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Role of Teat Dipping After Milking for Subclinical Mastitis Control and Improving Production of Dairy Cow

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ABSTRACT

This study was aimed to compare somatic cell count and milk production on dairy cattle after teat dipping post milking application. Samples collected from total of 121 quarters of dairy cattle in normal lactation period and identified as infected by subclinical mastitis. Subclinical mastitis examination was done by IPB Test Mastitis Test, somatic cell count calculation was done by Breed Method, and observation of milk production was done by calculating milk volume per quarter. Observations were performed during normal lactation periods of 12 weeks. Data were analyzed statistically using Mann-Whitney Test and unpaired t-test. The results showed that the number of somatic cells count in the treatment group with post milking teat dipping application was lower than in the control group and significantly different at week 11 ($p = 0.039$). Furthermore, the volume of milk production in the treatment group was higher than in the control group and significantly different in almost all weeks of observation ($p < 0.05$). It was showed that post milking teat dipping application can prevent subclinical mastitis infection effectively, seen from low somatic cell count (below 400.000 cells/ml) and can maintain optimum milk production. So that, this application can increase the economic benefits for dairy farmers.

Keywords: Dairy cattle, Milk production, Somatic cell count, Subclinical mastitis, Teat dipping

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Introduction

Dairy farming in Indonesia is one of the community businesses that make an important contribution on people welfare and economy. In Indonesia, there are many small-scale dairy farms which are the main income for their families. The primary product that produced by farmers is milk which has high nutritional value of animal protein when consumed by the people so that the dairy farming enterprise contributes greatly to the fulfillment of animal protein nutrition of the Indonesian people.

From economy perspective, the profit from milk's sale is relatively large and promising. However, the majority of dairy farmers in Indonesia is a small scale dairy farms so that they still unable to achieve large profits due to constraints in several ways. This obstacles cause low production of milk which can lead farmers to the losses (Sanotheran *et al.*, 2016). One of obstacles is the occurrence of subclinical mastitis which significantly reduced milk production (Pisestyani *et al.*, 2017).

The prevalence of subclinical mastitis in Indonesia is still high at 85% (Rahayu, 2007). The rest of these problems cause very high economic losses for both farmers (Beyene and Tolosa, 2017) and the milk processing industry (Abrahmsen *et al.*, 2014). Many factors that cause the incidence of subclinical mastitis include poor milking hygiene and lack of environmental sanitation on people's dairy farms (Abrahmsen *et al.*, 2014; Beyene and Tolosa, 2017). With these factors, a method is needed to change the hygiene and sanitation practices and biosecurity measures to minimize and even eliminate the occurrence of subclinical mastitis in dairy cows. These preventive measures can be raised by the increase of farmers and people knowledge and awareness (Wicaksono *et al.*, 2017).

One way to prevent and overcome the incidence of subclinical mastitis in dairy farms is by using teat dipping after post milking (Putri *et al.*, 2015). Teat dipping is applied using antiseptic fluids that can eliminate microorganisms and protect the nipples from infection so that udder health can be maintained and the incidence of

subclinical mastitis can be prevented (Magnusson *et al.*, 2006; Castro *et al.*, 2012). The indicator to identify the presence of subclinical mastitis infection can be observed from the calculation of somatic cell counts in milk (Kayesh *et al.*, 2014). Healthy cows which are not affected by subclinical mastitis will certainly produce high quantity of milk production. From the results of the study by Pisestyani *et al.* (2017), the application of teat dipping after milking can reduce the presence of pathogenic bacteria causing subclinical mastitis.

This study was aimed to compare somatic cell count and milk production on dairy cattle after teat dipping post milking application. From this study, we could analyze the role of teat dipping application in the prevention and control of the incidence of subclinical mastitis on dairy farms.

Materials and Methods

Samples

The sample used in this study was quarter milk samples, taken from a total of 121 milk quarters. The samples were taken from dairy farms in Kawasan Usaha Peternakan Sapi Perah Kecamatan Cibungbulang, Bogor District. The selected individual samples were the cows in normal lactation at the 4th to 6th month postpartum and had been diagnosed with positive subclinical mastitis for the subclinical mastitis test using IPB-1 mastitis test reagent.

The observation group was divided into two groups, namely the group of dairy cows who were treated with teat dipping after milking and the control group without any treatment. Observations were conducted once a week for twelve weeks.

Subclinical mastitis test

Subclinical mastitis test was conducted to select individual samples for observation using the IPB-1 mastitis test. Cows diagnosed with subclinical mastitis were seen from the positive results of the test. The method of testing: 2 ml of milk was putted into the paddle and then an equal amount of IPB-1 reagent was added. Next, the liquid was homogenized horizontally for 15-30 seconds and the results were observed. Negative result was obtained if the liquid remains homogeneous and a positive result was obtained if the liquid turns into thick/mucous (Wicaksono and Sudarwanto, 2016).

Somatic cell count calculation

Somatic cell count (SCC) calculation in milk was one indicator of the status of subclinical mastitis infection. SCC calculation was carried out using Breed Method. The object glass was cleaned using an ether alcohol solution and placed on Breed paper with a 1 cm² area of square. Milk samples were homogenized and then taken using a Breed pipette to be dropped 0.01 ml of milk on Breed paper. Next, milk sample was spreaded to meet a square pattern using an elbow-tipped wire. The glass object was dried with

room temperature for 5-10 minutes then the sample was fixed using Bunsen flame.

The prepared samples were then processed on Breed staining, ie. the glass of the preparation object was soaked in alcohol ether solution for two minutes and stained by putting in Breed solution containing *methylen blue Loeffler* for 1-2 minutes. The samples were putted into 96% alcohol solution and then dried. After that, SCC was calculated using a microscope with an objective magnification of 100x. The number of somatic cells was obtained by the formula:

$$SCC = F \times B$$

$$F = \text{Microscope factor of } 400,000$$

$$B = \text{Mean of somatic cell count from } 10 - 30 \text{ observation views}$$

Milk volume calculation

Milk production was calculated by measuring the volume of milk in each quarter. Milk from each quarter was collected using a 2 liter measuring cup. Furthermore, the amount of milk volume which was obtained from the milking results was calculated in the measuring cup and recorded as milk production calculation data.

Data analysis

Observation data of somatic cell count was analyzed using Mann Whitney test. Data on milk production was analyzed using unpaired t-test. The processing of data was done using the software of Microsoft Excel 2007 and SPSS for Windows version 16.

Result and Discussion

Comparison of cell somatic count of milk

The observation's result showed that the data of somatic cell counts were not distributed normally so this study used the median comparison between treatment group and control group. The data from the observations showed that the mean comparison between the two groups tends to be different, there was a higher one for the treatment group and there was also a higher one for the control group. The comparison can be shown in Figure 1.

Figure 1 shows that there was a dynamic change in the number of somatic cells in each week. At week 0, 1, 2, 5, 8, 9, 10, and 12 the number of somatic cells in the treatment group was lower than the control, but at 3, 4, 6, 7 and 11 the number of somatic cell counts in the group treatment was higher than control.

At week 2, the number of somatic cells in the two groups was at the highest point, while at week 10 the lowest point was for the treatment group, meanwhile week 11 was the lowest point for the control group. The high number of somatic cells in the second week in both groups can be caused by poor maintenance management on farms which has an effect on low levels of hygiene and sanitation. The results showed that the treatment group had a lower number of somatic cells count, so that this could prove the effectiveness of using

teat dipping to keep the number of somatic cells at low condition in milk.

There was an important result at the end of the week of observation (weeks 8, 9 and 10), the number of somatic cells in the treatment group was lower than the control group. There was a clear distinction between the two groups, namely in the control group of somatic cell counts above 400,000 cells/ml which indicated the condition of subclinical mastitis infection, while in the treatment group the number of somatic cells was below 400,000 cells/ml which meant negative subclinical mastitis infection. In several studies, milk which had somatic cell count of more than 400,000 cells/ml was categorized produced from infected cows with subclinical mastitis (IDF, 1999; Wahyono *et al.*, 2003; Batavani *et al.*, 2007).

The results of the statistical analysis on the comparison of the number of milk somatic cell count between the treatment and control groups are presented in Table 1. The results of the analysis showed significant differences between the treatment and control groups at week 11 ($p < 0.05$). There were less expected results, namely the number of somatic cells in the higher treatment group, but at week 12 there was a decrease in the number of somatic cells in the treatment group and the results were lower than the control group. On the other observation weeks did not differ significantly ($p > 0.05$). When

concluded from the number of weeks of observation, there were eight observations in which the treatment group had a lower number of somatic cell count. This can prove that the treatment of teat dipping had an effect on preventing the transmission of subclinical mastitis in cattle population on dairy farm.

This result was in accordance with Yasothai's (2017) study that the application of teat dipping could reduce somatic cell counts and be more effective if hygiene and sanitation on the farm were also maintained. Pisestyani *et al.* (2017) stated that the application of teat dipping was able to prevent subclinical mastitis because it was able to reduce the presence of pathogenic bacteria such as *Staphylococcus aureus* and *Escherichia coli*. The same idea was stated by Gleeson *et al.* (2009) that a disinfectant solution for teat dipping can reduce pathogens such as *Staphylococcus* and *Streptococcus* on the udder surface.

Meanwhile, the teat dipping process for milking using a milking machine was effective in reducing the number of microorganisms (Galton, 2004). Kamal and Bayoumi (2015) suggested that the application of post-milking teat dip was better than the pre-milking application in reducing the number of pathogenic microorganisms to prevent subclinical mastitis. This certainly supports the

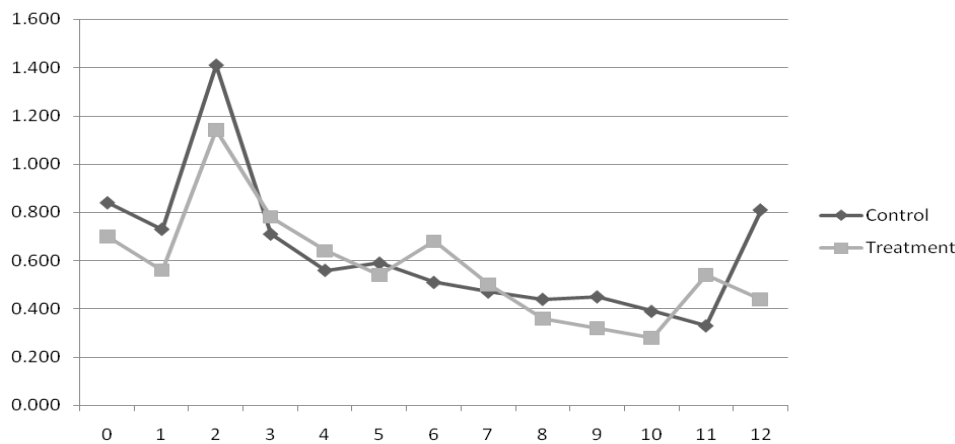


Figure 1. weekly observation result from the average of milk somatic cell count on intervention and control group.

Table 1. Comparison analysis of milk somatic cell count ($\times 10^6$ cell/ml) between intervention and control group

Observation week	p-value	Intervention		Control	
		Median	Interquartil range	Median	Interquartil range
0	0.134	0.700	0.880	0.840	1.125
1	0.234	0.560	2.050	0.730	1.640
2	0.201	1.140	1.940	1.410	3.480
3	0.834	0.780	1.070	0.710	0.550
4	0.668	0.640	1.090	0.560	0.980
5	0.202	0.540	0.740	0.590	1.840
6	0.874	0.680	1.230	0.510	0.675
7	0.863	0.500	1.160	0.470	0.975
8	0.328	0.360	0.520	0.440	1.030
9	0.446	0.320	0.750	0.450	0.975
10	0.524	0.280	0.470	0.390	0.990
11	0.039*	0.540	1.440	0.330	0.835
12	0.284	0.440	0.990	0.810	0.820

*significance with $p < 0.05$.

research by selecting the application of teat dipping used after milking.

Comparison of the amount of milk production

The observation's result showed that the data on the amount of milk production examined was normally distributed so that the average calculation used the mean between the treatment group and control group. Data from the study showed that the mean comparison between the two groups was different ($p < 0.05$), which in the treatment group was higher than the control group. The comparison can be shown at Figure 2.

Figure 2 shows clearly that the amount of milk production in the treatment group was higher than the amount of milk production in the control group. This happened throughout the week of observation. High milk production was seen at the beginning of the observation week and tends to continue to decline at the end of the observation week. This was related to the normal lactation period of cows which will decrease as the lactation progresses towards the dry period of the cage (Nugroho *et al.*, 2015).

Factors that could influence milk production produced by cattle are the amount of feed, the amount of drinking water, the age of livestock, the area of the cage and the milking interval (Pasaribu *et al.*, 2015). Of course these factors also indirectly affect the results of observations made. The results of statistical analysis of the comparison of milk production between treatment and control groups are presented in Table 2.

The results of the analysis showed that the number of productions in the treatment group was higher in the control group in almost every week of observation, namely at weeks 0, 1, 2, 3, 4, 6, 7, 8, 10, and 12 ($p < 0.05$). This proves that the teat dipping treatment can increase the amount of milk production due to the prevention of the emergence of subclinical mastitis infections which can reduce milk production.

Preventable subclinical mastitis infections have an impact on the volume of milk production which can be optimally stable together with the physiological conditions of the cattle. A very significant difference was seen in the final week of observation ($p = 0,000$) which proves that the optimum volume of milk was maintained according to the lactation period. Thus the teat dipping can prevent the reduction of 30-50% milk production due to subclinical mastitis (Surjowardojo *et al.*, 2008). This can avoid a large impact in the form of economic losses due to decreasing of milk production (Seegers *et al.*, 2003).

These results can be used as suggestions for dairy farmers and the government that the role of teat dipping is important in the practice of dairy farming management. This intervention is able to prevent the incidence of subclinical mastitis so as to maintain optimal milk production. This can increase the profits for farmers. The dairy industry is also able to get adequate milk supply and better quality raw materials. Moreover, the country will be benefited from the increasement of national milk production so as to increase the contribution of achieving good consumption of animal protein for the people of Indonesia.

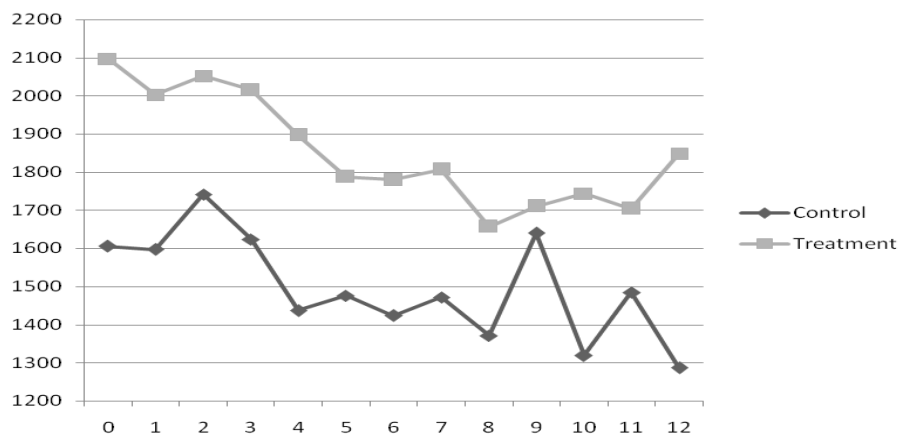


Figure 2. Weekly observation result from the average of milk production on intervention and control group.

Table 2. comparison analysis of milk production (ml/quarters) between intervention and control group

Observation week	p-value	Intervention		Control	
		Mean	Deviation standard	Mean	Deviation standard
0	0.006*	2,096.7	134.6	1,606.0	100.5
1	0.010*	2,002.5	107.8	1,597.2	109.1
2	0.089*	2,051.9	136.4	1,741.3	114.2
3	0.036*	2,015.2	139.7	1,623.9	118.6
4	0.002*	1,896.9	98.6	1,437.0	103.2
5	0.074	1,787.7	104.5	1,476.5	129.8
6	0.019*	1,779.7	97.7	1,423.8	108.1
7	0.021*	1,806.8	98.2	1,471.7	97.6
8	0.048*	1,656.6	89.2	1,371.4	110.2
9	0.603	1,710.0	101.8	1,639.3	85.6
10	0.002*	1,743.8	96.8	1,319.2	90.7
11	0.238	1,704.1	109.5	1,484.6	153.6
12	0.000*	1,849.1	107.6	1,286.5	86.5

*significance with $p < 0.05$.

Conclusions

The role of teat dipping was successfully prevented subclinical mastitis infection by maintaining a low number of somatic cells, so that it can increase milk production on dairy farms. Thus, this application was important to be added in the management of dairy farming so that it can increase the profitability of dairy farmers.

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