STRAINING MILK

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SEDIMENT in milk indicates carelessness in its production or handling.

Sediment contaminates milk and makes it less salable.

Most of the sediment in milk comes from the bodies of cows and consists of hairs, manure, bedding, etc.

Straining removes only the coarse particles of dirt and removes neither the bacteria nor the fine dirt.

Straining improves the commercial quality of milk, but does not appreciably improve its healthfulness.

The best system is to prevent, so far as possible, the entrance of dirt into milk. This can be done best by having clean cows in clean stables, milked with clean hands, into clean, small-top pails.

Filter cloth and absorbent cotton are efficient materials for strainers. Cheesecloth and wire gauze are less effective.

Straining cloths should be changed whenever they become soiled. They should be thoroughly washed and sterilized after each using. Efficient sterilization is accomplished by boiling or exposure to steam for at least five minutes.

Keep dirt out.

Strain through cotton or filter cloth.

Use only clean, sterile strainer cloths.

STRAINING MILK.

CONTENTS.

SIGNIFICANCE OF SEDIMENT IN MILK.

MILK, as it leaves the udder of a healthy cow, is clean and pure. It contains relatively few bacteria and no appreciable quantity of visible dirt. When cow hairs, particles of manure, bedding, or dust are found in milk they are evidence that the product has not been protected properly during milking or subsequent handling. On the other hand, the absence of visible sediment does not prove that the milk is clean, for it may have been carefully strained after careless production.

The entrance of dirt into milk is objectionable from two standpoints—sanitary and economic. The contamination of milk by manure may add organisms which are injurious to health. Schroeder[1] states:

> The real danger from tuberculous cattle lies in the manner in which tubercle bacilli are disseminated with their feces.

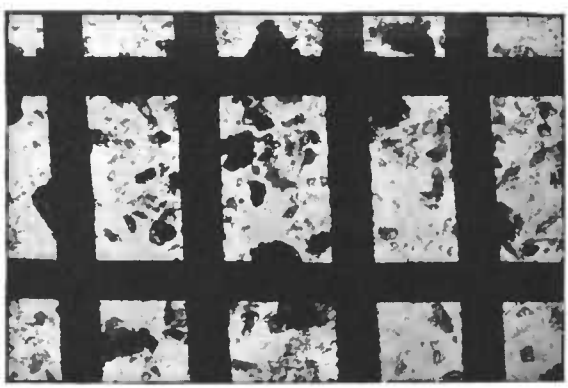

FIG. 1.—Wire strainer enlarged, showing relative size of wire mesh and dirt particles.

He found that tuberculous cows cough up and swallow tubercle bacilli, which pass through the digestive system and are excreted in the droppings. If particles of this matter get into the milk, they carry with them bacteria, which are capable of producing tuberculosis in human beings or in other animals that consume the milk. Economically also the presence of dirt in milk is a disadvantage. Dirty milk is not so readily marketed as clean milk. Consumers are becoming more critical as to the appear-

[1] Bureau of Animal Industry Bulletin 99, page 13.

NOTE.—This bulletin deals only with straining. It does not discuss other methods of removing dirt from milk.

ance of the milk they buy. Milk contaminated with dirt contains greater numbers of bacteria, hence it is liable to sour more quickly. Ayers, Cook, and Clemmer[1] found that in fresh, unstrained milk there was "a general relation between the sediment and the bacterial count."

SOURCES OF SEDIMENT.

By far the greater part of dirt in milk comes from the body of the cow. Other sources are the air, the hands and clothing of the milker, and unclean strainers, pails, cans, and other utensils. A very great proportion of the dirt in milk is composed of hairs, manure, straw, hay, etc., which drop into the milk from the body of the cow during milking. Hay, chaff, and dust also may fall or be carried by the wind into milk either during milking or afterward, if it is left exposed. If the milker's hands are dirty or his hat or clothing dusty, some sediment may be carried into the milk from these sources. Unprotected pails, cans, bottles, or other utensils may accumulate dust. When milk comes into contact with them the dirt is washed off.

WHAT STRAINING DOES.

Straining, if properly performed, removes a large part of the visible dirt which may have fallen into the milk. For this reason it is useful commercially in improving the appearance of the milk. It must be borne in mind, however, that straining removes neither the bacteria nor disagreeable flavors that the dirt carries into the milk. In other words, bacteria can not be strained out of milk, nor does the process improve the healthfulness of the product to any appreciable degree. The reason for this fact is that bacteria are much smaller than the meshes of the finest strainer. Thus they slip through easily while the larger particles of dirt are caught and removed from the milk. Figures 1, 2, 3, and 4 illustrate this very clearly. Figures 1 and 2 are from photographs, magnified about 50 times, of the meshes of a wire and of a

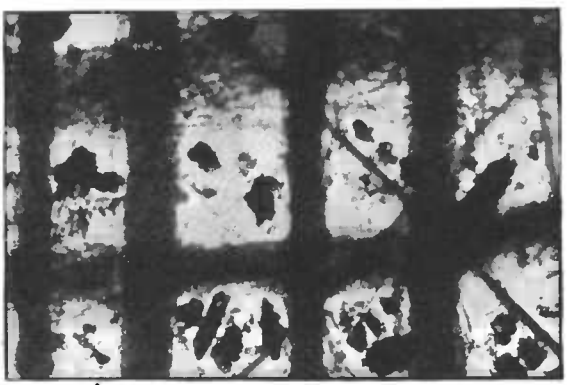

FIG. 2.—Cheesecloth strainer enlarged, showing relative size of cloth mesh and dirt particles.

[1] Department of Agriculture Bulletin 642, page 35.

cheesecloth strainer showing the relative sizes of the openings and of dirt particles from the body of a cow. It is evident that, though the cow hairs and coarser dirt are held by these types of strainers, many small particles pass through. This can be demonstrated readily by

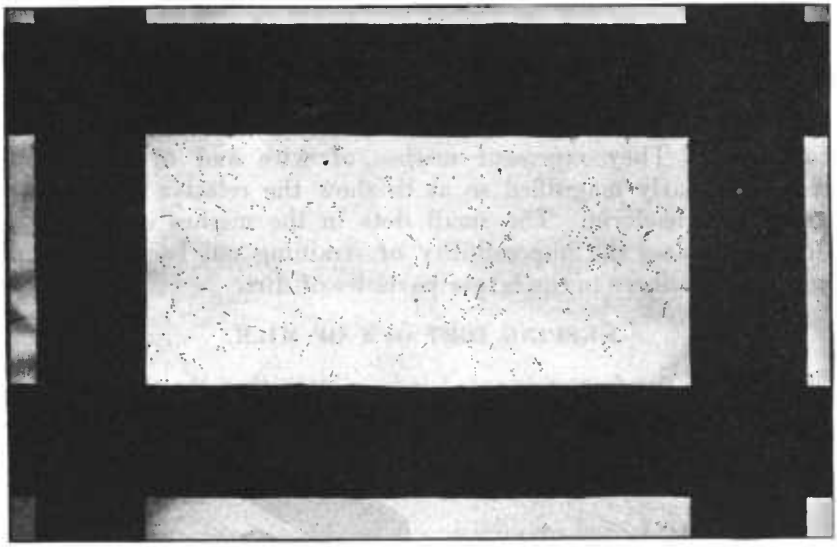

FIG. 3.—Wire strainer greatly enlarged, showing relative size of mesh and bacteria. The small dots are the bacteria.

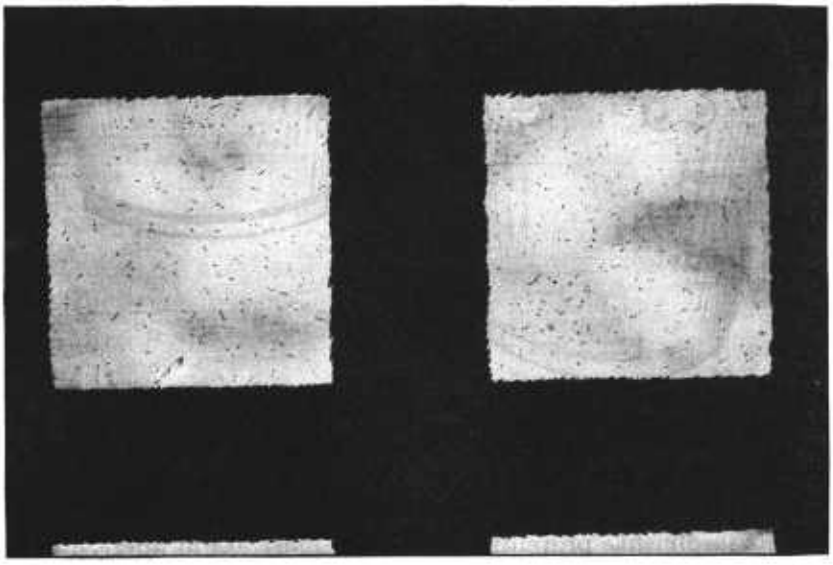

FIG. 4.—Cheesecloth strainer greatly enlarged, showing relative size of mesh and bacteria. The small dots are the bacteria.

straining a pint of dirty milk through such a strainer into a glass jar or pitcher. After standing for a short time much sediment will be found in the bottom of the receptacle.

Taylor[1] determined that 85 per cent of fresh manure dissolves in milk, 83 per cent being moisture and 2 per cent solid material. He also found that 91 per cent of the undissolved manure was visible as sediment at the bottom of the bottle, while 9 per cent was held in suspension in the milk.

Figures 3 and 4 show why it is impossible to strain out bacteria from milk. They represent meshes of wire and of cheesecloth strainers greatly magnified so as to show the relative sizes of the meshes and bacteria. The small dots in the meshes are bacteria. This emphasizes the impossibility of straining out bacteria except those which adhere to the larger particles of dirt.

KEEPING DIRT OUT OF MILK.

In view of the facts presented it is evident that the wisest course is, so far as possible, to prevent the introduction of dirt and bacteria

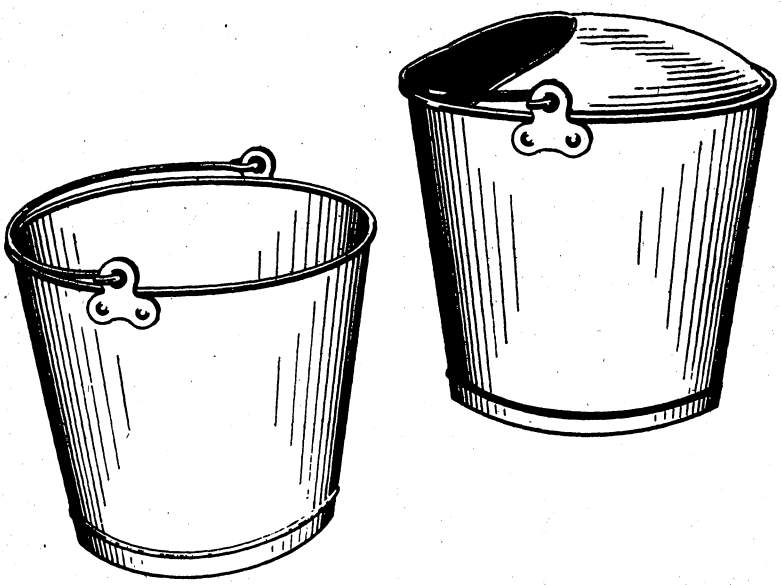

FIG. 5.—Small-top milking pail made from an ordinary pail by the addition of a hood.

into milk, and to use the most efficient straining method to take out all the sediment that can be removed.

Since the body of the cow is the chief and most dangerous source of milk sediment, preventive measures must begin there. Cows should be groomed frequently to remove loose hairs, bits of manure, or bedding. In addition the flanks, udder, and adjacent belly should

[1] Journal of Dairy Science, November, 1917, vol. 1, No. 4, page 303.

be cleaned with a moist cloth just before milking. If these parts are kept clipped they will be much easier to clean.

Most of the dirt which gets into the pail from the body of the cow falls vertically during milking. A large part of it and its contamination may be kept out of milk by the use of a hooded or small-top milking pail, as illustrated in figure 5. It can be made from an ordinary milk pail by the addition of the hood, which can be soldered on by any tinsmith at small expense. Many types of small-top pails are on the market, but the one illustrated combines satisfactorily the desired points, which are cheapness, ease of use, durability, smallness of opening, and ease of cleaning.

The Dairy Division has examined and scored several thousand milk samples, produced on more than a thousand farms. Figure 6 shows the relative quantities of sediment found in these samples, classified according to the type of milking pail used. Ayers, Cook, and Clemmer[1] publish photographs which emphasize this point, and state further: "The original cost of a small-top pail is little more than that of an open pail; it is no more expensive to care for and is of distinct value in preventing the entrance of manure and dirt into milk; consequently it should always be used."

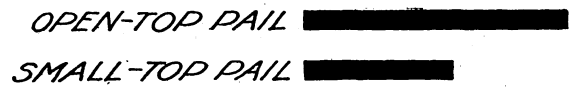

FIG. 6.—Relative quantities of sediment in milk drawn into open-top and small-top pails.

Dust in the stable air is liable to get into milk. For this reason every precaution should be taken to have the air pure during milking. Handling dry feeds, especially hay, should not be done just before or during milking. Sweeping the stable during these periods is equally objectionable. If the stable is built with tight ceilings and smooth walls, it will be easy to clean, and dust will not readily collect in sufficient quantities to contaminate the air heavily.

The milker's hands should be washed thoroughly and kept clean during milking. If they are allowed to become dirty they are liable to be a source of dirt in the milk, especially if "wet-hand' milking is practiced. The clothing of the milker should be free from dust, which may fall into the milk pail.

Care is necessary to protect the milk from dust and dirt after it is drawn. Except when the milk is actually being poured into the strainer, it should be kept covered at all times to prevent the entrance of dust and insects. Much fine sediment is often blown on to the strainer if the latter is left uncovered during the intervals between straining.

Figure 7 illustrates a device which can be made readily on any farm to protect milk during straining. While the milk is being

[1] Department of Agriculture Bulletin 642, page 33, and Plates I, II, and III.

poured into the strainer the cover is raised by a foot pedal. When the pedal is released the cover automatically drops back, serving as a protection against flies and dirt.

Milk should be kept in tightly covered receptacles at all times. Many farmers remove the covers from the cans during cooling to allow the "animal heat" to pass off. This practice is unnecessary and gives opportunity for considerable contamination.

Pails and cans after they are washed and sterilized should be inverted to drain and dry in a clean place, preferably the inside of the milk house. Strainer cloths may be hung in a similar place. If these utensils are placed where dust can be blown into them they will collect dirt which will subsequently appear as sediment in the milk.

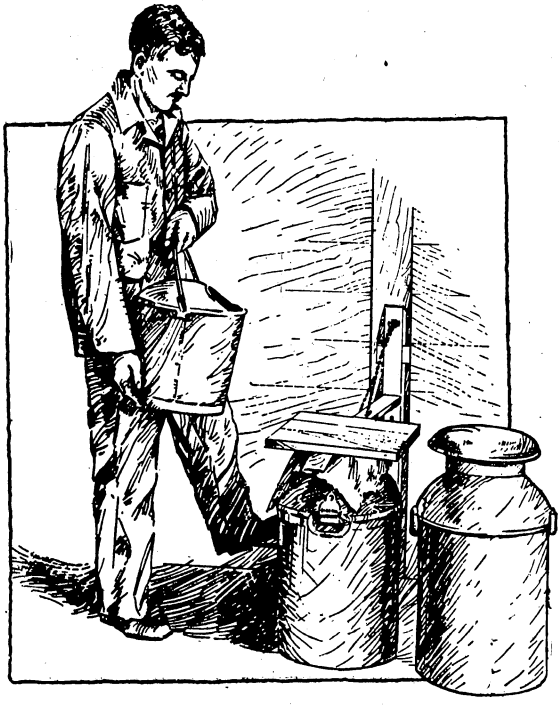

FIG. 7.—Cover device for strainer. It is in place, but is raised by the pedal while milk is being strained.

MILK STRAINERS.

Even in dairies where great care is used, a certain quantity of dirt gets into the milk, while on many dairy farms, where milk production is not so highly specialized and other farm activities require the bulk of the available labor, less time is given to cleaning the cows and caring for the milk. Under these conditions it is not surprising to find considerable sediment in many samples of market milk. For this reason it is desirable to strain carefully all milk to remove, so far as possible, the sediment which it may contain.

EFFICIENCY OF VARIOUS KINDS.

Milk strainers are made of various materials, the most common being wire gauze, cheesecloth, cotton cloth, canton flannel, filter cloth, and absorbent cotton. Reports recently received show the kinds of strainers used on about 40,000 farms in all parts of the United

States. The following table, arranged in the order of efficiency of material from poorest to best, summarizes the information given:

Kind of strainer:	Per cent of farms.
Wire	35
One thickness of cheesecloth	16
Cotton cloth or more than one thickness of cheesecloth	27
Filter cloth	1
Absorbent cotton	21
	100

Keeping in mind the figures shown above let us consider whether the present systems of straining generally used are as efficient as they should be. Figure 8 gives a graphic representation of the quantities of sediment in milk after straining through various materials. This illustration is the compilation of figures obtained in scoring several thousand milk samples in competitive contests, where information concerning methods used in production was available. It will be noticed that the milk strained through absorbent cotton or filter cloth contained the smallest quantity of sediment, while wire strainers were least effective in removing dirt.

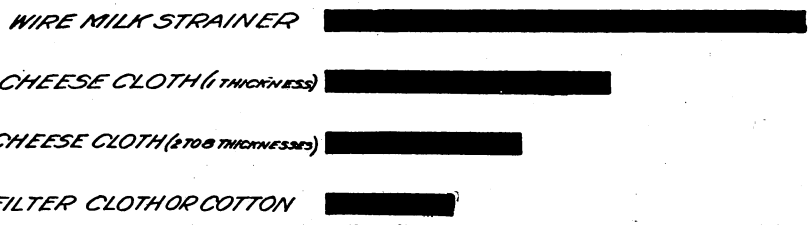

FIG. 8.—Quantity of sediment in milk after straining through various materials.

To demonstrate further the relative efficiency of various straining materials, a series of tests was made in which a measured quantity of manure was placed in each of several bottles of milk. The milk was then strained, a different type of strainer being used for each bottle, after which it was allowed to stand for some time before the bottoms of the bottles were photographed to show the sediment that passed through the strainers. The results are shown in figures 9 to 14. In these pictures figure 9 is the photograph of the milk before straining, showing the amount of sediment present. Figure 10 shows the sediment remaining after straining through a wire strainer, which removed hairs, straw, and some of the coarser particles of manure, but did not take out a very appreciable part of the fine sediment. That a single thickness of cheesecloth permits a large quantity of sediment to remain in the milk is shown in figure 11. Cheesecloth folded so that the milk has to pass through several thicknesses (figure 12) did not remove all the sediment.

Figure 13 shows dirty milk after straining through a filter cloth. This filter cloth is made of cotton in much the same manner as a

carpet; that is, it is smooth on one side while the other side has a "fuzzy" appearance due to the cotton fibers. This fuzzy side is exposed in the strainer so that the milk is poured directly on to it. From the illustration it is evident that this special cloth is quite effective in removing all but a small percentage of the sediment. But most effective of all is absorbent cotton placed between two thicknesses of cheesecloth. (See figure 14.) This method removes practically all the sediment, even in very dirty milk.

Filter cloth can be bought from the leading dairy supply houses, and is comparatively inexpensive. New squares of it may be used each milking, or, if properly washed and sterilized they may be used again until the long fibers become worn. One roll of filter cloth, if properly used, should last from 3 to 6 months in taking care of the milk from a herd of 20 cows.

Absorbent cotton can be purchased at any drug store. Before using it should be split into one-third or one-fourth of its original thickness, and fresh cotton must be used each time. A 1-pound package should last about a month for a herd of 20 cows.

CLEANLINESS ESSENTIAL.

Ayers, Cook, and Clemmer[1] determined that the greatest original source of bacteria during milk production was unsterilized utensils. In a series of 50 experiments they found that when the utensils were sterilized the average bacterial count was 31,040 per cubic centimeter, but that with unsterilized utensils the count averaged 666,520 per cubic centimeter. The straining cloths must receive particular attention, for if they are not carefully washed and sterilized they will harbor millions of bacteria that will contaminate milk at subsequent milkings. It is not uncommon to find straining cloths yellow with old milk and having a strong, cheesy odor. Milk strained through such cloths can have neither a low bacterial count nor an appetizing flavor.

Strainer cloths containing 35,000,000 bacteria per square inch have been found in use on dairy farms. The area of the strainer cloth which is in contact with the milk may be 36 square inches or more, which means that the milk passing through is liable to be inoculated with more than 1,000,000,000 bacteria. Furthermore, if the cloth is folded the chances for inoculation are increased in proportion to the number of thicknesses used.

Strainers and strainer cloths, as soon as used, should be thoroughly washed with warm water and washing powder. They should then be rinsed in clean water and sterilized by boiling for 5 minutes, or with steam for the same length of time. After sterilization strainer cloths should be hung up to dry in a clean place where they will be protected from flies and dust.

[1] Department of Agriculture Bulletin 642, p. 29.

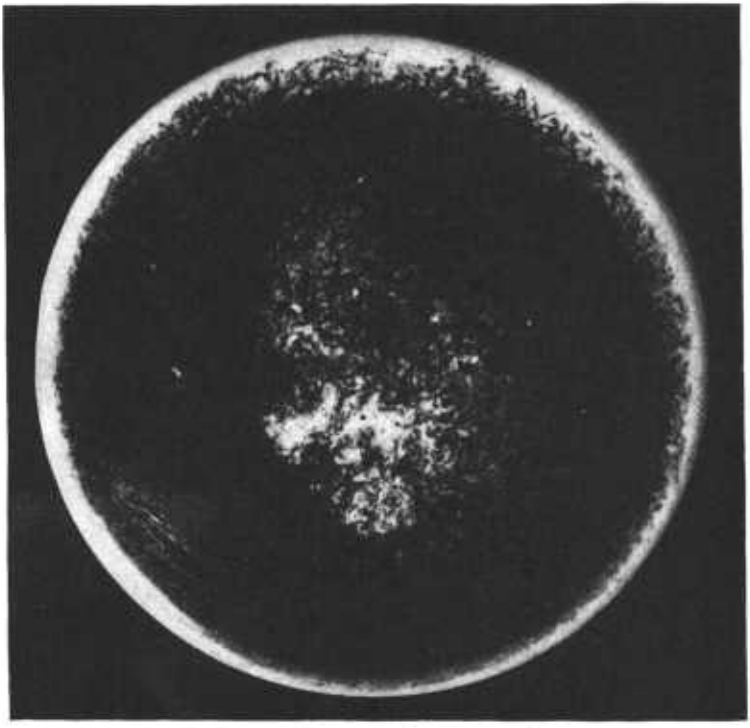

FIG. 9.—Dirty milk before straining, showing the quantity of sediment in bottom of bottle.

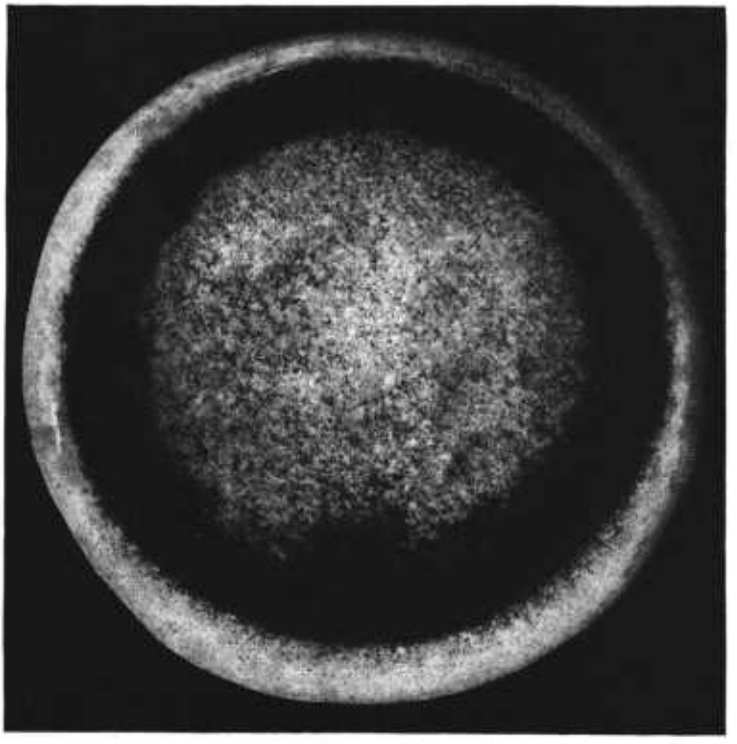

FIG. 10.—Dirty milk after straining through a wire strainer, showing quantity of sediment remaining.

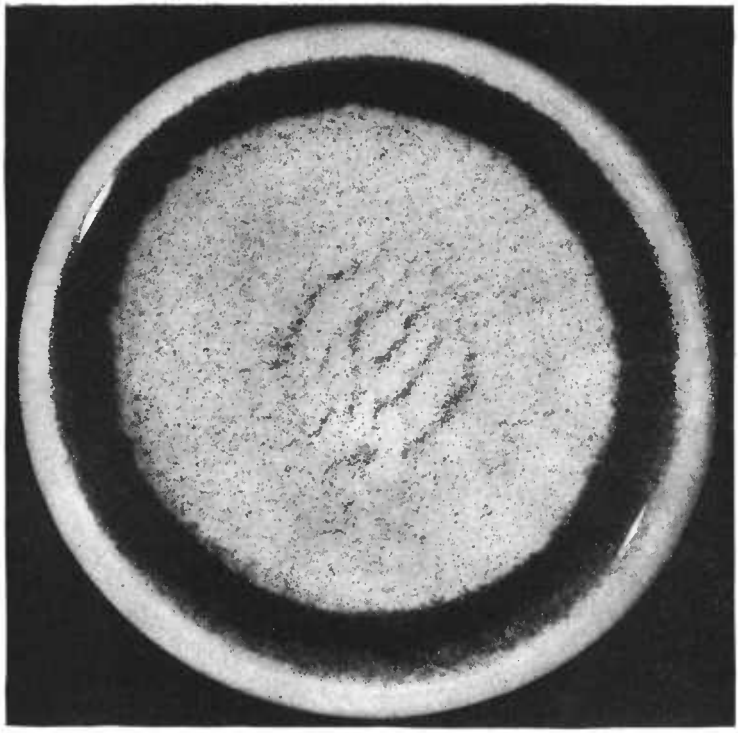

FIG. 11.—Dirty milk after straining through one thickness of cheesecloth, showing the quantity of sediment remaining.

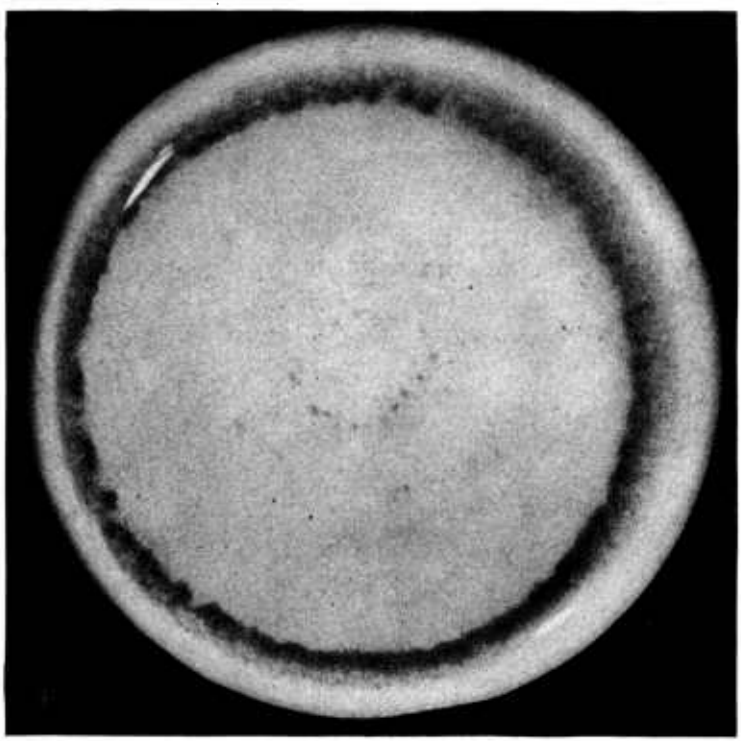

FIG. 12.—Milk after straining through 8 thicknesses of cheesecloth, showing the sediment remaining.

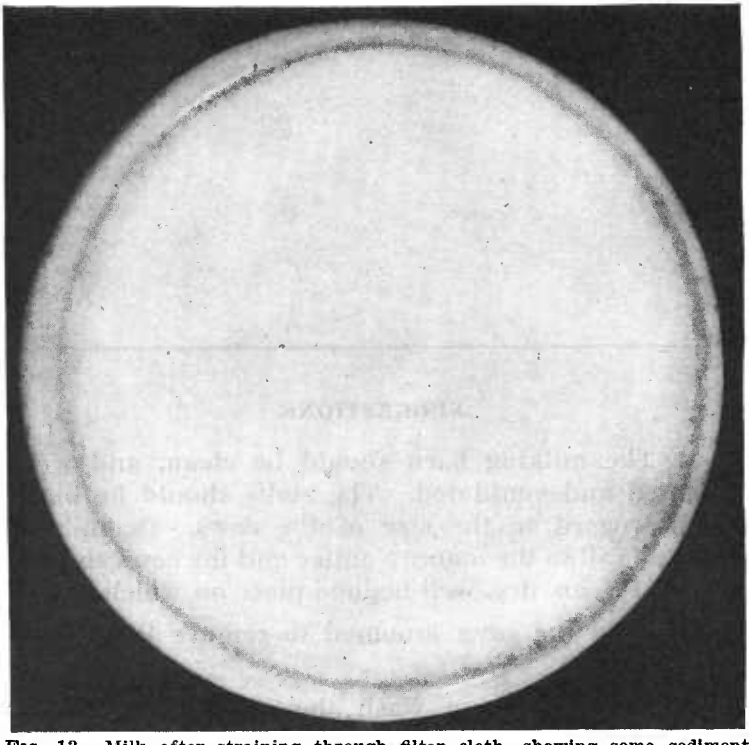

FIG. 13.—Milk after straining through filter cloth, showing some sediment

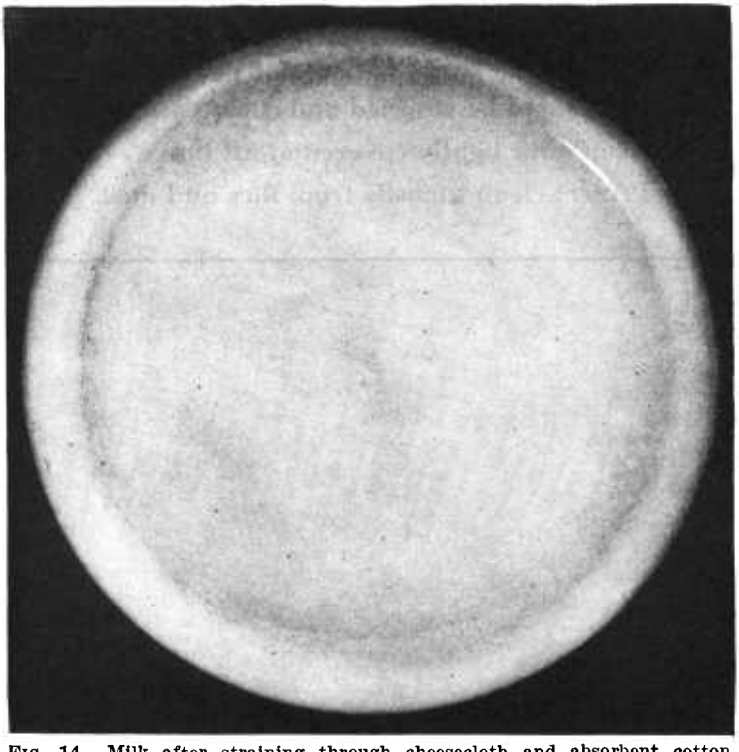

FIG. 14.—Milk after straining through cheesecloth and absorbent cotton, showing little sediment remaining.

SUGGESTIONS.

1. The milking barn should be clean, and well lighted and ventilated. The stalls should be built with regard to the size of the cows. Droppings should fall in the manure gutter and the cows should have a clean, dry, well-bedded place on which to lie.

2. Keep the cows groomed to remove loose hair and manure.

3. Before milking wash the cows' udders and flanks and wipe with a damp cloth.

4. Milk with clean, dry hands into a clean, sterilized, small-top pail.

5. Remove the milk immediately to the milk house, where it should be strained and cooled at once.

6. Keep milk tightly covered at all times.

7. Protect clean utensils from flies and dust.

PUBLICATIONS OF THE UNITED STATES DEPARTMENT OF AGRICULTURE RELATING TO THE PRODUCTION AND CARE OF MILK.

PUBLICATIONS AVAILABLE FOR FREE DISTRIBUTION.

Clean Milk; Production and Handling. (Farmers' Bulletin 602.)
Removing Garlic Flavor from Milk and Cream. (Farmers' Bulletin 608.)
Milk Goats. (Farmers' Bulletin 920.)
Cooling Milk and Cream on the Farm. (Farmers' Bulletin 976.)
Present Status of Pasteurization of Milk. (Department Bulletin 342.)
Study in cost of Producing Milk on Dairy Farms in Wisconsin, Michigan, Pennsylvania, and North Carolina. (Department Bulletin 501.)
A guide for Formulating a Milk Ordinance. (Department Bulletin 585.)
The Market Milk Business of Detroit, Michigan, in 1915. (Department Bulletin 639.)
The Four Essential Factors in the Production of Milk of Low Bacterial Content. (Department Bulletin 642.)
Estimation of Total Solids in Milk by Use of Formulas. (Bureau Animal Industry Bulletin 134.)
Manufacture of Cheese of Cheddar Type from Pasteurized Milk. (Bureau Animal Industry Bulletin 165.)
Chemical Changes Produced in Cow's Milg by Pasteurization. (Bureau Animal Industry Bulletin 166.)

PUBLICATIONS FOR SALE BY THE SUPERINTENDENT OF DOCUMENTS, GOVERNMENT PRINTING OFFICE, WASHINGTON, D. C.

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Use of Milk as Food. (Farmers' Bulletin 363.) Price 5 cents.
Care of Milk and Its Use in the Home. (Farmers' Bulletin 413.) Price 5 cents.
Bacteria in Milk. (Farmers' Bulletin 490.) Price 5 cents.
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Milk Supply of Boston, New York, and Philadelphia. (Bureau Animal Industry Bulletin 81.) Price 5 cents.

Market Milk Investigations: Milk and Cream Exhibited at National Dairy Show 1906. (Bureau Animal Industry Bulletin 87.) Price 10 cents.

Milking machine as factor in Dairying, Preliminary Report: 1, Practical Studies of Milking Machine: 2, Bacteriological Studies of Milking Machine. (Bureau Animal Industry Bulletin 92.) Price 15 cents.

Chemical and Physical Study of Large and Small Fat Globules in Cow's Milk. (Bureau Animal Industry Bulletin 111.) Price 5 cents.

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Bacteriology of Commercially Pasteurized and Raw Market Milk. (Bureau Animal Industry Bulletin 126.) Price 15 cents.

Milk Supply of Chicago and Washington, 1911. (Bureau Animal Industry Bulletin 138.) Price 15 cents.

Chemical Changes Produced in Cow's Milk by Pasteurization. (Bureau Animal Industry Bulletin 166.) Price 5 cents.

Sanitary Relations of Milk Supply, Report of Committee on Sanitary Relations to Conference Appointed by Commissioners of District of Columbia to Consider and Report Upon Local Milk Supply. (Bureau Animal Industry Circular 111.) Price 5 cents.

Sanitary Milk Production, Report of Conference Appointed by Commissioners of District of Columbia, with Accompanying Papers. (Bureau Animal Industry Circular 114.) Price 5 cents.

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Competitive Exhibitions of Milk and Cream with Report of Exhibition held at Pittsburgh, Pa., in Cooperation with Pittsburgh Chamber of Commerce. (Bureau Animal Industry Circular 151.) Price 5 cents.

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Comparison of Acid Test and Rennet Test for Determining Condition of Milk for Cheddar Type of Cheese. (Bureau Animal Industry Circular 210.) Price 5 cents.

Control of Bulk Milk in Stores. (Bureau Animal Industry Circular 218.) Price 5 cents.