

Iodine Teat Dips: A Comparison of Three Iodine Concentrations

EVA VAVROVA¹, ZBYSEK SLADEK¹, VACLAV TROJAN², MIROSLAV MACHACEK³

¹Department of Morphology, Physiology and Animal Genetics

²Department of Plant Biology

Mendel University in Brno

Zemedelska 1, 613 00 Brno

CZECH REPUBLIC

University of Veterinary and Pharmaceutical Sciences

Palackeho trida 1-3, 612 42 Brno

CZECH REPUBLIC

evavrova24@gmail.com

Abstract: The aim of this study was to compare disinfection properties of 0.4%, 1.5%, and 3% iodine concentration in teat dip. The samples were obtained from teat skin of 9 clinically healthy dry cows of czech fleckvieh breed. After cleaning their teats with wet towels, we used sterile swabs to wipe the skin of the teats to get the control samples. Then the swabs were put into test tubes with BC7 broth. Three cows were treated with 0.4%, 1.5%, and 3% iodine dip respectively. After 30, 60, 90, and 120 minutes, we took samples the same way previously. Each time 4 samples of every concentration were gained. These samples were examined by modified suspension method according EN on Malthus AT machine in the Institute for State Control of Veterinary Biologicals and Medicines. Every swab was cultivated in 4ml of BC7 broth for 24 hours at the temperature of 37°C. Antibacterial properties of distinct disinfection concentrations are shown by the changes of electric conductivity of the broth. After that the suspension was inoculated to blood agar and cultivated for another 24 hours, so that the colony forming units (CFU) could be counted. The bacteriostatic properties are proven by decline of CFU in the control sample compared to exposure times for each concentration of iodine. The results have shown that bacteriostatic effect of the 0.4% iodine is not sufficient. In 30 minutes after dipping, the colony forming units (CFM) decreased in 2.31 logarithmic orders. To declare its disinfective properties, we need it to be 3 logarithmic orders or more. The higher concentration of iodine is more likely to be effective. The iodine concentration of 1.5% reached its nadir after 60 minutes from exposure, and stayed almost the same for the next half an hour. Until 120 minute the CFU increased but still there was certain bacteriostatic effect. The strongest bacteriostatic effect was proven at the concentration of 3% iodine solution. The onset of the effect appeared after 30 minutes after exposure and went on until the end of sampling.

Key-Words: iodine, disinfection, teat dip, bacteriostatic

Introduction

Aim of our research was to evaluate the effect of three different concentrations of iodine in post-milking teat dips. Teat dipping with a proven disinfecting teat dip has been demonstrated to be one of the most effective mastitis control practices [1]. Teat dips are commonly used before and after milking to reduce new infections induced by mastitis-causing bacteria in lactating dairy cows [2]. The dips are designed to effectively reduce infection caused by environmental bacteria as well as reducing the spread of infections caused by contagious bacteria.

After milking the teat canal remains opened for at least an additional 15 minutes allowing pathogenes

to enter. Application of the teat dip immediately after milking kills the significant proportion of the pathogens on teats and reduces the possibility of the pathogenes entering the teat canal. Iodine teat disinfectants provide a broad spectrum efficacy with rapid kill while providing a persistent film on teat skin which offers extended protection through the formation of a physical and chemical barrier [1].

Iodine is the active ingredient in the majority of teat dips used today and is recognized as effective as documented in the National Mastitis Council's teat dip bibliography.

Iodine teat dips are effective at reducing the spread of bovine mastitis, and free iodine is an

important factor in determining the germicidal efficacy of these teat dips [3].

Material and Methods

The trial was performed at ŠZP Nové Dvory of University of Veterinary and Pharmaceutical Sciences. 9 healthy dry cows of czech fleckvieh breed were placed in the parlour. Their teats were cleaned with wet towels and we used sterile swabs to wipe the skin of the teats to get the samples of bacterial colonization (control). The swabs were put into test tubes with 4ml BC7 broth. Afterwards three cows were treated with 0.4%, 1.5%, and 3% experimental iodine dip respectively. The products were left to dry on teats.

Teat dips were provided ready to use. 30, 60, 90 and 120 minutes after treatment, we took the samples as we did in the beginning of the trial. Each time 4 samples of every concentration were gained. The analyses were made in the laboratory of Institute for State Control of Veterinary Biologicals and Medicines. The samples were examined by modified suspension method according EN on Malthus AT machine. The test tubes were put into this machine and their contents were cultivated for 24 hours at the temperature of 37°C. Gauging of electric conductivity is possible in these tubes thanks to their metallic parts so antibacterial properties of distinct disinfection concentrations are shown by the changes of electric conductivity of the broth. After cultivation the suspensions obtained from the tubes were inoculated to blood agar and cultivated for next 24 hours at the temperature of 37°C. The other day colony forming units (CFU) were counted. The bacteriostatic properties are proven by decline of CFU in the control sample compared to exposure times for each concentration of iodine. Appropriate broth is inoculated with suspension of a microorganism in order to achieve total repression of microorganism under trial conditions – GE (germicidal effect). GE is sufficient, if the CFU declines in more than 5 logarithmic orders (the disinfectant is killing microbes) in certain exposure time. When the decrease is in 3 logarithmic orders, the disinfectant has bacteriostatic properties (supression of bacterial growth).

Results and Discussion

0.4% iodine teat dip

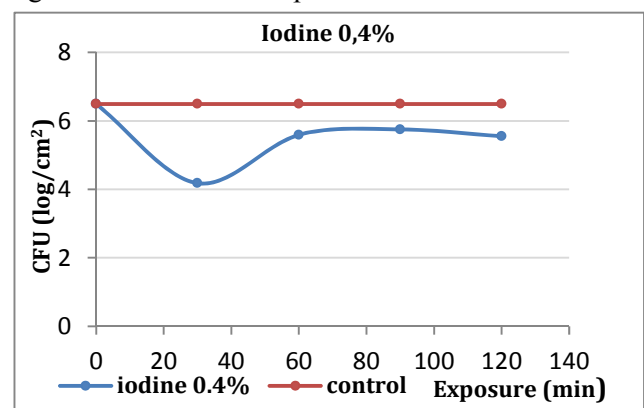
As for the 0.4% iodine teat dip, the results have shown that bacteriostatic effect is not sufficient. In 30 minutes after dipping, the colony forming units (CFU) decreased in 2.31 logarithmic orders. To

declare its disinfective properties, we need it to be 3 logarithmic orders or more. The higher concentration of iodine is more likely to be effective.

Table 1 0.4% iodine teat dip - effectiveness

Exposure time	CFU (log/cm ²)	CFU (log/cm ²)
0 min	6.49	
30 min	4.18	
60 min	5.59	6.49 (control)
90 min	5.75	
120 min	5.55	

Fig.1 0.4% iodine teat dip - effectiveness



1.5% iodine teat dip

The onset of disinfection effect of this concentration was a bit slower. The iodine concentration of 1,5% reached its nadir after 60 minutes from exposure, and stayed almost the same for the next half an hour. Until 120 minute the CFU increased but still there was a certain bacteriostatic effect. The higher concentration of iodine is significantly more effective than the concentration of 0.4%.

Table 2 1.5% iodine teat dip – effectiveness

Exposure time	CFU (log/cm ²)	CFU (log/cm ²)
0 min	6.49	
30 min	5.59	
60 min	3.30	6.49 (control)
90 min	3.33	
120 min	4.00	

3% iodine teat dip

As expected the teat dip with 3% content of iodine happened to be the most effective disinfectant. Yet bacteriostatic, its antimicrobial properties are very strong. The onset of the effect appeared after 30 minutes after exposure. The difference between CFU pre-dipping and samples taken after 30

minutes was more than 4 logarithmic orders. This concentration is meeting the requirements to disinfective solutions for maintaining the udder health.

Fig. 2 1.5% iodine teat dip – effectiveness

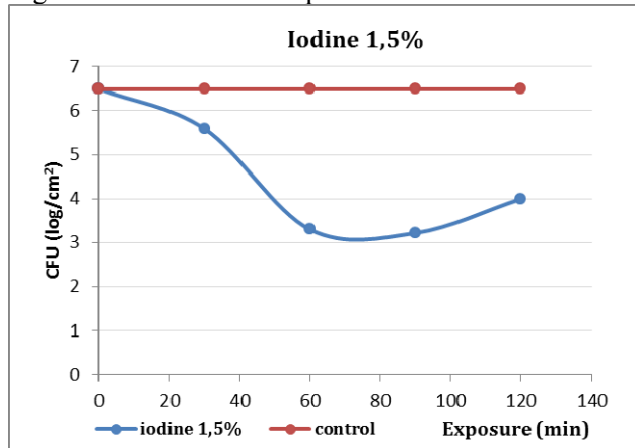
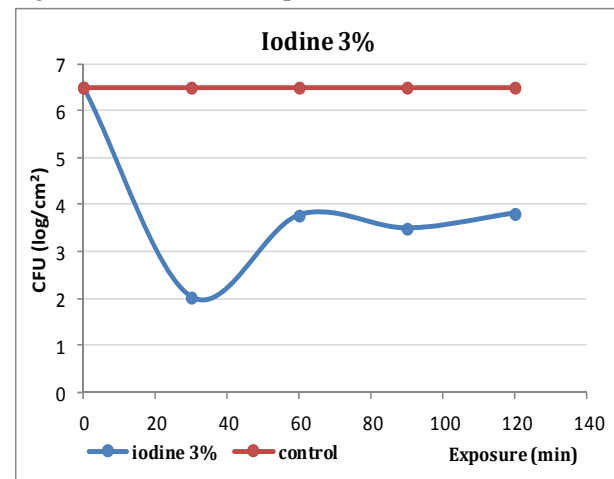


Table 3 3% iodine teat dip – effectiveness

Exposure time	CFU (log/cm ²)	CFU (log/cm ²)
0 min	6,49	
30 min	2,03	
60 min	3,78	6,49 (control)
90 min	3,50	
120 min	3,82	

Fig. 3 3% iodine teat dip – effectiveness



Conclusion

Proper milking hygiene is essential for the production of good quality raw milk and for the udder health of the cows [4]. One of the most important practices in the parlour is the proper after-milking teat dipping. This fact has been proven in many studies. The teat needs to be fully covered with disinfectant to avoid bacterial colonization of the teat skin and to stop replicating present bacteria. Based on experimental results, the 0.4% iodine solution is insufficient in its germicidal properties. The teat dip containing 1.5% iodine had a certain bactericidal effect. The concentration of 3% iodine in solution is the best choice for treating cows' teats after milking.

Acknowledgement

The research was financially supported by the European Union, European Fund for Regional Development via Innovation voucher 2013 and Farmak Moravia, a.s. company.

References:

- [1] Buchalova M, Rauer ES, *Improved Persistence of Iodine-based Teat Disinfectant: In Vitro Study*, NMC Annual Meeting Proceedings, Verona, WI, 2013.
- [2] National Mastitis Council, in *Current Concepts of Bovine Mastitis*, 4th ed. Natl. Mastitis Council, Inc., Madison, WI, 1996, pp. 40–41.
- [3] Gottardi W, *Iodine and iodine compounds*, in *Disinfection, Sterilization, and Preservation*, 4th ed. S. S. Block, ed. Lea and Febiger, Philadelphia, PA, 1991, pp. 158–159.
- [4] Pankey JW, Eberhart RJ, Cuming AL, Dagget RD, Farnsworth RJ, McDuff CK, Uptake on postmilking teat antiseptics. *J Dairy Sci* 67, 1984, pp. 1336-1353.