EPIDEMIOLOGY OF HEIFER MASTITIS

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Introduction

Until recently, it had been assumed that primigravid heifers were seldom affected by intramammary infections (IMI) at or near parturition. Recent research results now suggest that this assumption is false. A number of studies report a high rate of IMI in heifers at or near parturition.(1-3) Interestingly, the pathogens associated with these IMI's appear to have a regional distribution. A study in the southern United States found a high prevalence of IMI associated with *Staphylococcus aureus*.(2) Studies in the New England and Southeastern United States detected a high prevalence of IMI associated with coagulase negative staphylococci.(1,3) IMI's associated with *Staphylococcus aureus* are related to histopathologic lesions in the mammary gland which suggest that these infections may hamper the normal development of the lactating gland.(4) These findings have prompted research to investigate the use of antibiotic therapy to decrease the risk of IMI. This research has found that antibiotics administered prior to calving will decrease the prevalence of peripaturient IMI.(5,6) A question that has not been answered is: Do these infections in heifers, particularly IMI by the minor pathogens, warrant treatment? The objectives of this paper are to report preliminary data describing the incidence of IMI in heifers, the pathogens involved in the infections and the subsequent rates of clinical mastitis in first lactation heifers conditional on the IMI status at freshening.

Materials and Methods

Study design--Seven Pennsylvania dairy herds were recruited for the study. These herds were selected as a convenience sample based on herd size (>100 milking cows), participation in Dairy Herd Improvement Association (DHIA), exclusive use of artificial insemination (AI) in the cow herd and willingness to cooperate in a three year study. There were three main components to the study. The first component was to obtain quarter milk samples for microbiologic culture from all heifers within their first four milkings following parturition. Producers were provided with materials and trained to take these samples by personnel from the Mastitis Diagnostic and Research Laboratory (MDRL), Penn State University. These samples were frozen and stored at -20° C

by the producer. Samples were picked up once per week and transported to MDRL for culture and interpretation. Heifers with complete microbiologic data are considered project heifers.

The second component of the study was the collection of data on rates of clinical mastitis in project heifers. Each producer was asked to collect milk samples from quarters with clinical episodes of mastitis. These samples were handled by the producer in the same manner as the periparturient samples. The producer kept clinical logs which recorded the severity, duration and treatment regime used for the clinical case. Additional quarter milk samples were obtained fourteen days following the initial diagnosis of mastitis to assess cure rates.

The third component of the study was the collection of production and genetic data on all project heifers. These data were either collected from farm computer or written records or from DHIA computer records. It was intended that all project heifers would be followed prospectively through their first lactation or until they exited the herd, whichever came first. For heifers leaving the herd before the end of their first lactation, producers were asked to provide reasons for exit.

Microbiologic assessment--Quarter milk samples were cultured using described methods.(7) Briefly, 0.1 ml. of well mixed milk was evenly applied to an esculin-blood agar plate (5% sheep RBC in trypticase soy agar). Plates were incubated for 24 hours at 37° C. Cultures were evaluated using described methods.(7) The primary microbiologic categories assessed for this report were coagulase negative (CNS) or positive staphylococci (CPS), *Streptococcus agalactiae* or other streptococci (STR), coliform (COLI) and *Klebsiella sp.* (KLEB). Heifers were considered infected on the basis of a single positive culture.

Data analysis--Data were entered into computer data files using a microcomputer-based statistical package (PC-SAS). Data records were checked weekly to ensure that files were complete and accurately entered. Missing data were detected and subsequently replaced with complete data by interviewing producers or reviewing their farm records. Microbiologic data were checked manually with the original laboratory data to ensure accuracy. Frequency counts and crosstabulations were done using a mainframe statistical program (SAS, Version 5). Rates of clinical mastitis and comparison of time to first clinical case were assessed using an epidemiologic statistical package (EGRET). Differences in rates of clinical mastitis were modeled as relative risks in multiplicative models. Times to first clinical mastitis were modeled in a proportional hazards model.

Results

Data collection started in July of 1991. Data reported here are preliminary data from 317 project heifers up to March 1992. Only heifer infection rates are reported. Farms in the study were in the top one third of farms in Pennsylvania for rolling herd average. All farms were negative for *Streptococcus agalactiae* and one farm had a single infection caused by *Staphylococcus aureus*.

In these preliminary data, 53.6% (170/317) of periparturient heifers were infected in one or more quarters. The predominant pathogen isolated was CNS which accounted for 78.8% of the infections (134/170). STR was isolated from 41 of the infected heifers (24.1%), COLI was isolated from 20 infected heifers (11.8%), and KLEB was isolated from 11 of the infected heifers (6.5%). Some heifers had mixed infections or more than one quarter infected with different pathogens. Fewer than 7% of project heifers could not be classified because of sample contamination.

A total of 60 heifers (18.9%) were diagnosed with clinical mastitis. Although the risk for clinical mastitis was higher for heifers with periparturient IMI than those without, this was most pronounced for heifers with STR and gram negative bacterial infections. It was less pronounced for periparturient infections associated with CNS.

Using a proportional hazards model, the survival functions for time to first clinical mastitis were no different for heifers with periparturient IMI relative to heifers without IMI. The same trends for risk of clinical mastitis were repeated in these analyses. Heifers with gram negative and STR infections had shorter times to first clinical mastitis than those with CNS or no infections.

Discussion

Recently, there has been work investigating the use of antibiotic treatments to decrease the risk for periparturient IMI in heifers.(5,6) Although these studies have shown these treatments to be efficacious, the rationale for therapy has been based on a theoretical role that periparturient IMI could have on the lactation. These preliminary data look at the role of periparturient IMI on subsequent clinical mastitis. These data suggest that there is an association of periparturient IMI with subsequent rates and time to clinical mastitis. The important periparturient IMI effect is associated with STR, KLEB and COLI infections and not with the most prevalent type of infection, CNS.

References

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Summary

Until recently, it had been assumed that primigravid heifers were seldom affected by intramammary infections (IMI) at or near parturition. Recent research results now suggest that this assumption is false. A number of studies demonstrate a high rate of IMI in heifers at or near parturition. These findings have prompted research to investigate the use of antibiotic therapy to decrease the risk of IMI, these studies have found that lactational antibiotic products will decrease the prevalence of peripaturient IMI. A question that has not been answered is: Do these infections in heifers, particularly IMI by the minor pathogens, result in increased rates of clinical mastitis?

Preliminary data from this study documented that 53.6% (170/317) of periparturient heifers sampled were infected in one or more quarters. The predominant pathogen isolated was coagulase negative staphylococci (CNS) which accounted for 78.8% of the infections (134/170). Environmental streptococci (STR) were isolated from 41 of the infected heifers (24.1%), coliform (COLI) was isolated from 20 infected heifers (11.8%), and *Klebsiella sp.* (KLEB) was isolated from 11 of the infected heifers (6.5%). Some heifers had mixed infections or more than one quarter infected with different pathogens.

These preliminary data also suggest that there is an impact of periparturient IMI on subsequent rates and time to clinical mastitis. The effect was not the same for all periparturient IMI. The important effect was associated with STR, KLEB and COLI infections and not with the most prevalent type of infection, CNS.