LYE SOLUTION FOR MILKING MACHINE RUBBER PARTS*

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To determine how wide a margin of safety existed with the lye soak solution, the residual milk was allowed to dry on to the teat-cup assemblies, then without any attempt at cleaning they were filled with the lye solution. This, supplemented by a weekly brush-washing, maintained these parts in good sanitary condition. The several advantages of the lye solution employed are indicated.

A simple, inexpensive method of caring for milking machine rubber parts has long been the object of an intensive search. Parfitt's introduction of the lye soak solution method gave rise in 1930 to a suitable method which has, since that time, continued to give complete satisfaction in the Central Experimental Farm dairy. Substitutes, including detergent-sanitizers, have been tried from time to time but none has been found to equal the lye soak method in reliability, simplicity, and economy. Satisfaction with this procedure has likewise been experienced elsewhere. Recently, however, Enright has blamed the lack of cleanliness of teat cup assemblies upon the inadequacies of the lye storage method.

Our method consists simply of rinsing the units in 21/2 Imp. gals. (3 U. S. gals.) of cold water, brushing the outsides of the assemblies, and filling with 0.5 percent lye solution. The units are then merely drained before use. Once a week the units are completely dismantled for inspection and all inner surfaces brushed with a hot cleanser solution. The inflations are alternated in use; one week idle, one week in service.

Following this practice the rubber parts have remained clean and the bacteria counts of the raw bulk milk have rarely exceeded 10,000 per ml. Recently the inflations have been boiled once a month in 2 percent lye solution. The units are then merely drained and used without any mistreatment. The effect of such misunderstanding, the suction rinse of two milker units, together with the weekly dismantling and brushing, was omitted for over five months. Nevertheless, bacteria counts remained low, and except for a moderate deposit of calcium phosphate from the residual milk the inflations remained clean. It is, therefore, difficult to understand why this recommended procedure should fail to maintain the teat cup assembly in a sanitary condition.

Apart from failure to fill the teat cup assembly completely, or the use of too weak a lye solution, allowing milk to dry on the milker parts appeared to be the only other form of neglect likely to result in high counts. The effect of such mistreatment was therefore investigated on four DeLaval units fitted with new inflations. For this purpose the usual procedure was abandoned, and instead the teat cup assemblies were hung up in a warm room (around 80°F) for 61/2 hours after the morning milking and for 30 minutes after the evening milking. At no time was the milk residue rinsed off. Following the drying interval the assemblies were filled with lye solution. Just prior to the next milking they were drained and used without any

### TABLE 1

**Summary of Counts on Machine-Drawn Milk Samples**

**Central Experimental Farm, Oct. 17, 1949-Jan. 14, 1950**

<table>
<thead>
<tr>
<th>Period</th>
<th>No. of Samples</th>
<th>Log. Average Count</th>
<th>Distribution of standard plate counts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>&lt;5000</td>
</tr>
<tr>
<td>A. Oct. 17-Nov. 2</td>
<td>7</td>
<td>13,200</td>
<td>1</td>
</tr>
<tr>
<td>B. Nov. 3-Dec. 16</td>
<td>37</td>
<td>7,798</td>
<td>1</td>
</tr>
<tr>
<td>C. Dec. 19-Jan. 14</td>
<td>8</td>
<td>6,480</td>
<td>1</td>
</tr>
</tbody>
</table>

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† While under our conditions it has not been found necessary to rinse the milker units with a sanitizing solution before use, this practice is recommended to producers.

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further treatment. Once a week the
units were dismantled, inspected,
and examined for total count and
coliform organisms. 1

The plate count results are sum-
marized in Table 1. Periods A and
C represent the preceding and fol-
lowing periods when the customary
pre-rinsing with cold water
was practiced, while Period B is the ex-
perimental period. The arithmetic
mean for the 37 samples examined
during Period B was 8,025, the
logarithmic mean 7,798, per ml.
Counts on the pasteurized milk
ranged between 21 and 100 per ml
with an arithmetic mean of 43. Coli-
form organisms were present in 0.01
ml portions of 51.35 percent of the
raw milk samples during the experi-
mental period, compared with 53.0
percent during the control periods.
No coliforms were found in 1 ml
portions of the pasteurized milks at
any time.

Weekly inspections of the disas-
sembled teat-cup assemblies showed
them to be only slightly less clean
than when the usual rinsing treat-
ment was employed. The slight film
that developed might be expected to
result from the precipitation of cal-
cium phosphate from the residual
milk by the highly alkaline lye solu-
tion. Despite such gross neglect,
these units appeared to be in a satis-
factory state of cleanliness.

Titrations of the lye solution on
20 occasions during the test period
gave values ranging from 0.35 to
0.49 percent, with a mean of 0.41
percent.

Discussion

There are at least two opinions
on the subject of milking machine
sanitation. The first is that it is
imperative that after each milking
the teat cup assembly be rinsed, dis-
mantled, brushed in hot detergent
solution, rinsed, and finally sanitized
by heat or chemical solutions. The
second is that few producers will
faithfully carry out such a compli-
cated, time-consuming procedure,
that most of them will take "short-
cuts," and in consequence get into
trouble. It is felt that a simpler
procedure is much more likely to be
carried out faithfully. As Flake 8
observes, "it is preferable to have
a high degree of compliance with a
procedure that will result in an
acceptable machine than to have a
low percentage of compliance with
a more time-consuming procedure
that would, if properly followed,
yield a milking machine that is more
nearly sterile."

Our aim has been to develop a
method which is neither expensive
nor time-consuming, and which can
be used successfully where the hot
water supply is limited. Provided the
teat-cups and tubing are com-
pletely filled with 0.5 percent lye
solution, a satisfactory sanitary con-
dition can be maintained even with
gross negligence, as indicated by the
results reported in this paper.

While it may not be feasible un-
der all conditions to maintain teat
cup assemblies in good sanitary condi-
tion without the use of an additional
suction rinse with hot cleanser solu-
tion, the need for dismantling and
brushing twice daily does not appear
to have been demonstrated. Our
own results 15 and those of others 9,17
have shown that suction washing
gave significantly lower counts than
brush washing. Hay 8 has also
warned of the danger of destroying
the smooth inner surface of high
quality milking rubbers by the use
of spiral brushes or metal scrapers,
while all too frequently worn-out
brushes are being relied upon.

It is unfortunate that the idea has
been propagated that where the teat
cup assembly is dismantled only once
a week for inspection, this consti-
tutes "once a week" cleaning. This
is far from correct. The lye solution
method is intended to keep a clean
milking machine in that condition,
not to clean up a dirty one. Lye
solution has valuable detergent prop-
erties, in addition to its germicidal
activity, and might be regarded as
the original detergent-sanitizer. Ad-
vantage is taken of this in the
machine-washing of milk bottles,
where brushing is not usually em-
ployed. In common with other
alkaline salts, however, it is less
effective in the control of mineral
deposits. In hard water areas an
incrustation of calcium carbonate
may slowly build up on the sur-
faces. 16,18 Such deposits, while un-
sightly, apparently do not affect the
bacterial content of the milk. They
are easily removed by a weak acid
solution, or avoided by using soft
water, or by adding a small amount
of polyphosphate as a sequestering
agent. The substitution of sodium
metaphosphate for lye has also been
recommended, 9 as has an occasional
use of an organic acid detergent.

In the Cornell studies, Dahlberg
et al. 4 found that "a lye solution in
the milker teat cup assemblies on a
rack was a very effective cleaner and
sterilizer." Jensen and Bortree 10
reported that inflations treated with
lye solution absorbed much less fat
than did those stored in chlorine,
quaternary ammonium, acid deter-
gent, or polyphosphate solutions.
Moreover, some of these solutions
cased deterioration of the rubber
and other undesirable changes. The
Arizona studies 8 also indicated that
lye solution, following a cold water
rinse, gave lower counts than con-
ventional methods, with a daily sav-
ing in time of 30 minutes to an hour
for a 2-unit machine. Moseley 18 re-
cently queried 16 Guernsey milk pro-
ducers whose raw milk plate counts
during 1950 never exceeded 50,000
per ml. Of the 13 replying, 11 used
wet storage and 9 of these used lye
solution. The above findings, and
our own, do not support Enright's 8
contention that the use of lye solu-
tion can be blamed for most of the
unclean teat-cup assemblies.

Regardless of the method
employed to remove the milk residue,
lye in solution between milkings possesses the following advantages:

1. Lye is more readily obtainable
than other recommended detergents
or sanitizers.

2. It is the cheapest effective com-
pound.

3. It retains its strength, both in
the solid form and in solution.

4. It maintains its efficiency in the
presence of rubber and other organic
matter.

5. It possesses valuable detergent
properties, dissolving casein and
saponifying fat, the presence of
which causes deterioration of rubber
liners.

6. It does not cause oxidation of
the rubber.

7. It does not form the granular
deposit reported by Parfitt 19 with
hard water solutions of hypochlo-
rates.

(Continued on page 160)
The Efficacy of the Microscopic Examination of the Incubated Producer Milk Samples in Detecting Streptococci Mastitis in Dairy Herds. *J. Milk Technol.*, 9, 197–201 (1946).


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8. Less fat is absorbed by the rubber inclusions than when other recommended compounds are used.11

9. The slipperiness of the solution affords a simple method of determining that it is up to strength.

10. It is much more effective than chlorine compounds in the destruction of coliform organisms.

11. Periodical boiling in a 2 percent solution is extremely effective in the control of thermodynamic organisms, while also prolonging the life of the rubber parts.

12. Lye does not injure the metal parts (except aluminum or aluminum alloys).

13. Even a 5-minute treatment with lye solution is sufficient to maintain surfaces in good sanitary condition.

## Conclusion

Lye solution maintained milking rubber machine parts in a satisfactory sanitary condition even when the residual milk was permitted to dry on the surfaces.

## Acknowledgments

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## References


