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Methods of Cream Separator Sanitation

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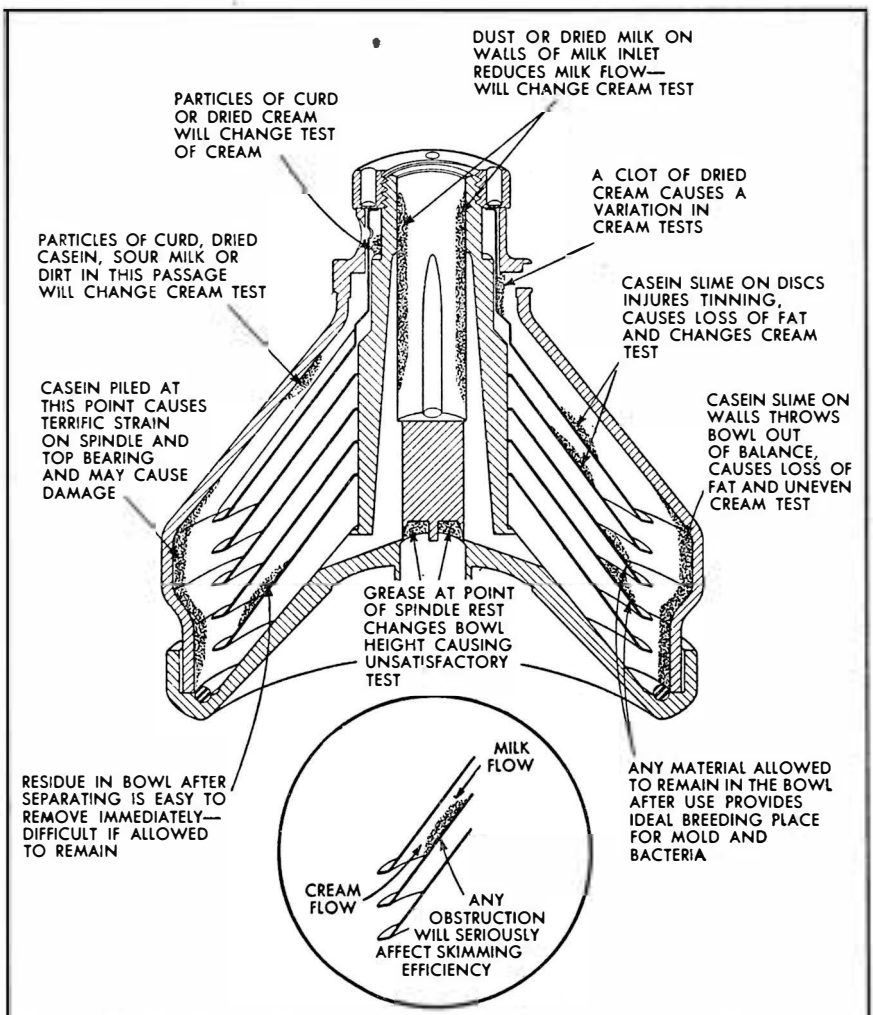

Cross-section of separator bowl showing losses likely to result from use of an unclean machine.

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Methods of Cream Separator Sanitation

By C. C. Totman and D. H. Jacobsen*

Cream quality surveys repeatedly have revealed the farm separator as an important factor affecting the flavor of cream. The relation between the unwashed separator and off-flavored cream has been pointed out and the remedy has appeared to be obvious. The labor required to wash the machine twice daily, however, often has appeared unreasonable when a small value of milk is separated as is the case on many farms. The present work was designed to test the effectiveness of methods which likely would require less labor but might maintain satisfactory cream quality.

As early as 1904 the United States Department of Agriculture pointed out that serious cream quality troubles might be encountered unless farmers followed detailed instructions regarding the use and care of cream separators on the farm. Bacterial numbers† were reduced greatly when unwashed separators were thoroughly flushed with water, both before and after use, when the bowl was held below 65 degrees F. When it was held at 85 degrees F. profuse fermentation occurred.

It has been generally recognized that the separator should be properly washed after being used. This is important because of its influence on (1) cream quality; (2) efficient separation, and (3) the life of the machine. Chlorine solutions have merits when used as germicidal rinses for separators. Other experimenters have used trisodium phosphate or lye, or trisodium phosphate containing 0.25 percent sodium chromate as a corrosion inhibitor. The first two are quite corrosive and trisodium phosphate with chromate solution may be corrosive if solution strengths are not carefully controlled.

With these factors in mind, several chemicals were used in these trials, some germicidal, others largely growth retarders. The concentration used was such that effective antiseptic action might be expected without harmful effect on the metal parts of the separator. The number of trials and the concentration of chemicals used in this work were rather limited. Therefore, results are not conclusive.

In this experiment, three types of solutions were used, salt, acid, and chlorine. Salt was used at both 5 and 10 percent levels, acetic acid at 0.5 percent and commercial vinegar with 1 part to 7 parts of water. Common vine-

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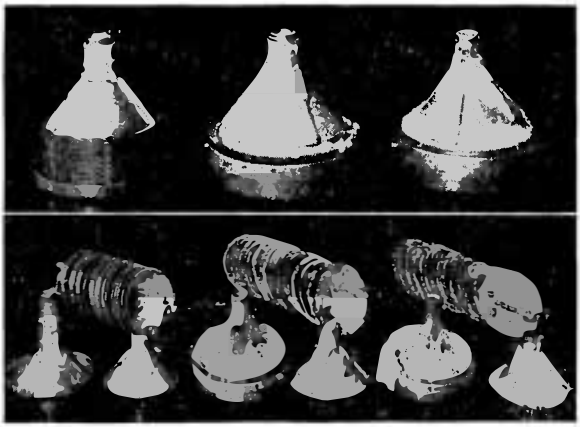
gar averages 4 to 4.5 percent acetic acid. Chlorine solutions of 200 p.p.m. (parts per million) were used and these retained over 100 p.p.m. after standing 12 hours in the treated separator.



Parts washed after each use | Parts washed once a day | Parts unwashed for a full week

Separator washing makes a difference

University of Illinois

Three separators were used, two with stainless steel metal parts and one with tinned steel parts. About three gallons of milk were run through each machine at night, and the separators treated as follows:

One was washed with a hot trisodium solution, the parts then rinsed and placed in 150 degrees F. water for five minutes, removed and allowed to air dry.

The second machine was flushed with warm water only and allowed to remain at room temperature of 75 to 80 degrees (simulating practices on some farms).

The third separtor was flushed with water in the usual manner and this was followed with 1 gallon of the solution to be tested.

The designation "inhibitor solution" as used hereafter refers to the salt, acid, or chlorine solutions. It is recognized that chlorine is definitely germicidal, but that salt and acid in the concentrations used are largely deterrents to bacterial growth, and only partially germicidal. Separators were alternated, so each received the various treatments in different trials. After treatment and a 12-hour idle period about 3 gallons of fresh milk was run through each machine. Samples of the milk and cream from each were collected. Bacterial counts were made immediately on all samples. Samples of cream were divided into three portions. These were placed at 70, 55, and 40 degrees F. for holding tests. They were then scored and acidity tests run after two, four, and seven days holding. The scores given the cream represent the scores of butter expected from the various samples of cream.

Results

Bacterial numbers of cream direct from the separators indicated washing and scalding of separator parts to be highly desirable. All of the inhibitor solutions except 5 percent salt were effective in retarding bacterial growth.

Bacterial numbers on cream from the unwashed separator were from 10 to 103 times greater than those of the washed separator cream. Bacterial numbers on the cream from inhibitor treated machines ranged from 0 to 10 times greater than cream from the washed separators. Data are presented in Table 1.

Table 1. Effect of Separator Treatment on Bacterial Numbers of Milk and Cream

Inhibitor solution	No. of trials	Fresh milk	Cream from separator		
			washed	unwashed	treated
10% salt	3	61,300	46,300	2,240,000	466,000
5% salt	2	60,500	42,800	2,155,000	1,460,000
0.5% acetic acid	3	198,000	116,000	2,060,000	269,000
12.5% vinegar	1	30,000	22,700	950,000	14,700
Chlorine 200 p.p.m.*	6	8,410	21,400	2,070,400	234,300

*p.p.m. (parts per million)

Table 2. Effect of Separator Treatment on Acidity Development in Cream (Average of 9 Trials)

Age of cream in days	Separator washed Storage Temp.		Separator unwashed Storage Temp.		Separator treated Storage Temp.	
	70°F.	50°F.	70°F.	50°F.	70°F.	50°F.
	Percent cream acidity		*Percent cream acidity*		*Percent cream acidity*	
1	0.24	0.19	0.60	0.31	0.35	0.22
2	0.53	0.27	0.72	0.52	0.63	0.32
3	0.66	0.43	0.77	0.62	0.71	0.48
4	0.67	0.53	0.83	0.66	0.75	0.56
7	0.82	0.67	0.86	0.72	0.81	0.68

Table 3. Effect of Separator Treatment on Cream Quality—Cream Storage Temperature 55-60° F. (Average of 6 trials)

Separator treatment	Days cream was held			Days cream was held		
	2	4	7	2	4	7
	Percentage Acidity			*Cream Flavor Score*		
Washed	0.25	0.51	0.75	91.7	90.4	90.1
Unwashed	0.47	0.67	0.76	91.2	90.7	90.5
Chlorine (200 ppm)	0.34	0.60	0.76	91.7	90.3	90.3

Results in Table 2 indicate that cream from the unwashed separator developed more acid in one day at both 50 and 70 degrees F. and continued at a higher acidity level through the seventh day than cream from the washed separator. Cream from the washed and scalded separator was lowest

in acidity at all intervals through the seventh day. This was true both at 50 and 70 degrees F. The rate of acid development in cream from the "treated" machine was intermediate between that shown by samples from the washed and unwashed separators. Cream acidities were lower at all intervals on cream held at 50 degrees F. Final acidities on cream held at 70 degrees F. were all higher than cream held at 50 degrees F. with the highest on the unwashed separator cream.

Since cream from the unwashed separator stored at 70 degrees F. developed 0.60 percent acidity in one day while corresponding samples stored at 50 degrees developed only 0.24 percent, it is obvious that farmers either must wash the separator twice daily or store cream at temperatures considerably below 70 degrees F. It seems illogical to rectify only one of two evils when either one will cause poor cream. Since 0.60 percent is the limit of acidity for cream to grade No. 1, and to be paid for at a higher price, producers are rewarded for more careful methods. It is well here to point out that cream buyers and butter makers are continually stressing the three considerations they consider most important to maintain cream quality. They are: *Separator washing, cooling tanks or refrigeration,* and *frequent delivery*. The first two are emphasized in Table 2.

Sourness of cream is a helpful factor in judging its quality for buttermaking. It is used because it may be determined accurately and indicates in a general way, the age, storage temperature and cleanliness of cream. Most important considerations are flavor and odor. These are determined by grading both butter and cream. Some undesirable cream flavors are removed to a considerable extent in buttermilk drawn from the churn and therefore are not so noticeable in butter, while other flavors may be more apparent in butter than in cream. Since flavors and odors are judged and not measured, the grader indicates his estimate of their intensity and probable damage to the flavor of fresh butter and to its keeping quality.

Undesirable cream flavor changes usually accompany souring of cream. Even if this were not so, the addition of large amounts of neutralizer (soda or lime) to neutralize the acidity of cream above 0.6 percent, robs butter of some of its fine flavor.

Observations on the age of cream as related to souring and decrease in flavor score are shown in Table 3. It is noted that acid percentage is higher through the fourth day in cream from the unwashed machine but at seven days no significant difference existed in samples from the three methods of treatment. Lack of difference after seven days is due to the fact that cream acidity attains a maximum. Increases in acidity beyond this point occur only with prolonged age of the cream and gain in numbers of particular high-acid producing bacteria.

Cream held at 55 to 60 degrees F. for four days graded No. 1 in these trials as none was over 0.60 percent acidity and scores were above 90. It

should be noted, however, that there was a continuous decrease in score throughout the seven days and that the greatest drop was between the second and fourth days. It may be observed also in Table 2 that cream from the unwashed separator was highest in acidity and lowest in score for about three days. If cream from an unwashed separator is held at 70 degrees F. its acidity may be as high as 0.60 percent in 24 hours. (See Table 2.) Correlation of these data indicate that cream should be well cared for and marketed within a two- or three-day period if quality and price advantages are to be secured.

Relation of Cream and Butter Scores

Butter was churned from cream from separators treated in three ways as previously described. The cream was churned on the second, fourth, and seventh days after separation. Cream scores and butter scores paralleled each other closely. Quality of both cream and butter were satisfactory with cream held for only two or three days at 55 to 60 degrees F. No advantage for any method of separator treatment was evident in butter scores. Cream scores indicated some advantages in both washed and treated separator creams, up to two or three days.

It is only fair to state that cream scores and the butter made from this cream failed to show uniform correlation. Cream fermentations vary widely and their effects on butter quality are so different that good graders sometimes fail to grade accurately. Frequently, poor cream does not make the grade of butter expected.

There are probably other methods of separator care which could be practiced, but which could not be unqualifiedly recommended. The practice of cold water rinsing of spouts and hopper with active puddling of discs in a pail of cold water, inverting the tinware to drain and dry and spacing bowl discs to permit drying and aeration over night, is better than no treatment at all.

Summary

This work indicates that thorough washing and scalding of separator parts is the best method to secure high quality cream.

Bacterial counts of cream and the rate of acidity development were the most conclusive evidence of poor cream. Flavor and odor scores showed less correlation but were fairly reliable on cream from one to three days old. This might be expected because the first two considerations may be accurately determined, while taste and smell are based on judgments.

Unwashed separator cream was uniformly of lower quality up to three days; there was less difference at the end of seven days and frequently there was no discernable flavor difference.

Cream from separators treated with inhibitor solutions except (5 percent salt) was intermediate in quality and grade during three days, showing some advantage in treatment.

Cream held at 55 to 60 degrees F. kept its quality much better than duplicate samples held at 70 degrees F.

At 40 degrees F. (in one series of trials) cream maintained quality well for seven days. This was to be expected and is in line with elementary knowledge of food preservation.

Butter scores made from cream of various scores and grades failed to correlate uniformly. Frequently poor cream did not produce the grade of butter expected.

General Guide For Better Quality Cream

1. Prevent milk contamination by proper care of pails, cans, strainers, milking machines, stables, milkers, and clothes of the dairyman.

2. Preserve cream quality by proper sanitary care of separator.

3. Use a cream cooling tank with frequent change of cold water. Don't mix warm cream with cold cream. Keep cream temperatures near 50 degrees F. or less, if possible.

4. Don't cover cream tightly but avoid entrance of insects. Cover well during periods of air blown dust. Tight covering of a partly filled can causes high air humidity and stimulates mold growth.

5. Avoid odors and dust in the barn, in the separator room and where cream is stored.

6. Market cream regularly every two or three days and particularly in warm weather.