

Prevalence of udder infections and effects on milk somatic cell count during lactation in dairy goats

TANJA STUHR¹, KAREN AULRICH¹, KERSTIN BARTH¹, KARIN KNAPPSTEIN²

¹ Thuenen-Institute of Organic Farming, Germany, www.vti.bund.de,
karen.aulrich@vti.bund.de

² Department of Safety and Quality of Milk and Fish Products,
Max Rubner-Institute, Germany,
www.mri.bund.de, karin.knappstein@mri.bund.de

Abstract

The objective of this study was to investigate the effects of udder infections, milk yield, teat shape and condition, lactation stage and parity on SCC in goats' milk. Of the 126 udder halves sampled over the lactation period, 52% were continuously or sporadically infected with mastitis pathogens (coagulase-negative staphylococci (CNS), corynebacteria, major pathogens). Most prevalent species found in milk samples were CNS with 47% of bacterial isolates. The analysis of milk SCC revealed the lactation week as the most influential factor, followed by the lactation number. The average daily milk yield also had a highly significant effect on milk SCC. A significant effect of the udder infection status on milk SCC could be observed, but no differentiation could be made among different pathogenic groups. A classification of teat shape by classifying different types of teats and the degree of callosity yielded no significant effects on milk SCC.

Key words: dairy goat, staphylococci, SCC, milk yield

Introduction

An inflammation of the mammary gland is one of the most common infectious diseases in dairy goat farming. Somatic cells are a normal milk constituent that can be considered as indicator for the immune defence of glandular tissue. Interrelationships between variations in goat milk somatic cell count (SCC) and the presence of different causative agents, as well as other influencing factors, were already discussed (Stuhr and Aulrich 2010). The aim of research was to examine the course of milk SCC in correlation to infection status as well as milk yield, teat shape and condition and parity over an entire lactation period of a goat herd.

Material and methodology

From February to November 2010, 63 lactating goats between Lactation Numbers 1 and 8 of the dairy goat herd of the Thünen-Institute of Organic Farming, Germany, were investigated. Udder half milk samples were collected immediately before the routine morning milking at weekly intervals over a period of 40 weeks. Milk samples were taken under aseptic conditions for cyto-bacteriological examinations according to the guidelines of the DVG (2009). Milk SCC was analysed by a fluoro-opto-electronic method according to ISO 13366-2/2006 (International Organization for Standardization 2006). All animals were examined three times during lactation with regard to teat shape (normal, short, funnel and bottle-shaped) and the degree of hyperkeratosis of each gland. Furthermore, the average daily milk yield was determined for every goat. Statistical analysis was based on logarithmic values and was carried out with the software program SPSS for Windows® using GLM procedure with repeated measures analysing the fixed effects of lactation week, lactation number, milk yield and infection status of udder halves.

Results

Of the 126 udder halves sampled over the lactation period, 52% were continuously or sporadically infected with one pathogenic group (coagulase-negative staphylococci (CNS), corynebacteria, major pathogens). The most prevalent species found in milk samples were CNS with 47% of bacterial isolates. Corynebacteria were detected in 40% of the infected udder half samples, 9% were infected with *Staphylococcus aureus* and 5% with the streptococci species *Streptococcus (Sc). dysgalactiae* or *Sc. uberis*. Uninfected halves showed the lowest, udder halves with the detection of major pathogens the highest mean value of SCC, whereas CNS and Corynebacteria infected halves ranked between these two groups (Table 1).

Table 1. Somatic cell counts (SCC) in goat milk samples in relation to different intramammary infection status of udder halves

Infection status	Log10 SCC				
	N	Min.	Max.	Mean	S.E.
Uninfected	3173	3.78	7.44	6.17	4.78
Coagulase-negative staphylococci	620	4.34	7.42	6.20	5.12
Corynebacteria	537	4.51	7.34	6.34	5.09
Major pathogens	174	4.48	7.45	6.55	5.58

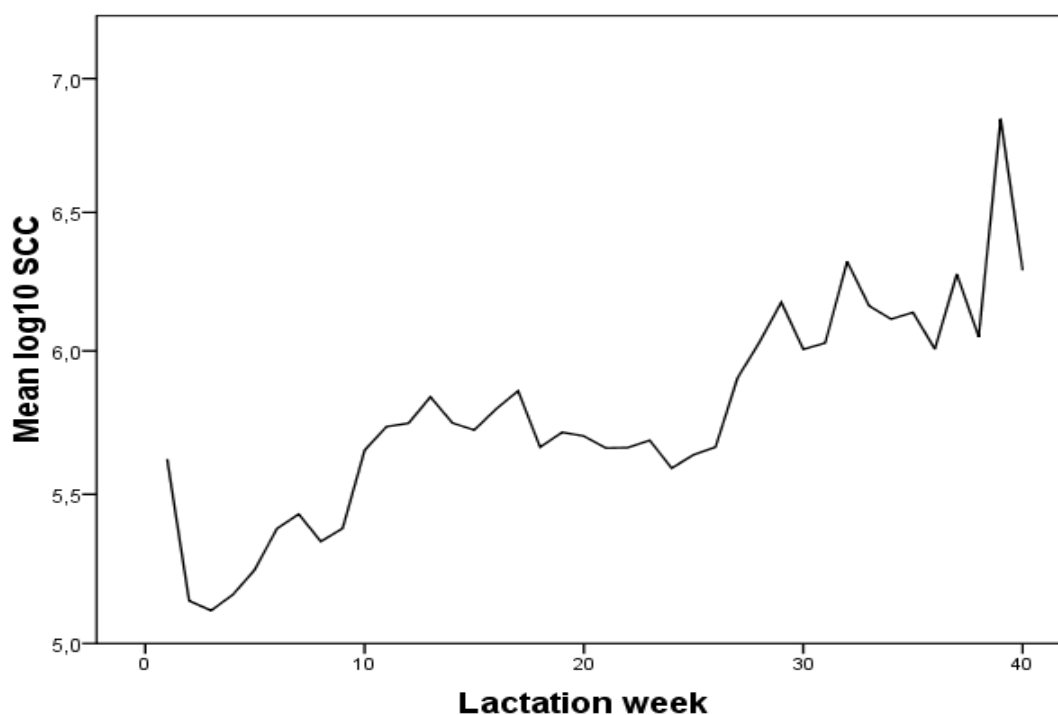


Figure 1. Mean somatic cell counts (SCC) in goat milk udder half samples recorded weekly during the lactation period 2010

The analysis of milk SCC revealed the lactation week as the most influential factor, followed by the lactation number ($F_{39,2277}=19.57$ $P<0.001$; $F_{5,124}=14.46$ $P<0.001$). The first week of lactation showed elevated values of SCC, but these decreased during the following two weeks. A clear trend of steadily increasing SCC values could be observed over the lactation period (Figure 1). A high number of lactation was correlated with increased levels of SCC. The average daily milk yield also had a highly significant effect on milk SCC ($F_{330,3359}=2.46$ $P<0.001$). In early and mid lactation

milk yield levels ranged between 2.1 and 2.8 l/d, while in late lactation a decrease to 1l/d was noticeable. A lower daily milk yield resulted in higher values of SCC. With $F_{3,2867}=2.91$ ($P<0.05$) a significant effect of the udder infection status on milk SCC could be observed but no differentiation could be made among different pathogenic groups. The classification of teat shape and the degree of callosity yielded no significant effects on milk SCC.

Discussion

According to other studies, CNS was the most common group of bacteria isolated from udder half milk samples (Contreras et al. 2007, Hall and Rycroft 2007). Unexpectedly high levels of Corynebacteria in bacteria isolates were detected during this study, a low prevalence of streptococcal infections is in correspondence with Manser (1986). Our study on herd level over the lactation period demonstrated the great variability of SCC in dairy goats. SCC is highly influenced by the stage of lactation and tends to increase during lactation period, but even higher values may not indicate an intramammary infection. Very high levels in autumn might be caused by the influence of estrus, which was already stated by McDougall and Voermans (2002). Increasing levels of SCC until the end of lactation may be linked to a decreasing amount of milk production and lower daily milk yields, as has already been stated by Zeng and Escobar (1995). In contrast to investigations of Aulrich and Barth (2008) parity did highly affect milk SCC with a significant increase in the case of greater parities. The presented study proved a significant effect of infection status on SCC, but a differentiation of pathogenic groups by the level of SCC could not be confirmed by our results. Nevertheless, in case of suspected udder infections SCC in goat milk could be suitable as first and cost-effective screening parameter to initiate further analysis.

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