

THE EFFECT OF GERMICIDE USED FOR UDDER WASHING ON THE NUMBER OF MICROCOCCI ON TEAT-CUP LINERS

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The addition of germicide to the water used for washing the udders of cows prior to milking is a common step in procedures recommended for the sanitary production of milk. It is also frequently advocated for preventing the spread of mastitis infection from cow to cow in a milking line. Some aspects of the use of germicides for this purpose and their relation to mastitis sanitation have been reviewed (2,6).

This work has been undertaken as part of an investigation of methods for controlling the spread of pathogenic staphylococci. It has been shown that there is no significant difference in susceptibility to hypochlorite disinfectants between coagulase-positive and coagulase-negative strains of *Micrococcus pyogenes* (5). In view of the difficulty of differentiating on culture medium between coagulase-positive and coagulase-negative strains, mannitol salt agar (Difco) has been used throughout, and the term "micrococci" as used herein includes all colonies growing on this medium.

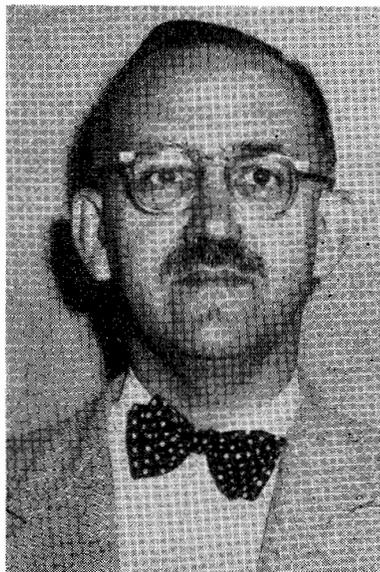
EXPERIMENTAL

The cows used in these experiments were maintained under good sanitary conditions in a small stanchion barn on the College Research Farm. At least two weeks of washing with warm water only separated any two experiments.

Between milkings the teat-cup liners were stored in 1% lye solution. Two sets of liners were used in alternate weeks. The set removed at the end of each week was boiled in 3% lye solution, washed and stored dry until put into use again at the end of the week.

After removal from each cow and before being attached to the next one, the teat cups were rinsed in cold water and then dipped for at least 30 seconds in a disinfectant compatible to the udder washing solution, i.e. sodium hypochlorite 500 p.p.m. during the Hibitane and sodium hypochlorite experiments and Iosan (50 p.p.m. available iodine) during the Iosan experiment. This procedure has been shown to provide adequate reduction in numbers (7).

Each cow's udder was washed at each milking with a separate paper towel dripping wet with germicide solution, which was made up to the proper strength in warm water in a separate pail for each concentration. Where udders were very dirty they were pre-washed with a paper towel and warm water.



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Five cows were used for each experiment. The udder of each cow was washed for one week with one of four concentrations of germicide and one week with warm water. The cows and treatments in each experiment were randomized in a 5 x 5 latin square design, so that each experiment lasted 5 weeks. The solution for each cow was changed each Saturday morning.

At the evening milking on Monday, Wednesday and Friday of each week the teat-cup liners were swabbed and the organisms were enumerated by methods published previously (7,8). All platings were in triplicate.

GERMICIDES

The germicides listed below were used in these experiments. The first two represent newer groups of chemical compounds introduced in recent years, while

the last compound is one of those used in dairy sanitation for a long time.

Iodophor. The product used is sold under the name "Iosan", and provides 1.75% available iodine.

1:6-Di-4-Chlorophenyldiguanidohexane (1). This is a new organic compound marketed in Canada under the trade-name Hibitane. It is also known as Chlorhexidine (9).

Sodium hypochlorite. A liquid Sodium hypochlorite (7% available chlorine) was used.

RESULTS

The mean numbers of micrococci obtained from 60 teat-cup liners for each treatment are shown in Table 1.

TABLE 1 — THE EFFECT OF KIND AND CONCENTRATION OF GERMICIDE USED FOR UDDER WASHING ON THE MEAN NUMBER OF VIABLE MICROCOCCI ON TEAT-CUP LINERS

Iosan		Hibitane		Sodium Hypochlorite	
Conc. p.p.m. Iodine	Mean ^a Liner Count	Conc. p.p.m. Active Ingredient	Mean ^a Liner Count	Conc. p.p.m. Av. chlorine	Mean ^a Liner Count
0	37,600	0	39,900	0	26,400
25	30,600	100	34,900	250	21,500
50	25,600	133	14,600	500	19,800
75	28,800	200	14,800	750	17,300
100	20,600	400	7,600	1000	19,800
F=2.02 ^b		F=3.95 ^b		F=.909 ^b	

^aMean Count from 60 liners.

^bRequired F at 5% = 3.26

Although there was no significant overall difference between the counts obtained in the Iosan experiment, inspection of the treatment means did show a significant difference between the counts obtained where udders were washed with water only and those washed with 100 p.p.m. available iodine.

Under the conditions of these experiments washing udders with Hibitane gave the lowest mean liner counts. This is graphically shown in Figure 1, in which are plotted the percentage reductions in the number of micrococci on teat-cup liners from udders washed with the 4 concentrations of each disinfectant.

The smallest reductions were found where sodium hypochlorite was used. Increasing the concentration

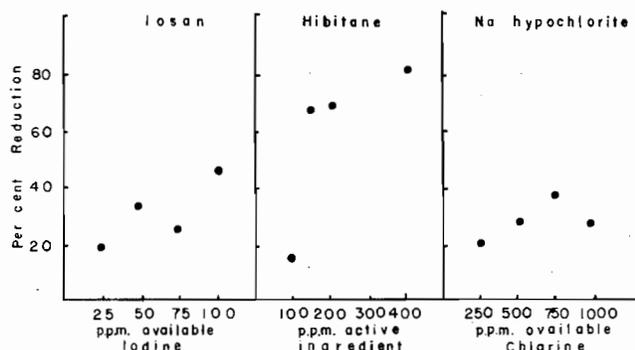


Figure 1. Per cent reductions in the numbers of micrococci on teat-cup liners, resulting from the use of germicides in the udder-wash water.

to 1000 p.p.m. did not result in any significant decrease in the counts obtained.

In all three experiments there was a marked variation in the mean counts obtained from liners from different cows. Only in the Hibitane experiment was the variance for cow means less than that for treatment means.

No significant differences were found in the mean count obtained each week during the experiment when either Iosan or Hibitane were used, but there was a significant difference between the weeks during which sodium hypochlorite was used.

DISCUSSION

The number of micrococci, as defined, on the teat-cups liners immediately after they are removed from the cows has been used as the criterion for judging the effectiveness of udder washing. This is based on the supposition that the microflora of the teat skin has a marked effect on the numbers and types of organisms on the teat-cup liner, with which it comes in intimate contact during the milking process. The microflora of the teat-cup liner itself is important in the practice of dipping teat-cups between cows in the milking line, which can result at best in a reduction of 90 to 95 per cent of the micrococci present (7).

The most obvious conclusion to be drawn from the results presented is that it is extremely difficult to reduce the numbers of micrococci on teat-cup liners, as they are removed from the teats, by udder washing procedures. This is in agreement with results published by other workers showing that there were no appreciable differences in the microbial count of the milk produced when solutions containing 400 p.p.m. or 200 p.p.m. of available chlorine, 400 p.p.m. or 200 p.p.m. of a quaternary ammonium compound were compared with water alone for washing udders (3). In a subsequent paper it was also shown that both these sanitizers in the above concentrations were ineffective in checking the spread of organisms usually associated with mastitis (4). However, the present work does show that high concentrations of Hibitane used for udder washing do significantly reduce the number of micrococci on the liners. This undoubtedly results from a reduction in the number of the skin microflora since this is the main source of organisms found on teat-cup liners (8).

Sodium hypochlorite, even in concentrations up to 1000 p.p.m. available chlorine had little effect, demonstrating the complete inadequacy of recommending solutions containing 100 or 200 p.p.m. available chlorine, which is a very common practice.

This study demonstrates that there is a need for highly potent germicides which can reduce the number of microorganisms on the teat skin without causing ir-

ritation. On those farms which use a milking parlour, the method outlined by Moore (6) may make possible the use of somewhat lower concentrations of germicide, but in the many dairy barns where milking is still performed in the cow stall the use of water from a hose is likely to result in wet, cold floors which may bring other complications.

SUMMARY

Experiments have been carried out to determine the effect of several germicides in udder washes on the number of "micrococci", defined as all organisms growing on mannitol-salt agar, found on teat-cup liners immediately after removal from individual cows. The need has been shown for highly potent germicides if the number are to be reduced by this procedure.

Lowest numbers were found on liners from cows washed with Hibitane (Chlorhexidine). Iosan (100 p.p.m. available iodine) resulted in a significant reduction in the number as compared to warm water. Sodium hypochlorite, even in concentrations up to 1000 p.p.m. available chlorine had little effect. There was a marked variation in the mean liner-counts from individual cows.

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