under the best of conditions.

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No. 32, Wheat and Some of Its Products.
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No. 38, Nebraska and the Beet Sugar Industry. Report of Dr. Max Hollrung, Halle, Germany. Translated from "Zeitschrift des Vereins fuer Ruebenzucker Industrie des Deutschen Reichs."
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