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INFLUENCE OF MASTITIS, WEANING AND INTRAMAMMARY ANTIBIOTIC TREATMENT ON SOMATIC CELLS AND TUMOR NECROSIS FACTOR-α IN MILK OF BEEF COWS

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Authors:

T.D. Ridgway, R.P. Wettemann, C.A. Lents, L.J. Spicer and M.J. Paape

Story in Brief

Angus x Hereford cows (n=20) were used to determine the effects of mastitis, weaning calves, and intramammary treatment with antibiotics on concentrations of somatic cells and tumor necrosis factor-α (TNF-α) in milk. Calves were weaned at approximately the seventh month of lactation and milk samples from each quarter were evaluated for somatic cell count (SCC), concentrations of TNF-α , and microorganisms. Half of the cows with increased SCC (based on the California Mastitis Test) and half of the cows with minimal SCC were treated with Albadry Plus® (novobiocin and penicillin) at weaning. Cows were sampled 7 d after weaning to quantify SCC and TNF-α . Quarters were classified at weaning based on SCC (SCCW) as minimal (<100,000 SCC/mL) or increased SCC (≥ 100,000 SCC/mL). Somatic cell counts on d 7 were increased in all quarters and not influenced by SCCW. Treatment reduced SCC in quarters that had increased SCC at weaning. Concentrations of TNF-α in milk increased from weaning to d 7 and were not influenced by treatment or increased SCC at weaning. Mastitis-causing organisms present were coagulase negative *Staphylococcus* and *Staphylococcus aureus*. Presence of organisms in quarters at weaning did not influence TNF-α and SCC in milk on d 7. We conclude that concentrations of TNF-α and SCC increase in the mammary gland during 7 d after weaning and antibiotic treatment reduced the increase in SCC in quarters with increased SCC.

Key Words: Beef Cow, Mastitis, Tumor Necrosis Factor-α

Introduction

Infectious diseases in livestock account for several billion dollars of annual loss in the United States. Mastitis alone results in approximately $2 billion annual loss in the dairy industry, making it the number one loss of income. More than 60% of that total economic loss is due to decreased milk production of infected animals (Shuster et al., 1995). Mastitis is more commonly associated with the dairy industry than with the beef cattle industry. Milk production of the dam is the most influential factor affecting weaning weight of beef calves, so

mastitis is a disease that should be considered in beef as well as dairy cows. Mastitis decreases weaning weights of beef calves by 7 to 10% (Lents, 1997).

Cytokines, such as tumor necrosis factor-α (TNF-α), are produced by the mammary gland during infections and inflammation. Large amounts of TNF-α are produced during *E. coli* mastitis and TNF-α can inhibit somatotropin (GH) release, which may decrease milk production (Shuster et al., 1995). Somatic cells are also increased in quarters during infection. Intramammary dry cow treatment reduced the incidence of mammary infection during the dry period (Lents et al., 1997). The objective of this study was to determine the effects of mastitis, weaning calves, and intramammary treatment with antibiotic on concentrations of somatic cells and TNF-α in milk of beef cows.

Materials and Methods

Milk samples from 50 mature Angus x Hereford cows were evaluated at weaning with the California Mastitis Test (CMT "e 1) to identify 10 cows with minimal SCC and 10 cows with increased SCC indicative of intramammary infection. Calves were weaned at approximately the seventh month of lactation and cows were given 10 units of oxytocin (i.m.) to facilitate milk letdown. Milk samples were obtained from each quarter and evaluated for SCC, TNF-α , and mastitis-causing organisms. Half of the cows with increased SCC (based on CMT) and half of the cows with normal SCC were treated with Albadry Plus at weaning. Milk samples were obtained 7d after weaning to quantify SCC and TNF-α . Quarters were classified at weaning based on somatic cell counts at weaning as having increased (≥ 100,000 SCC/mL) or minimum (<100,000 SCC/mL) somatic cells.

Results and Discussion

During 7 d after weaning, SCC increased approximately 10-fold in all quarters. As expected, quarters identified by CMT as having increased SCCW had more somatic cells than quarters identified as having minimal SCC. Treatment of cows with antibiotics suppressed the increase in SCC on d 7 in quarters of cows that had increased somatic cells at weaning (Figure 1). Treatment with antibiotics tended to reduce the SCC in infected quarters. However, the presence of organisms did not influence SCC. This could be related to the low number of infected quarters in this study (n=10).

Similar to somatic cells, tumor necrosis factor-α increased approximately two-fold in all quarters from d 0 to 7. Presence of infectious organisms, number of somatic cells or treatment with antibiotics did not influence TNF-α values in milk (Figure 2). This could be due to the time when samples were obtained.

We conclude that concentrations of TNF-α and SCC increase in the mammary gland during 7d after weaning. Treatment of cows with antibiotics suppressed the increase in SCC in quarters of cows that had increased somatic cells at weaning. This reduction in SCC in cows with increased somatic cells at weaning may be associated with the efficacy of antibiotics to reduce mammary infection during the dry period.

Literature Cited

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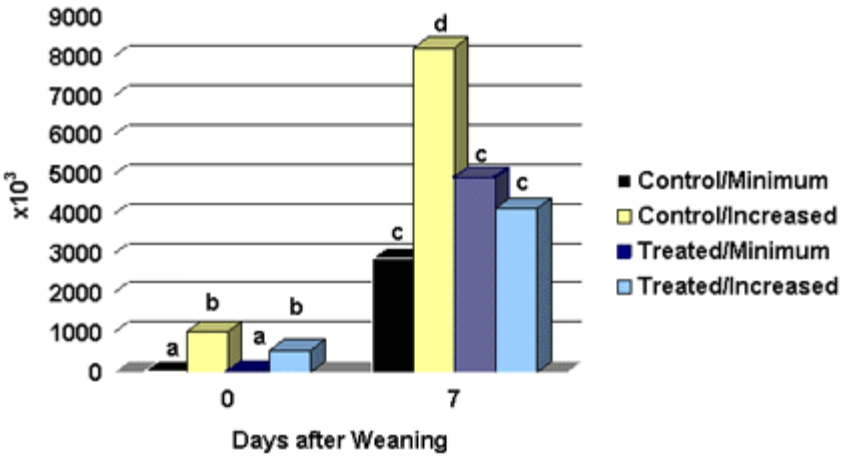

Figure 1. Effect of treatment, somatic cell counts at weaning, and day of sampling on somatic cell counts (SCCW x Day, P<.0001; Treatment x SCCW, P<.07).

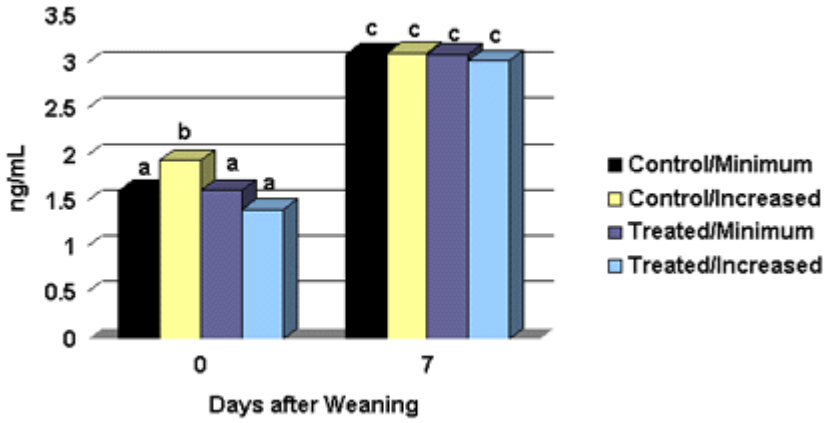

Figure 2. Effect of treatment, somatic cell counts at weaning, and day of sampling on TNF-α (Day, P < .0001).

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