COVERED PAILS MEAN CLEANER MILK.

SUMMARIZED BY
F. H. HALL
FROM BULLETIN BY
H. A. HARDING, J. K. WILSON AND G. A. SMITH.

PUBLISHED BY THE STATION.
BOARD OF CONTROL.

Governor Horace White, Albany.
Commissioner Raymond A. Pearson, Albany.
Lyman P. Haviland, Camden.
Edgar G. Dusenbury, Portville.
Thomas B. Wilson, Hall.
Irving Rouse, Rochester.
Alfred G. Lewis, Geneva.
Lewis L. Morell, Kinderhook.
Elihu S. Miller, Wading River.

OFFICERS OF THE BOARD.

Thomas B. Wilson, President.
William O'Hanlon, Secretary and Treasurer.

STATION STAFF.


Fred C. Stewart, M.S., Botanist.
John G. Grossenbacher, Ph.D., A.B., Associate Botanist.
G. Talbot French, B.S., Assistant Botanist.
Lucius L. Van Slyke, Ph.D., Chemist.
Alfred W. Bosworth, B.S., Ernest L. Baker, B.S., Associate Chemists.
Harry A. Harding, Ph.D., Bacteriologist.
†Martin J. Prucha, M.S., Associate Bacteriologist.
James K. Wilson, B.S., Assistant Bacteriologist.
George A. Smith, Dairy Expert.
Frank H. Hall, B.S., Editor and Librarian.
Percival J. Parrott, M.A., Entomologist.

Harold E. Hodgkiss, B.S., William J. Schoene, M.S., Assistant Entomologists.
Ulysses P. Hedrick, M.S., Horticulturist.
Orrin M. Taylor, Foreman in Horticulture.
*F. Atwood Sibrine, M.S., Special Agent.
†Jennie Terwilliger, Director's Secretary.

Adin H. Horton, Computer and Mailing Clerk.
†Donald Reddick, Ph.D., Assistant Botanist.
†Fred Z. Hartzell, M.A., Assistant Entomologist.
†Fred E. Gladwin, B.S., Special Agent.

Address all correspondence, not to individual members of the staff, but to the New York Agricultural Experiment Station, Geneva, N. Y.
The Bulletins published by the Station will be sent free to any farmer applying for them.

* Riverhead, N. Y. † Absent on leave. † Connected with the Chautauqua Grape Work.
Cleaner milk demanded of dairymen.

Consumers, in daily increasing numbers, demand cleaner milk. In many communities the demand is not merely expressed; it is backed by rigid regulations of boards of health and sanitary officers. With this demand for better quality, however, there is usually great reluctance on the part of the consumer to bear even part of the increased cost of producing the improved product. This burden falls upon the producer, alone. Since he must meet the demand or find difficulty in marketing his milk, he should, from self-interest, learn by what means he can make the greatest improvement at the least cost. Recent work at this Station, supported by quite wide application of the results in many of the dairies supplying milk to the city of Geneva, indicates that the use of covered milk pails is the simplest, cheapest method by which marked reduction in milk impurities can be secured.

*This is a brief review of Bulletin No. 326 of this Station, on The Modern Milk Pail, by H. A. Harding, J. K. Wilson and G. A. Smith. Anyone specially interested in the details of the investigations will be furnished, on application, with a copy of the complete bulletin. The names of those who so request will be placed on the Station mailing list to receive future bulletins, popular or complete as desired. Bulletins are issued at irregular intervals, as investigations are completed, not monthly.
Bacteria, in milk or elsewhere, may be useful, 

**Bacteria indicate** neutral or harmful; and it would be very de-

sirable, if it were possible, so to classify them 

whenever we discuss the bacterial content of 

milk. To the buttermaker and cheesemaker, for instance, certain 
bacteria that cause clean souring of milk are essential; to the 

housewife these same bacteria are undesirable since their activity 

soon makes the milk unpalatable, but they are not necessarily 
harmful; indeed, Metchnikoff claims that their abundant pres-

ence in the alimentary canal helps to delay old age;—but a 
single typhoid bacillus in a pail of milk may mean the loss of 
a life.

Ordinarily, bacteria in milk, whatever their nature, indicate 

the presence of foreign matter,—dirt. They usually enter the 
milk during its drawing or cooling; and the fact that they are 

there generally means that dust, dirt or filth has in some way got 

into the milk. It is on materials of this kind that bacteria are 

found in vast numbers.

We cannot, easily enough and quickly enough to be of value in 
testing a sample of market milk, identify the *kinds* of bacteria 
it contains; but we can quite readily find out *how many* of them 

there are. The number of bacteria, therefore, is taken as our 

best guide to impurities in milk; and it is by counting bacteria that 

comparisons of milk samples are made. This method was used 
in the Station bacteriological laboratory to find out how much 
effect different styles of pails have in keeping dirt out of the milk.

The ordinary milk pail is of metal, about 10 

**Covered pails.** inches high, holding 12 to 16 quarts, with 
sides inclined so that the top is wider than the 

bottom,—perhaps as perfect a form as could 

be devised for catching all the foreign matter that is dislodged 

from the cows' flanks and udders or that falls through the dis-

turbed air of the stable. The old strainer pail, used so much
twenty-five or thirty years ago, was an improvement over the open pail in having part of the top covered; but this pail was not effective as a "strainer"—the only object sought at that time, since "dairy bacteria" were then practically unknown—and has almost disappeared. Beginning about 1895 new types of pails began to appear, in which the size or shape of the pail top was changed so as to lessen the area exposed to the falling dust and dirt and thereby to shut out part of the impurities. Many of these "improved" or "covered" or "sanitary" milk pails are now on the market. In most of these, some form of hood is added to the regular pail so that the opening faces sidewise rather than directly upward and is reduced in area; in another type most of the top of the pail is covered, leaving only a circular or elliptical opening; while still another type employs both the reduced opening and the hood to protect it. For excluding dirt probably each of these pails is better than the open one; but some of them have been condemned from the outset by their extreme height, which makes it impossible to use them without great inconvenience with short-legged or heavy-uddered cows. In other pails the opening has been so much reduced or is so badly placed that it is very difficult to milk into them. Some of the forms with small circular openings have been designed for the use of strainers of cloth, woven wire sieve and cloth, or cloth and cotton to exclude the dirt. Against this type of pail there are two objections. The cloth or cotton used requires careful handling and daily sterilization, and under ordinary farm dairy methods would become, in itself, a most prolific source of bacterial infection; and, second, the streams of milk, beating on the foreign matter retained by the straining device, soon wash out of the dust and dirt the bacteria, which can pass through the finest strainers to contaminate the milk.

In all of the types, also, are some pails so poorly designed or so complex that they cannot be readily cleaned and sterilized. Most of these pails are patented or are put out by manufacturers
at high prices. A Geneva tinsmith, Mr. Harry Loy, has devised, however, the simple, inexpensive addition to the common milk pail shown at the right on the title page. This hood can be easily made by any good tinsmith and soldered to a regular pail; so that at an added cost of about 50 cents any dairyman can secure a most efficient covered pail.

Tests of covered pails. During the past two years the Station has made extended tests of the value, as dirt excluders, of seven pails of the better types. The efficiency of each pail is estimated by counting the bacteria in samples of milk drawn into the tested pail, and into the ordinary open pail under similar, carefully controlled conditions.

Four cows were used in nearly all the tests, two being milked into the improved pail one evening, the other two into the open pail, the pails being reversed the following evening. So far as possible the same man milked the same pair of cows throughout the test. Thus by alternating the pails with the same cows and same milkers any natural differences in bacterial content of the udder or in carefulness of the men were neutralized. Each test was continued about two weeks. All known precautions were taken to get rid of disturbing influences and to secure accuracy in the work at all stages. It is believed that the comparisons are reliable as between each tested pail and its open-pail check; but of course the numbers of bacteria varied considerably in tests made at different times owing to changes in the season, differences in condition of the cows and similar factors. The percentages of reduction in bacteria, as given in the table, represent to some extent the comparative efficiency of the different pails, but only within quite wide limits.
Table I shows briefly the extent and results of the tests.

**Table I — Decrease of Bacteria in Milk by Use of Covered Milk Pails**

<table>
<thead>
<tr>
<th>PAIL</th>
<th>Cows milked</th>
<th>Milking No.</th>
<th>No. of Culture plates of bacteria made</th>
<th>Average bacterial content of samples</th>
<th>Reduction of bacteria by covered pail</th>
<th>Remarks on covered pails</th>
</tr>
</thead>
<tbody>
<tr>
<td>Open</td>
<td>4</td>
<td>22</td>
<td>148</td>
<td>1,435</td>
<td></td>
<td>Too tall, opening too narrow and sides too straight for convenient use.</td>
</tr>
<tr>
<td>Freeman</td>
<td>4</td>
<td>22</td>
<td>147</td>
<td>740</td>
<td></td>
<td>Too high and opening wrong shape for ease in milking.</td>
</tr>
<tr>
<td>Atlantic</td>
<td>4</td>
<td>24</td>
<td>125</td>
<td>4,266</td>
<td></td>
<td>Too high; cover detachable and would often be removed by ordinary milker. Form has since been improved.</td>
</tr>
<tr>
<td>Champion</td>
<td>4</td>
<td>16</td>
<td>96</td>
<td>7,839</td>
<td></td>
<td>A good pail; milk does not pour out perfectly.</td>
</tr>
<tr>
<td>Newburgh</td>
<td>4</td>
<td>14</td>
<td>84</td>
<td>8,303</td>
<td></td>
<td>Cloth strainer called for; opening too large; extra spout for emptying hard to clean.</td>
</tr>
<tr>
<td>Gurler</td>
<td>2</td>
<td>10</td>
<td>55</td>
<td>4,346</td>
<td>9,785</td>
<td>Satisfactory pail except in minor details. Low, easily cleansed. Can be made by any tinsmith.</td>
</tr>
<tr>
<td>Loy</td>
<td>4</td>
<td>24</td>
<td>143</td>
<td>7,537</td>
<td></td>
<td>Loy pail changed† by making cover flush with top and reinforcing edge of opening.</td>
</tr>
<tr>
<td>Modified Loy</td>
<td>2</td>
<td>10</td>
<td>58</td>
<td>11,351</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modified Loy</td>
<td>4</td>
<td>20</td>
<td>119</td>
<td>418</td>
<td></td>
<td>In all the tests, especially the first and last in the table, the bacterial content of the milk was very low, even in the open-pail samples,—more like that in certified milk than in farm dairy milk. On this account the percentage reductions of bacteria</td>
</tr>
</tbody>
</table>

* Bacterial colonies on two plates too numerous to count.
† Modifications suggested by use at Station.
by the covered pails are probably lower, rather than higher than they would be in use in most dairies; for it is where conditions are poor, rather than where they are excellent, as in the Station stable, that the most marked results are to be expected from any device for keeping milk clean. The figures, then, indicate that any dairyman not now using some form of covered pail may easily reduce the germ content of his milk 50 per ct. or more by adopting such a pail of good type. All of those tested are satisfactory as dirt excluders; but several of them have quite serious defects, as noted under "Remarks" in the table; and most of them are patented or proprietary pails and somewhat expensive. The Loy hood for the regular pail is not patented or its use restricted, but may be made and attached by any tinsmith. In the modified form the top is soldered flush with the top of the pail so that no groove or channel is left to catch dirt or to carry spattered milk into the pail when emptying. The upper edge of the opening is also strengthened and protected by a collar which turns away from the opening, when the milk is poured out, any loose particles that may have lodged on the pail top. The completed pail is only 12½ inches high, so that the hands do not strike the top even in milking small cows or those with heavy udders. The elliptical opening, 5 by 7 inches, at the side of the top, is practically as easy to milk into as an open pail. This opening, with the swell of the top, makes it possible to see all parts of the inside of the pail and to reach them easily for cleaning. In attaching the cover the joints should be well filled with solder carefully smoothed to make washing easy and to prevent the retention of dirt or thickened milk by rough places. These last two points are very important, for unless the pail itself be kept clean and sterile it cannot serve most efficiently its purpose of reducing the germ content of the milk.