

1-1-2008

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Recommended Citation

BAŞTAN, AYHAN; KAÇAR, CİHAN; ACAR, DUYGU B.; ŞAHİN, MİTHAT; and CENGİZ, MEHMET (2008) "Investigation of the Incidence and Diagnosis of Subclinical Mastitis in Early Lactation Period Cows," *Turkish Journal of Veterinary & Animal Sciences*: Vol. 32: No. 2, Article 9. Available at: <https://journals.tubitak.gov.tr/veterinary/vol32/iss2/9>

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Investigation of the Incidence and Diagnosis of Subclinical Mastitis in Early Lactation Period Cows

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Received: 15.12.2005

Abstract: The aim of this study was to compare the results of the California mastitis test (CMT) and bacteriological culture for detection of subclinical intramammary infections after 10 days postpartum. Samples were collected from 102 cows. The CMT was performed once on each cow. The results of bacteriological culture and the CMT were compared in 344 milk samples. Two hundred fifty samples were CMT (+) and 94 samples were CMT (-); 224 samples were bacteriologic culture (+) and 120 samples were culture (-). Both CMT and culture (+) samples numbered 212, CMT and culture (-) samples 82, CMT (+) and culture (-) samples 38, and CMT (-) and culture (+) samples 12.

Sensitivity of the CMT score was 94%, specificity was 68%, positive predictive value was 84%, negative predictive value was 87%, and accuracy rate was 85%. In conclusion, the prevalence of subclinical mastitis in the early lactation period was high and the CMT was a reliable method for its detection in this period.

Key Words: Cow, CMT, early lactation period, mastitis

Erken Laktasyon Dönemindeki İneklerde Subklinik Mastitislerin Tanısı ve İnsidensinin Araştırılması

Özet: Bu çalışmanın amacı, doğumdan 10 gün sonra meme içi subklinik enfeksiyonların saptanmasında California mastitis test (CMT) ve bakteriyolojik kültür sonuçlarını karşılaştırmaktır. Süt örnekleri 102 adet inekten alındı. Her bir inek için CMT bir kez tekrarlandı. Üç yüz kırk dört adet süt örneğinde kültür ve CMT sonuçları karşılaştırıldı. İki yüz elli adet örnekte CMT (+), 94 adet örnekte CMT (-); 224 adet örnekte kültür (+) ve 120 adet örnekte bakteriyolojik kültür (-) saptandı. CMT ve bakteriyolojik kültür (+) saptanan örnek sayısı 212, CMT ve kültür (-) örnek sayısı 82, CMT (+) ve kültür (-) örnek sayısı 38, CMT (-) ve kültür (+) örnek sayısı 12 adet bulundu.

California mastitis test skorunun sensitivitesi % 94, spesifitesi % 68, pozitif doğruluk oranı % 84, negatif doğruluk oranı % 87 ve genel doğruluk oranı % 85 olarak saptandı. Sonuç olarak, erken laktasyon döneminde subklinik mastitis prevalansı yüksektir ve bu dönemde subklinik mastitis tespitinde CMT güvenilir bir metottur.

Anahtar Sözcükler: İnek, CMT, erken laktasyon dönemi, mastitis

The inflammation of the mammary gland, usually in response to an invasive agent, can be characterized by an increase in the somatic cell count in milk (1).

In the past most of the peri-parturient cases were caused by gram-positive contagious pathogens including

Staphylococcus aureus and *Streptococcus agalactiae*, surviving in the udder during the dry period (2).

Intramammary infections (IMIs) found in early lactation can be a result of either IMIs that do not resolve or new IMIs that develop during the dry period. The

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importance of the dry period to eliminate existing and prevent new intramammary infections is well understood (3).

In the early weeks of lactation while gram-negative bacteria may be the predominant mastitis pathogens in herds producing low somatic cell counts (SCCs) in milk, major mastitis pathogens produce high SCCs in milk (4).

Identifying and eliminating intramammary infection in early lactation may have significant economic benefits. The use of individual cow SCCs to identify the presence of intramammary infections in early lactation cows is possible. Measurement of the concentration of SCC in milk was established as the most reliable indirect measure of mammary gland infection. Previous research had suggested that SCC is normally elevated during the first 2 weeks of lactation, followed by a rapid decrease; however, more recent studies have demonstrated that cow level SCC declines more rapidly than previously thought (5,6).

The California mastitis test (CMT) is a practical test for subclinical mastitis that can be used easily at the cowside (7).

In the study by Dingwell et al. (5), an IMI was defined as the presence of a major mastitic organism and the CMT was performed on quarter foremilk samples at the cowside and the CMT reaction of each quarter was recorded in an ordered scale as 0, 1, 2, or 3. In this study, 10% of quarters were identified as having IMI in early lactation and it appears that the CMT has the potential to be a rapid, accurate, and economically feasible test for fresh cows.

This study was performed on cows without any clinical abnormality under field conditions. Data were collected from 102 cows (344 milk samples) that were all starting their 2nd or subsequent lactation 10 days after calving.

Quarter milk samples were collected aseptically for bacteriological culture and they were sent to the microbiological laboratory for routine culture. The CMT was performed only once on each cow 10 days after calving. The CMT was performed on quarter foremilk samples at the cowside, and test results were read and recorded by an experienced clinician. The CMT was performed according to Dingwell et al.'s (5) recommendations. The CMT reaction of each quarter was recorded in an ordered scale as 0, 1, 2, or 3, with 0

indicating no reaction, and 1 being a trace and a slight positive reaction.

In this study, CMT and bacterial culture results were compared for 344 milk samples. Two hundred fifty samples were CMT (+) and 94 samples were CMT (-); 224 samples were bacterial culture (+) and 120 samples were bacterial culture (-). Both CMT and bacteriological culture were positive in 212 samples. In 82 samples CMT and culture results were negative. Although CMT results were positive, culture results were negative in 38 samples. On the other hand, the CMT was negative even though culture results were positive in 12 samples (Table 1).

Table 1. The results of the CMT and bacterial culture.

CMT	Bacterial Culture	
	+	-
+	212	38
-	12	82

Sensitivity, specificity, and positive and negative predictive values were calculated for the CMT score, using the results of all 344 milk samples. Sensitivity of the CMT score was 94%, specificity was 68%, positive predictive value (PPV) was 84%, negative predictive value (NPV) was 87%, and accuracy rate was 85% (Table 2).

Table 2. The results of statistical analysis.

Sensitivity	Specificity	PPV	NPV	Accuracy
94%	68%	84%	87%	85%

Many researchers have reported that SCC is the best predictor of intramammary infection status. The CMT, a qualitative measurement of the somatic cell count in milk, is a screening test for subclinical mastitis that can be used easily at the cowside. The use of the CMT to identify infected quarters has been extensively validated in cows that were not in early lactation (7). Recently, the CMT has been used to identify intramammary infections in the first 10 days of lactation (8).

A study performed by Dingwell et al. (5) showed that the sensitivity, specificity, PPV, and NPV of the CMT were 68.8%, 71.5%, 21.1%, and 95.4%, respectively. The proportions of specific pathogens determined in the early

lactation period were 25%, 25%, 18%, 17%, 8%, and 5% for *E. coli*, *S. agalactiae*, *B. cereus*, *S. aureus*, gram-negative staphylococci spp. and gram-positive staphylococci spp., respectively.

In the present study, sensitivity, specificity, PPV, NPV, and accuracy rate of the CMT were 94%, 68%, 84%, 87%, and 85%, respectively. According to these results, positive CMT reactions were considered indicative of mastitis.

The high subclinical mastitis incidence encountered in the present study is in contrast with the old concept of high clinical mastitis prevalence in early lactating cows, which has recently been falling in popularity. The high

incidence of environmental mastitis may be a result of poor management in the previous dry period. In addition, high rates of environmental pathogen isolation highlight the importance of milking hygiene and dry-period treatments. Most dairy farmers lack information on this subject and their education must be a critical part of national mastitis prevention strategies.

In conclusion, the increase in subclinical mastitis prevalence in the early lactation period is very important. Hygiene procedures and proper dry-period management is effective in mastitis prevention and the CMT is a reliable method in subclinical mastitis detection in the early lactation period.

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