Epidémiol. santé anim., 1997, 31-32

INCIDENCE OF CLINICAL MASTITIS IN DAIRY HERDS IN THREE BULK MILK SOMATIC CELL COUNT COHORTS

Barkema H.W.[1], Schukken Y.H.[2], Lam T.J.G.M.[3], Beiboer M.L.[4], Wilmink H., Benedictus G.[1], Brand A.[2]

L'incidence des mammites cliniques a été étudiée dans 274 troupeaux dans 3 cohortes de comptages de cellules somatiques de lait de tank (CCS de lait de tank). Le taux d'incidence moyen de mammite clinique était de 0,278, 0,257 et 0 ,252 cas pour 365 vache-jours à risque dans les troupeaux à CCS de lait de tank bas (≤ 150 000), moyen (150 000 à 250 000) et élevé (250 000 à 400 000 cellules/ml) respectivement. Le taux d'incidence de mammite clinique n'était pas différent entre les 3 cohortes de CCS de lait de tank. La variance du taux d'incidence de mammite clinique entre troupeaux augmentait quand le CCS de lait de tank était plus bas. Les mammites cliniques à pathogènes gram-négatif comme Escherichia coli, Klebsiella spp. ou Pseudomonas spp. étaient plus fréquentes dans les élevages à CCS de lait de tank bas. Les mammites cliniques à Staphylococcus aureus, Streptococcus dysgalactiae et Streptococcus agalactiae étaient plus fréquentes dans les élevages à CCS de lait de tank élevé. Les mammites cliniques avec des symptômes généraux étaient plus fréquentes dans les troupeaux à CCS de lait de tank bas. Le taux global de réforme et le taux de réforme pour mammite clinique ne différaient pas entre les cohortes de CCS de lait de tank. Dans les troupeaux à CCS de lait de tank élevé, néanmoins, plus de vaches à CCS élevé ont été réformées. Les fermes à CCS de lait de tank bas ont réformé plus pour lésions des trayons, facilité de traite, forme de la mamelle, fertilité et caractère, en comparaison avec les fermes à CCS de lait de tank élevé. Les élevages à CCS de lait de tank bas ont aussi été capables de réformer plus pour des raisons d'export et ont réformé plus pour des raisons de production.

INTRODUCTION

The relationship between BMSCC and incidence of clinical mastitis is of interest. High BMSCC is not acceptable with regard to milk quality, but some authors suggested that cows in herds with low BMSCC may have an increased susceptibility to clinical mastitis (Jackson, 1990; Green et al., 1996; Schukken et al., 1989b). This could mean that there may be an optimal BMSCC, being low, but not necessarily the lowest BMSCC possible. However, no evidence is available indicating that clinical mastitis will automatically increase if a herd produces low BMSCC (Smith, 1996). Because of a lack of published data on a sufficient number of herds, the purpose of the present study was to examine the relationship between BMSCC and incidence of clinical mastitis.

MATERIALS AND METHODS

Based on mean BMSCC, three cohorts of 100 dairy farms were selected. Ten out of 13 times in the last year and the last three times that BMSCC was evaluated the count had to be in one of three cohorts: ≤150,000 (low), 151,000 to 250,000 (middle), or 251,000 to 400,000 cells/ml (high). Farms were selected that housed lactating cows in a free-stall barn in winter, participated in a three or four weekly milk recording systeme, had a production quota between 300,000 and 900,000 kg, and had cows of the Holstein-Friesian or Dutch Friesian breeds. The farmers collected milk samples from every quarter with visible signs of clinical mastitis before treatment. Culling dates and reason of culling of all animals were recorded by the farmer. Eighteen farms were excluded from the analyses because of non adequate data collection. Six farms stopped farming activities during the study.Bacteriological culturing of milk samples was performed according to standards of the NMC. Of all milk samples, 0.01 ml was cultured. The cow incidence rate of clinical mastitis (**IRCM**) was expressed as the number of quarter cases per 365 cowdays at risk when data were analyzed at herd level. Intervals between cases of clinical mastitis in the same quarter had to be ≥14 days. Cowdays at risk were calculated as the total number of days during the study that a cow was present at the farm, minus 14 days after each case of clinical mastitis. The relationship between both geometric mean BMSCC during the study period and IRCM was tested using Poisson regression (PROC GENMOD, SAS/STAT User's Guide, 1990). The same model was used for the relationship between culling rate and IRCM.

RESULTS

A total of 8429 cases of clinical mastitis in 7596 quarters in 6373 lactations of 5827 cows were reported by the farmers during an 18 month study period. The incidence rate of clinical mastitis was not different between herds with low, middle, and high Bulk Milk SCC (Table I).
Variance of clinical mastitis incidence between herds increased with lower BMSCC.

[1] Animal Health Service, PO Box 361, 9200 AJ Drachten, The Netherlands
[2] Department of Herd Health and Reproduction, Utrecht University, PO Box 80151, 3508 TD Utrecht, The Netherlands
[3] Department of Infectious Diseases and Immunology, Utrecht University, PO Box 80165, 3508 TD Utrecht, The Netherlands
[4] Veterinary Clinic Ureterp, Weibuorren 1/aa, 9247 AX Ureterp, The Netherlands

Table I
The incidence of clinical mastitis (cases per 365 cowdays at risk) in herds with a different Bulk Milk Somatic Cell Count (x 1000 cells/ml)

	Bulk Milk SCC (x 1000 cells/ml)			
	≤ 150	151-250	251-400	all herds
Farms	85	133	56	274
Mean number of cows per farm	70[□,†]	76[●]	81	75
Mean number of cases per farm	30	31	32	31
Mean number of cases not sampled and not registrated per farm	3.6[*,†]	4.5[†]	5.3	4.5
Mean IRCM	0.279	0.258	0.254	0.263
Median IRCM	0.235	0.240	0.213	0.235
Minimal IRCM	0	0.04	0.01	0
Maximal IRCM	1.01	0.93	0.68	1.01
IRCM systemically ill	0.045[*,†]	0.036[†]	0.029	0.037

[*] significant difference with middle BMSCC cohort ($P < 0.05$)
[□] tendency to be different with middle BMSCC cohort ($0.05 \leq P < 0.10$)
[†] significant difference with high BMSCC cohort ($P < 0.05$)
[●] tendency to be different with high BMSCC cohort ($0.05 \leq P < 0.10$)

Clinical mastitis with gram-negative pathogens such as *Escherichia coli, Klebsiella spp.* or *Pseudomonas spp.* occurred more often in low Bulk Milk SCC herds. Clinical mastitis with *Staphylococcus aureus, Streptococcus dysgalactiae* and *Streptococcus agalactiae* occurred more often in the high BMSCC herds (Table II). Clinical mastitis with systemic signs of illness occurred more often in herds with low BMSCC.

Table II
Incidence rate of clinical mastitis (cases per 365 cowdays at risk) per pathogen of 8429 cases in three Bulk Milk SCC cohorts[1]

	Bulk Milk SCC (x 1000 cells/ml)			
	≤ 150	151-250	251-400	all herds
Streptococcus dysgalactiae	0.0281[*,●]	0.0375	0.0362	0.0345
Streptococcus agalactiae	0.0008[*,†]	0.0041	0.0060	0.0035
Streptococcus uberis	0.0179	0.0177	0.0199	0.0182
Other streptococci	0.0252	0.0207	0.0206	0.0220
Staphylococcus aureus	0.0482[□,†]	0.0628[†]	0.0831	0.0630
Coagulase-negative staphylocci	0.0182	0.0186	0.0151	0.0177
Escherichia coli	0.0608[†]	0.0522	0.0443	0.0529
Corynebacterium bovis	0.0146	0.0146	0.0190	0.0156
Actinomyces pyogenes	0.0018	0.0027	0.0026	0.0024
Klebsiella spp	0.0054[*]	0.0028	0.0040	0.0037
Pseudomonas spp	0.0029[*,†]	0.0009	0.0011	0.0015
Mixed culture	0.0408[□,†]	0.0505	0.0577	0.0493
Negative	0.0590[*,†]	0.0363[●]	0.0263	0.0407
Contaminated	0.0127[*,†]	0.0192	0.0205	0.0176
Not sampled but registrated	0.0199[□,†]	0.0146[●]	0.0092	0.0150

[1]If two pathogens were isolated they were treated as a case of either pathogens.
[*] significant difference with middle BMSCC cohort ($P < 0.05$)
[□] tendency to be different with middle BMSCC cohort ($0.05 \leq P < 0.10$)
[†] significant difference with high BMSCC cohort ($P < 0.05$)
[●] tendency to be different with high BMSCC cohort ($0.05 \leq P < 0.10$)

Both overall culling rate and culling rate for clinical mastitis were not affected by the level of BMSCC (Table III). High BMSCC farms, however culled more cows with high SCC. Low BMSCC farms did select more on tramped teat, milkability, udder shape, fertility and character compared to high BMSCC farms. Low BMSCC farms were also able to cull more cows for export and had to cull more cows without problems not to milk more than allowed

for their milk production quota than high BMSCC farms did.

Table III

Culling rate per reason of culling (animals culled per 365 cowdays at risk) in the 274 herds with different Bulk Milk SCC.

	Bulk Milk SCC (x 1000 cells/ml)			
	≤ 150	151-250	251-400	all herds
Clinical mastitis	0.0268	0.0233	0.0248	0.0245
High SCC	0.0120*,†	0.0238†	0.0436	0.0246
Tramped teat	0.0133□,†	0.0098	0.0074	0.0102
Milkability	0.0112□,●	0.0081	0.0070	0.0087
Udder shape	0.0122†	0.0110†	0.0048	0.0100
Fertility	0.0910*,†	0.0757	0.0722	0.0789
Lameness	0.0284	0.0314	0.0314	0.0303
Low milk production	0.0353□	0.0448	0.0365	0.0400
Calving problems	0.0058□	0.0085†	0.0047	0.0069
Mortality	0.0088	0.0076	0.0095	0.0083
Other healt problems	0.0277	0.0335	0.0342	0.0318
Age	0.0112	0.0106	0.0102	0.0106
Export	0.0065†	0.0061†	0.0026	0.0054
Milk quota	0.0320*,†	0.0213†	0.0062	0.0210
Meat cattle	0.0014	0.0018	0.0011	0.0015
Character	0.0020†	0.0013	0.0009	0.0014
No reason	0.0044†	0.0033†	0.0106	0.0052
All reasons for culling	0.2874	0.2774	0.2682	0.2767

* significant difference with middle BMSCC cohort ($P < 0.05$)
□ tendency to be different with middle BMSCC cohort ($0.05 \leq P < 0.10$)
† significant difference with high BMSCC cohort ($P < 0.05$)
● tendency to be different with high BMSCC cohort ($0.05 \leq P < 0.10$)

DISCUSSION

At the herd level low SCC does not lead to a significant increase in clinical mastitis. This is important when advising farmers to decrease BMSCC. Apparently there is no associated risk of higher incidence of clinical mastitis. However, variance of clinical mastitis incidence does appear to increase; mean incidence is not affected, but the highest and lowest incidence rates were in the low BMSCC cohort. Also, the incidence of systemic signs accompanying clinical mastitis appeared more often in low BMSCC herds. Hence, overall mastitis incidence was not affected, but its variance and the severity of disease was higher at a lower BMSCC level. Whether the increased severity of disease outweights the increased milk production and decreased subclinical mastitis prevalence has to be analyzed further using economic analyses.

CONCLUSIONS

- Herds with low BMSCC did not have significant higher IRCM than herds with middle or high BMSCC.
- IRCM variance among farms was higher in the low BMSCC cohort than in the high BMSCC cohort.
- Clinical mastitis with gram-negative pathogens like *E. coli, Klebsiella spp.* or *Pseudomonas spp.* occurred more often in low BMSCC herds. Clinical mastitis with *Staph. aureus, Strep. dysgalactiae* and *Strep. agalactiae* occurred more often in herds with higher BMSCC.
- IRCM of cows which were reported by the farmer as being systemically ill was higher in the low compared to middle, and middle compared to the high BMSCC cohort.
- Both overall culling rate and culling rate for clinical mastitis were not affected by the level of BMSCC. High BMSCC farms, however culled more cows with high SCC.

REFERENCES

Green, M. J., L. E. Green, and P. J. Cripps. 1996. Low bulk milk somatic cell counts and endotoxin-associated (toxic) mastitis. Vet. Rec. 138:305.

Jackson, E. R. 1980. The control of bovine mastitis. Vet. Rec. 107:37.

Schukken, Y.H., F.J. Grommers, D. van de Geer, and A. Brand. 1989. Incidence of clinical mastitis on farms with low SCC in bulk milk. Vet. Rec. 125:60.

Smith, K. L. 1996. Standards for somatic cells in milk: physiological and regulatory. IDF Mastitis News 21:7.