EFFECTIVENESS OF POSTMILKING TEAT ANTISEPSIS WITH IODOPHOR, CHLORHEXIDINE OR DODECYL BENZENE SULPHONIC ACID

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SUMMARY

Nine cows, divided into 3 treatment groups, balanced for initial somatic cell count, age, parity and stage of lactation were used in a study to evaluate the effectiveness of 3 commercial teat dips containing iodine (IOD), chlorhexidine gluconate (CHX) or dodecyl benzene sulphonic acid (DDBSA) as the active ingredient. Foremilk samples were taken and sub-samples cultured on Plate Count Agar (PCA) for total bacterial counts and on a Baird-Parker Agar (B-P) or Edwards Medium (EM) to determine the effect of teat dips on different bacteria species. Total bacterial counts obtained with PCA demonstrated reductions in bacterial load of foremilk due to IOD, CHX and DDBSA of 47.9%, 62.5% and 60.6% respectively, which was significant ($P<0.05$) only for CHX. The different agar cultures demonstrated that the bacteria profile may be altered by teat dipping.

Keywords: dairy cows, teat dips, total bacterial counts, somatic cell count

INTRODUCTION

Mastitis control is a major factor determining the efficiency and profitability of a dairy operation. Losses in profit result from reduced milk production, discarded milk and treatment cost as well as cost of replacing culled animals. Potential milk production losses have been shown to be highly correlated with somatic cell count (Reneau 1986).

Bacterial infections are the major cause of mastitis (Hungerford . 1990). A bacteriological survey of clinical mastitis in South-East Queensland (Daniel *et al.* 1982) revealed that 38.5% of clinical cases were caused by *Staphylococcus aureus, 12.5%* by *Streptococcus agalactiae, 6.6%* by *Streptococcus dysgalactiae, 3.4%* by *Streptococcus uberis,* 2.6% by *Coliform* spp. and 0.6% by *Pseudomonas* spp. Mastitis control should be achieved by reducing bacterial infection of the teats. This can be achieved through management, hygiene, drying-off therapies and post-milking teat disinfection (Hungerford 1990). Results from several studies suggest that post-milking teat dipping may be the most effective measure for controlling mastitis (Boddie *et al.* 1990; Eberhart 1986 and Pankey *et al.* 1984a). A variety of post-milking teat dips have been available including iodophors, quaternary ammonia compounds, chlorhexidines, sodium isocyanurate and dodecyl benzene sulphonic acid. The objectives of this study were to evaluate: (i) the effectiveness of iodine (IOD), chlorhexidine gluconate(CHX) and dodecyl benzene sulphonic acid (DDBSA) as active ingredients in commercial teat dips as measured by their effect on total bacterial count (TBC) and somatic cell count (SCC) and (ii) the specificity of each teat dip against different species of bacteria.

MATERIALS AND METHODS

Nine Holstein-Friesian cows were used in an experiment for bacterial enumeration and somatic cell counts. The active ingredients in the teat dips tested were iodine (0.5%), chlorhexidine gluconate (0.55%) and DDBSA (2.0%). Plate Count Agar (AM145), Baird-Parker Medium (AM14) and Edwards Medium (Modified, AM53) were used. Any form of teat disinfection of these cows ceased for a period of 4 weeks prior to the start of the experiment.

Bacterial enumeration and somatic cell count

The cows were used in an 8-week study to evaluate the effect of 3 different active ingredients in 3 commercial dips on total bacterial count and somatic cell count in raw milk, using a 3x3 Latin square design. Each group contained 1 cow with high (>180000), 1 cow with medium (100000-180000) and 1 cow with low(<100000) somatic cell counts. Groups were also balanced for age, parity and stage of lactation. All cows were maintained under feedlot conditions and were machine-milked twice daily. Teat dips were prepared in deionised water according to manufacturer's instructions. The 2 teats on the left side of each cow were dipped full length with the appropriate dip of her group immediately after milking. Teat dip cups were filled with fresh reagent daily. The teats on the right side were not dipped and served as the control. During the three 2-week periods, each group received 1 of the 3 teat dips containing either IOD, CHX or

DDBSA. There was 1 week of no treatment between periods to eliminate any carry over effects of treatments.

Sample collection

Milk samples were collected for bacterial enumeration immediately before the beginning of the trial and at the 8th, 18th and 28th milking of each period. Composite samples for the test side as well as for the control side of each cow were collected by taking approximately 10 mL of foremilk from each of the 2 quarters. Aseptic sampling techniques as described by Anon. (1982) were followed. Immediately following foremilk sampling, composite samples for somatic cell counts were stripped into plastic vials containing 0.25 mL bronopol preservative and refrigerated for later examination.

Laboratory examination

Milk samples were diluted to 10% concentration and 0.1 mL of the resultant solution was used to innoculate each plate according to procedures described in the Australian Standard 1095 (Standards Association of Australia 1971). Samples on PCA were incubated at 30°C for 72 hours; samples on B-P and EM were incubated at 37°C for 48 hours. Plates were refrigerated for later counting. All visible colonies on PCA (total bacterial count), brown-black colonies on B-P *(Staphylococcus* spp.) and light blue colonies on EM *(Streptococcus* spp.) were enumerated.

Statistical analysis

All data were subjected to statistical analysis using SAS (1988) GLM procedures. Mean squares analysis (ie. analysis of variance) was performed on natural logs of total plate counts for each growth medium and somatic cell counts in 0.0 1 mL and 0.001 mL raw milk respectively. The effect of teat dip on teat condition was subjected to similar statistical analysis without transformation.

RESULTS

Although relatively large numerical reductions (Figure 1) in bacterial loads in milk were observed, reduction in total bacterial count (T.B.C.) on PCA was significant ($P<0.05$) only for CHX. Iodine was effective ($P<0.05$) against *Staphylococcus* spp. as determined on Baird-Parker medium but CHX and DDBSA had no effect (Figure 2A). None of the 3 dips had an effect ($P>0.05$) on *Streptococcus* spp. in milk (Figure 2B). None of the 3 dips affected ($P>0.05$) somatic cell counts (S.C.C.) in milk, although IOD and DDBSA treatments resulted in 18.2% and 28.4% reductions respectively (Figure 3).

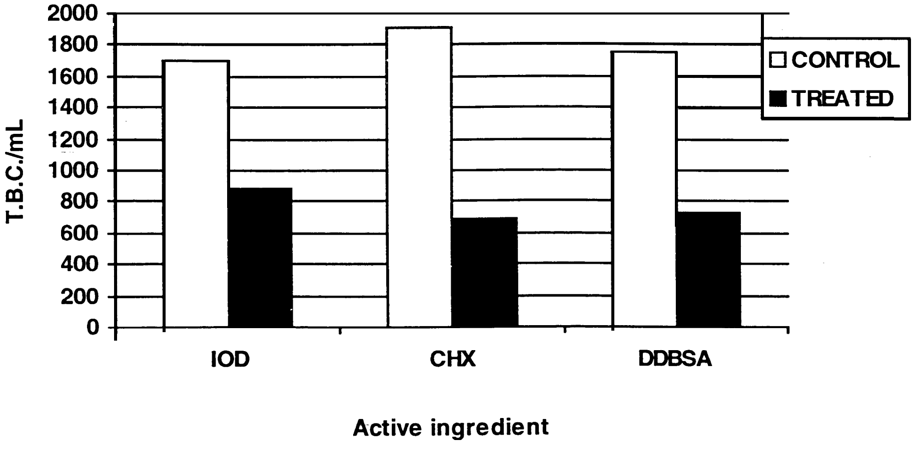

Figure 1. Effect of teat dipping on total bacterial count/mL raw milk as enumerated on plate count agar

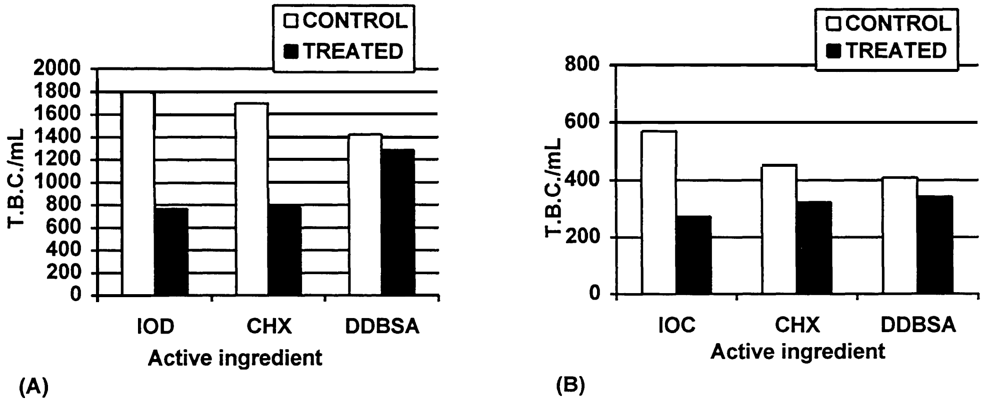

Figure 2. Effect of teat dipping on total bacterial count/mL raw milk as enumerated on (A) Baird-Parker medium and (B) on Edward Medium

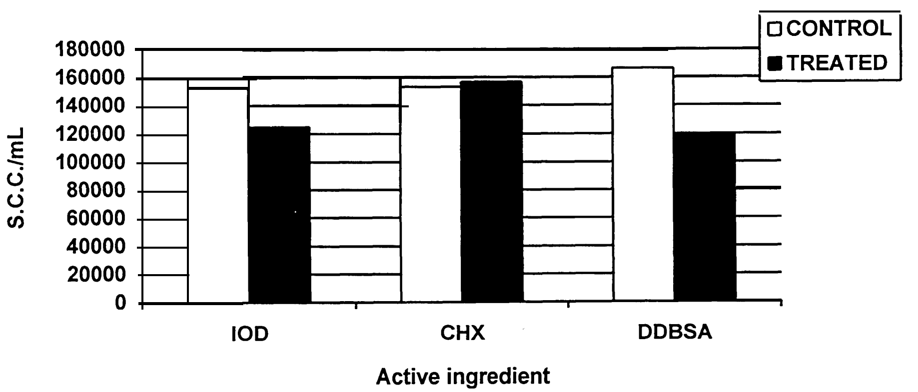

Figure 3. Effect of teat dipping on somatic cell count/mL raw milk

DISCUSSION

Total bacterial count-plate count agar

Total bacterial count reductions in foremilk ranging from 47.9 to 62.9% were observed with teat dipping. However, the reduction was significant only ($P<0.05$) for CHX (ie. Tedox-E) which caused an average reduction of 62.9% in total bacterial count in foremilk. DDBSA produced a reduction of 60.6% which was significant at ($P=0.0544$). This impreciseness may be attributed to the small number ($n=9$) of animals used in the study. The reductions in bacterial loads in foremilk achieved in this study (48% - 63%) are of the same order of magnitude as those reductions in actual infections that are commonly achieved in natural exposure trials. For example, Oliver *et al.* (1990) who used CHX dip in a natural exposure trial observed a 50% reduction in intramammary infections.

*Specificity **of** dips*

Determination on Baird-Parker medium Baird-Parker medium is a selective medium for the isolation and enumeration of *Staphylococcus aureus.* However, it was observed that a variety of organisms arising from the milk were capable of proliferating on the medium as well and therefore the isolation of *S. aureus* became impossible. The bacterial count returned by enumeration on Baird-Parker medium was only slightly lower than by PCA. This indicates that nearly all the bacteria in foremilk were capable of colonising Baird-Parker medium, therefore its selective characteristic may be limited.

Determination on Edwards medium Edwards medium is for the isolation of *Streptococci* spp. Therefore, counts obtained on this medium represent the *Streptococci* load in foremilk. IOD produced a 52.9% reduction ($P=0.07$ 11) in *Streptococci* count while the reductions were only 28.6% and 16.0% for CHX and DDBSA respectively. Information in the literature on these dips is not consistent. For example, Pankey *et al.* (1984b) reported that IOD was more effective in reducing intramammary infection by *Streptococci ssp.* than CHX, but Boddie *et al.* (1990) demonstrated that CHX was more effective than IOD against this organism.

Somatic cell counts

In this study, teat dipping did not reduce ($P>0.05$) somatic cell count in milk. Possibly the duration of treatment, 14 days per period, ie 28 milkings, was not long enough to show any changes. It appears that unless a dramatic increase in subclinical/clinical infections occurs in this short time, it is unlikely that post-milking teat dips would affect somatic cell count.

CONCLUSIONS

1) The results of this study show that teat dipping can substantially reduce bacteria load in foremilk as demonstrated by the 47.7, 62.9 and 60.6% reduction with iodine, chlorhexidine and dodecyl benzene sulphonic acid based dips respectively. Chorhexidine was the most effective ($P<0.05$) active ingredient.
2) The species specific test determined on Edwards medium showed that iodine was more effective in reducing *Streptococci* spp. in foremilk than Chlorhexidine or DDBSA, although the effect was not statistically significant ($P>0.05$). The determination of dip specificity against *Staphylococci* spp. determined on Baird-Parker medium was inconclusive.

Overall, the results of this study has shown that teat dipping can reduce bacteria load in milk. This could ultimately reduce penetration and proliferation and thus reduce intramammary infections.

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