SOMATIC CELL COUNTS IN DAIRY HEIFERS DURING EARLY LACTATION

Somatische celgetallen bij vaarzen tijdens de vroege lactatie

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ABSTRACT

This paper describes the distribution of the first milk somatic cell counts (SCC), measured between 5 and 14 days of lactation, during a one year period (1999) for 12,994 dairy heifers on 3,221 herds in Flanders (Belgium). Somatic cell counts ≤ 150 x 10^3 cells/ml were allocated to class 1. Somatic cell counts between 151 x 10^3 and 300 x 10^3 cells/ml, between 301 x 10^3 and 1,000 x 10^3 cells/ml and > 1,000 x 10^3 cells/ml were allocated to classes 2, 3 and 4, respectively. The prevalence per class was 65.4, 15.6, 12.9 and 6.1% for classes 1, 2, 3 and 4, respectively. The within-herd prevalence per SCC class was calculated for 137 herds for which at least 10 SCC were available. The within-herd prevalence for class 1 varied from 27.3 to 100%, with a median of 66.7%. For classes 2, 3, and 4, the median within-herd prevalence was 15.4 (range: 0.0 - 50.0%), 10.0 (0.0 - 54.5%), and 0.0% (0.0 - 30.0%), respectively.

SAMENVATTING

Dit artikel beschrijft de verdeling van de eerste melkcelgetallen, gemeten tussen dag 5 en dag 14 van de lactatie, gedurende een periode van één jaar (1999) van 12994 pasgekalfde vaarzen van 3221 melkveebedrijven in Vlaanderen. Celgetallen ≤ 150 x 10^3 cellen/ml werden ingedeeld in klasse 1, celgetallen met een waarde tussen 151 x 10^3 en 300 x 10^3 cellen/ml, tussen 301 x 10^3 en 1,000 x 10^3 cellen/ml en > 1,000 x 10^3 cellen/ml werden ingedeeld in respectievelijk klassen 2, 3 en 4. De prevalentie was 65,4, 15,6, 12,9 and 6,1% voor de klassen 1, 2, 3 en 4, respectievelijk. De binnenbedrijfsprevalentie per klasse werd berekend voor de 137 bedrijven waarvan minstens 10 celgetallen beschikbaar waren. Voor de celgetallen van klasse 1, varieerde de binnenbedrijfsprevalentie van 27,3 tot 100% met een mediaan van 66,7%. Voor de klassen 2, 3 en 4 was de gemiddelde binnenbedrijfsprevalentie 15,4, respectievelijk (range: 0,0 - 50,0%), 10,0 (0,0 - 54,5%), en 0,0% (0,0 - 30,0%).

Keywords: Somatic cell count - Heifer - Diary cow - Early lactation

INTRODUCTION

Mastitis is the most common and expensive disease in dairy cattle (Trinidad *et al.*, 1989). Economic losses are caused by reduced milk production, discarded milk, cost of veterinary services and drugs, and culling of high yielding dairy cows before they have ever reached their top production. Current mastitis control practices are focused on lactating cows and include prompt treatment of clinical cases, proper milking techniques, use of functionally adequate milking machines, teat-dipping after milking, dry cow treatment and culling of chronically infected animals. Little attention has been paid to intramammary infections (IMI) in primigravid dairy heifers and the inspection of their udders is usually restricted to palpation shortly before or even after freshening. As their nonlactating udders have traditionally been regarded as uninfected (Trinidad *et al.*, 1989) , it took a long time before it was realized that IMI in dairy heifers were present in far greater numbers than previously recognized (Munch-Petersen, 1970; Oliver and Mit-

chell, 1983; Daniel *et al.*, 1986; Boddie *et al.*, 1987; Sobiraj *et al.*, 1988; Trinidad *et al.*, 1989; Trinidad *et al.*, 1990; Pankey *et al.*, 1991; Fox *et al.*, 1995; Nickerson *et al.*, 1995). The importance of udder health in heifers upon entering the milking herd cannot be overstated, however, because heifers have an impact on future milk yield and quality in the herd.

Milk somatic cell counting is an important instrument for monitoring udder health in lactating cows (Trinidad *et al.*, 1990) and is used worldwide as an indicator of subclinical mastitis (Laevens *et al.*, 1997). However, while SCC is available to the farmer as a useful tool for detecting and controlling udder health on his farm, it is at the same time used for penalization when milk SCC exceed the threshold level of 400 x 10^3 cells/ml (EEC directive).

The aim of this study was to describe the distribution of the first lactational SCC for dairy heifers in early lactation during a one year period (1999) by allocating them to four classes. As the major factor affecting SCC is IMI (Harmon, 1994; Laevens *et al.*, 1998), this distribution reflects the IMI status of the dairy heifers in Flanders at the start of their first lactation.

MATERIALS AND METHODS

Data collection

The individual SCC for 1999 of all lactating heifers and multiparous cows from all herds participating in the Dairy Herd Improvement program in Flanders (Belgium) were made available as a single dataset by the Flemish Cattle Breeding Association. This dataset contained the following information:

- Herd Identification
- Cow Identification
- Breed Code
- Parity
- Days In Milk (DIM)
- Cumulative Milk Production
- Date of SCC Measurement
- SCC: measured at monthly intervals for every cow that was at least 5 DIM. Composite milk samples were therefore collected from two successve milkings and were analyzed with the Fossomatic 5000 (Foss Electric, Hillerød, Denmark).

Data processing

Only SCC from heifers measured between day 5 and day 14 day post partum were selected. A classification was performed as follows:

- Class 1: SCC ≤ 150 x 10^3 cells/ml
- Class 2: SCC between 151 x 10^3 and 300 x 10^3 cells/ml
- Class 3: SCC between 301 x 10^3 and 1000 x 10^3 cells/ml
- Class 4: SCC > 1000 x 10^3 cells/ml.

The time-dependent variation of SCC during the observed time interval was assessed by fitting a regression line through the observed $\log_e$-transformed SCC (lnSCC) using SPSS 9.0 for Windows (SPSS Inc., Chicago, Illinois, USA).

The within-herd prevalence per class was calculated when at least 10 SCC were available per herd. The within-herd prevalence is the percentage of heifers per class in a herd.

RESULTS

The first SCC of 12,994 heifers from 3,321 herds were determined. From 137 herds, more than 9 SCC were available.

The overall distribution of SCC for classes 1, 2, 3 and 4 was 65.4, 15.6, 12.9 and 6.1%, respectively (Table 1).

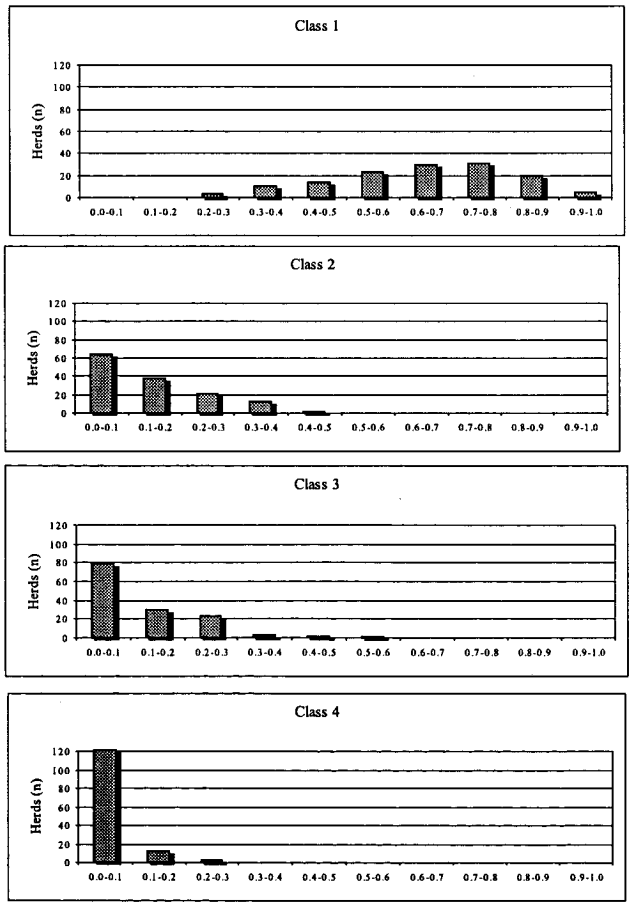

Figure 1. Within-herd prevalence per SCC class.

Table 1. Overall and seasonal prevalence per SCC class.

Period	Prevalence n (%)	Class 1	Class 2	Class 3	Class 4
January-February-March	3177 (24)	62.5%	17.2%	14.1%	6.2%
April-May-June	1468 (11)	55.9%	19.6%	16.6%	7.8%
July-August-September	3935 (30)	64.0%	17.1%	13.3%	5.5%
October-November-December	4414 (35)	71.7%	11.8%	10.5%	5.9%
Overall	**12994 (100)**	**65.4%**	**15.6%**	**12.9%**	**6.1%**

Most of the SCC were measured during the months of July to December (n=8,349, 65%), as the majority of the heifers calved during the second half of the year (Table 1).

A seasonal SCC variation was observed as shown in Table 1. The prevalence of class 1 SCC was lowest in April, May and June (55.9%), whereas it was highest in October, November and December (71.7%). The prevalences of classes 2, 3 and 4 were just the opposite. They were highest in April, May and June (19.6, 16.6, and 7.8%, respectively) and lowest in October, November and December, except for class 4, which had the lowest prevalence in July, August, September (11.8, 10.5 and 5.5%).

A time-dependent variation was observed. Somatic cell counts decreased with increasing DIM (lnSCC=5.47-0.081*DIM).

The within-herd prevalence for each class is shown in Figure 1. For the SCC of class 1, the within-herd prevalence varied from 27.3 to 100%, with a median of 66.7%. For the SCC of classes 2, 3, and 4 the median within-herd prevalence was 15.4 (range: 0.0 - 50.0%), 10.0 (0.0 - 54.5%), and 0.0 (0.0 - 30.0%), respectively.

DISCUSSION

In this study, nearly 35 % of all heifers had a first lactational SCC, measured between day 5 and day 14 post partum, > 150 x 10^3 cells/ml, and 19 % had a first lactational SCC > 300 x 10^3 cells/ml. This is high, considering the fact that a heifer is expected to have a SCC of 100 x 10^3 cells/ml or lower (O'Rourke and Blowey, 1992), and considering the results from Laevens *et al.* (1997) who found that 95% of the heifers that were bacteriologically negative during their first lactation had a SCC ≤ 150 x 10^3 cells/ml during the first month of lactation.

The results in this study are to be interpreted with caution as data on bacteriological culture were not available. This means that SCC were only used as an indicator of udder health problems in heifers. Somatic cell counts are physiologically high during the first week of lactation, according to O'Rourke and Blowey (1992). Dohoo *et al.* (1993) recommend not to take into account all individual SCC measured during the first 9 days in order to avoid upwards bias. Barkema *et al.* (1999) , however, stated that quarter-milk SCC was applicable as of day 3 post partum for the purpose of determining IMI in an udder quarter. They state that high SCC (>250 x 10^3 cells/ml) early post partum can hardly ever be considered physiologic.

The seasonal variation of SCC might be explained by the fact that the heifers have been kept indoors during winter, thus creating a higher risk for IMI. This was also observed by Fox *et al.*, (1995). In contrast, Klaas *et al.* (1998) found the lowest prevalence of IMI in heifers between August and September.

Besides the seasonal variation, there was also a large between-herd variation. This may be an indication that heifer management plays an important role in the prevention of IMI. The prevention of prepartum IMI is currently based on controlling flies during the summer period, using individual calf hutches to avoid suckling among calves, segregating pregnant heifers from dry cows (Trinidad *et al.*, 1989) and applying prepartum treatment (Shearer and Harmon, 1993). However, further investigations must be done to determine risk factors associated with increased SCC in early lactation and IMI in primigravid dairy heifers.

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