

## THE RELATIONSHIP OF THE SOMATIC CELL COUNTING TO SUB-CLINICAL MASTITIS AND TO IMPROVE MILK QUALITY

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### ABSTRACT

A number of Bulk milk samples had been collected from two farming area in district of Bogor. All samples were examined using different test such as total somatic cell count, total bacteria count, mastitis test, fat and protein value and acidity (pH). The aim of this research is to evaluate the relationship of the somatic cells count (SCC) to sub-clinical mastitis cases and to improve the milk quality by using Indonesian milk standard (Indonesian National Standard: SNI 01-3141-1998). The result showed that only 17% of the samples had total somatic cell count less than 400.000 cell/ml and 83% above the SNI, 01-3141-1998. According to IDF regulation its mean 83% of the samples came from the herds which suffered from sub-clinical mastitis. Furthermore with IPB-1 mastitis test showed that 77% of the samples had positive reaction. The result also showed that 71% of the samples had total bacteria count less than  $1 \times 10^6$  CFU/ml (SNI), but when this bacteria count evaluated with International Standard, it is only 38% have a good milk quality ( $< 250.000$  CFU/ml). An increased level of somatic cells negatively affects the milk fat and protein, event the change in total fat and protein is not high (SNI). The pH value showed that 75% of samples had pH between 6.3 to 7.5 (SNI) and 25 % were out of this parameters. This research have proven that there is a close relationship between the number of somatic cells, sub-clinical mastitis and the milk quality.

Keywords: Somatic Cell Count, sub-clinical Mastitis, Milk quality.

### INTRODUCTION

Mastitis is the most costly disease on the dairy farm. Nearly 70% of the result of reduced milk production caused by sub-clinical mastitis. Mastitis, indicated by a high-level Somatic Cells Count (SCC) has a very negative effect on product quality, due to increased enzymatic activity, coming from both lipolytic and proteolytic enzymes. This effect will reduce cheese yield, butter yield, change acid production in fermented products (Foss 2002).

Inflammation or injury of the Udder tissue will elevates the milk somatic cell count. Roughly 50% of the cows with SCC above 400.000 and 80% of the cow with SCC above 600.000 are infected in one or more quarters (McQueen 1980).

Sub-clinical mastitis is more problematic because no visible changes appear in the milk or the udder, but milk production decreases and the composition is altered. There are 15 – 40 cows infected with sub-clinical mastitis for every cow with clinical symptoms. The first sign of infection is the increase in somatic cell count and a high number of somatic cells indicates that the immune system is an a state of alert. When the milk of all cow in a herd is mixed as bulk

milk, the somatic cell count in a composite sample is a good indicator of the prevalence of mastitis in the herd.

A somatic cell count greater than 200.000 cells/ml indicates the presence of sub-clinical mastitis. Somatic cell counts greater than 500.000 cells/ml indicates that one third of the mammary glands are infected and the loss of milk due to sub-clinical mastitis is at the least 10% (Foss 2002). So objective of this research is to evaluate the relationship of the somatic cell count to sub-clinical mastitis cases and to improve the milk quality by using Indonesian Milk Standard (SNI 01-3141-1998).

## MATERIAL AND METHODS

A number of Bulk milk samples had been collected from two farming area in district of Bogor. All milk samples were examined using different test such as Somatic Cells Count in the milk were counted by using Breed method. The sub-clinic mastitis were detected by using IPB-1 method. Total bacteria count were counted by using Koch method. Total fat value were tested by using Gerber method and total protein value were counted by using FAO formula. The acidity of the milk were tested with pH meters. All data was evaluated by using Indonesian Milk Standard (SNI,01-3141-1998).

## RESULT AND DISCUSSION

When the milk of all cows in herd is mixed, as in a bulk tank milk, the somatic cell count in a composite sample is a good indicator of the prevalence of mastitis in the herd. (Berry *et al.* 2005). One hundred bulk milk samples were counted on Somatic Cell Count (SCC) by using Breed method. The result showed in Table 1.

Table 1. Somatic Cell Count in the Bulk milk samples (n=100)

Somatic Cell Count per ml milk	number of samples	percentage
< 400.000	17	17
> 400.000 - < 700.000	18	18
>700.000 - < 1.000.000	6	6
>1.000.000	59	59

SNI .01-3141-1998:  $4 \times 10^5$  cells/ml is maximum level

The result showed only 17% of the samples had SCC less than 400.000 cell/ml and 83% above level number of SCC in the SNI,01-3141-1998. Somatic Cell Count under 400.000 cells/ml are typical of herds that have good management practices, but no particular emphasis on mastitis control. In other side, SCC greater than 500.000 cells/ml indicates that one third of the mammary glands are infected. According to IDF regulation its mean 83% of the samples came from the herds which suffered from sub-clinical mastitis. Several studies have proven that there is a close relationship between infections in the udder and the number of somatic cells. The relationship between SCC and sub-clinical Mastitis (IPB-1 method) were analyzed and the result showed in Table 2.

Table 2. The relationship of Somatic Cell Count to sub-clinical Mastitis (n=100)

Sub-clinical Mastitis (IPB-1 test)	Number of Samples	Somatic Cell Count (SCC)/ml	
		minimum	maximum
negative	23	160.000	880.000
positive 1 <sup>+</sup>	24	400.000	1.440.000
positive 2 <sup>++</sup>	39	1.000.000	3.560.000
positive 3 <sup>+++</sup>	14	1.880.000	7.780.000

IDF (19) : > 400.000 cells/ml milk indicates sub-clinical mastitis

Tables 2 showed that 77% of samples by using Mastitis test (IPB-1 method) come from herds which suffered from sub-clinical Mastitis. Its also showed that increased of infection rate associated with increased of the SCC/ml Using SCC with direct method (Breed method) detected 83% of the samples come from herds which suffered sub-clinical mastitis, but by using mastitis test as indirect method (IPB-1 method) its showed only 77% of the samples come from herds which suffered sub-clinical mastitis. Sub-clinical mastitis is more problematic because no visible changes appear in the milk or udder, but milk production decreases, bacteria are in the milk, and the composition is altered. (Wendt *et al.* 1998). The result of total bacterial count and the relationship with milk quality showed in Table 3.

Table 3. The relationship between the total bacteria count and milk quality (n=100)

Bacteria count/ml	number of sample	milk quality
< 250.000	38	very good
> 250.000 - < 500.000	22	good
>500.000 - < 1.000.000	11	sufficient
>1.000.000 - < 3.000.000	15	poor
>3.000.000 - < 5.000.000	6	very poor
>5.000.000	8	reject

SNI 01-3141-1998 : Maximum Total Bacteria Count:  $1 \times 10^6$  cfu/ml, International Standard:  $2.5 \times 10^5$  cfu/ml

The result showed that 71% of the samples had total bacteria count less than  $1 \times 10^6$  CFU/ml (SNI,01-3141-1998) but when this bacteria count evaluated with International standard it is only 38% have a good milk quality (<250.000 CFU/ml). From a dairy point of view, increased somatic cell count has a negative influence on the different milk components and leads to quality problem in the final dairy products.(Wendt.K *et al.*1998). An increased level of somatic cells negatively affects the milk fat and protein, event the change in total fat and protein is not high (SNI 01-3141-1998). The result of components analyzed showed in Table 4.

Table 4. The relationship between SCC/ml with milk fat and protein value (n= 60)

SCC/ml	number of sample	Average percentage	
		Fat	Protein
< 400.000	16 (26.67%)	4.16	3.48
> 400.000 - < 700.000	16 (26.67%)	3.65	3.22
> 700.000 - <1.000.000	5 (8.33%)	3.54	3.17
>1000.000	23 (38.33%)	2.96	2.88

SNI 01-3141-1998 : minimum fat contains : 3% and protein: 2.7% (BSN 1998)

An increase level of somatic cells negatively affects the milk fat. The contents of free fatty acids is increased, and lipase activity gives rancidity problems in dairy products. The butter yield is reduced and the quality of the butter is affected. The amount of protein in milk decreases as somatic count increases. This is due to increased proteolytic enzyme activity in the milk. One of these enzymes is plasmin that breaks down casein during milk storage. Plasmin comes from the blood plasma into the milk through damaged mammary tissue. The change in total protein is not high but the percentage of casein decreases while the percentage of whey protein increases.(Foss 2002). According to the international standard, percentage of fat in normal milk is 3.5 and total protein 3.6.

Data in table 4 showed that increased of SCC/ml associated with decreased of fat and protein contain. The acidity of the milk were measures with pH meters and the result showed in Table 5.

Table 5. Average of pH value of Bulk milk samples (n=100)

pH value	Number of samples	percentage (%)
< 6.0	20	20.0
> 6.3 < 6.75	75	75.0
> 6.75	5	5.0

The pH value showed that 75% of samples had pH 6.3 – 7.5 (SNI) and 25% out of these parameters. Mastitis milk had normal pH in average 6.3 – 7.5 pH of the milk is one of important parameters to measure of fresh milk which had positive influence to the dairy product.

## CONCLUSIONS

17% of the samples (n=100) had SCC less than 400.000 cells/ml. 83% of the samples came from herds which suffered sub-clinical mastitis and with mastitis test detected only 77% of the samples had positive reaction. 71% of the samples had total bacteria count less than  $1 \times 10^6$  CFU/ml and only 38% have a good milk quality (International Standard) Increased of SCC/ml associated with decreased of fat and protein contain and 75% of the samples had normal pH This research have proven that there are close relationship between the Number of somatic cells, sub-clinical mastitis and the milk quality.

## REFERENCES

- Berry EA, Hillerton JE, Lind O. 2005. Managing bulk milk cell count Using DCC. Mastitis in dairy production: Current knowledge and future solutions. Wageningen Academic Publishers, Netherlands, 2005
- [BSN] Badan Standardisasi Nasional. 1998. SNI 01-3141-1998 tentang Susu segar. Jakarta
- Foss. 2002. Somatic Cell Counting The Way to Control Mastitis and improve Dairy product quality. Foss Analytical A/S-Denmark
- McQueen RD. 1980. Mastitis: Facts and Fallacies Mastitis Management Means for Increased Profits, Illinois.

Wendt K, Lotthammer KH, Fehlings K, Spohr M. 1998. Handbuch Mastitis Kamlage  
Verlag.GmbH & Co., 49082 Osnabruck