

Treatment of Early Postpartum Metritis in a Dairy Herd: Response and Subsequent Fertility

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Introduction

Infection of the uterus or the metritis complex is a commonly diagnosed disorder of the postpartum period in dairy cows. Rates of 32-80% have been reported in dairy herds. (1-6) The effect of metritis on milk production is not well documented, however, in one study cows classified as having severe metritis had a significant decline in production compared to cows identified as normal or having a mild infection. (1) Most investigations have been directed towards the effect metritis has on reproductive efficiency. When metritis was classified as mild or severe, the mild cases had no detrimental effect while those classed as severe had reduced fertility. (1,7,8) In reports where there was no attempt to grade the infections, cows with metritis had lower reproductive efficiency. (4,5,6,9)

In some cases the accuracy of making a diagnosis of metritis can be questioned, likewise, the need to treat all cases can be disputed, and the treatment strategy to follow is not clear. Over time there has been a wide array of treatments used with generally a high degree of clinical recovery. There is no doubt that a high percentage of early postpartum metritis cases make a spontaneous recovery, and this must be considered when evaluating treatments. Unfortunately, there are few controlled trials to judge treatment efficacy.

In the past few years a better understanding of the postpartum period has been gained. The postpartum period has been characterized and classified into 3 periods. (10) The bacteriology and endocrinology have been investigated, and the pathogenesis of pyometra outlined. (11) The role that prostaglandins may have on the postpartum uterus and the involutionary process has been studied, (12,13) and the various treatment options for uterine infections have been detailed. (10, 14, 15, 16)

The purpose of this study was to make a retrospective analysis from reproductive health records of postpartum metritis in a dairy herd.

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Materials and Methods

A retrospective study of the incidence and treatment of postpartum metritis as well as the response and subsequent fertility following therapy was done in the Purdue University Dairy Center herd. Analysis of reproductive records covered the 5 year period from January 1979 through December 1983. This time period was chosen because various treatments had been tried as well as some cases being left untreated. It was also a period of time when reproductive efficiency, milk production and management practices in the herd were stable.

The herd consisted of approximately 200 Holstein cows housed in free stalls and fed a total mixed ration. Breeding was done by artificial insemination beginning at the first estrus after 50 days postpartum. From May through October parturition occurred in a grassy grove; the remainder of the year maternity stalls were used. During the test period milk production averaged 16,500 pounds per cow per year, and the average calving interval was 13 months.

A reproductive health program was carried out with regular visits at 2 week intervals. Postpartum exams were done between 1 and 3 weeks after parturition with the average time being 2 weeks. Only cows that were judged to have a uterine infection but had not yet had their first postpartum ovulation were included.

Diagnosis of metritis was made by rectal palpation and visualization of reproductive tract discharges. Neither vaginoscopic nor manual exploration of the vagina were carried out. The criteria used for the diagnosis of metritis were ballottement of fluid, possible crepitant feel of the uterine contents, lack of myometrial tone, retarded involution and the presence of abnormal discharge. The uterus was gently massaged and an attempt was made to elevate the cervix and anterior vagina to bring about expulsion of uterine and/or vaginal fluids. The retention of uterine fluid, the presence of crepitus and the observation of abnormal drainage were weighted most heavy in making a diagnosis. The character of the discharge ranged from thin, watery and fetid early to purulent or mucopurulent later.

The ovaries were examined for the absence or presence of luteal tissue. Only cows with no distinguishable luteal tissue were included. Neither blood nor milk progesterone levels were utilized to verify the accuracy of rectal examination of

the ovaries.

Individual cow record cards were maintained and included uterine condition with approximate amount of fluid, character of discharges and status of the ovaries.

During the study period 6 different treatment groups were identified. Groups: C, control, no treatment; IN, infusion of the uterus, 50-100 ml of 5% solution of Lugol's iodine (0.25% iodine); PG, prostaglandin, 25 mg Lutalyse^a IM; PG & E, prostaglandin and estrogen, 25 mg Lutalyse IM and 6 mg ECP^b IM; E and O, estrogen and oxytocin, 6 mg ECP IM followed by 100 units oxytocin IM daily for 3 days; E, estrogen, 6 mg ECP IM. Treatments were administered one time at the first postpartum exam, and all treated cows were evaluated in 2 weeks and placed in one of 3 groups. Groups: (I) normal (uterus involuted, no abnormal discharge, may or may not have a CL); (II) no luteal tissue, fluid in the uterus, may have abnormal discharge or no palpable uterine fluid but discharge present and (III) pyometra, (fluid in the uterus with an identifiable CL). Corpora lutea in groups I and III were the result of an ovulation between treatment and reevaluation.

Cows in group I received no further treatment. Cows in group II were infused with 50 ml of 5% Lugol's iodine, and those in group III received 25 mg of Lutalyse IM. Cows in treatment Group C that were in groups II or III at the first recheck were treated accordingly. Retreated cows were evaluated at 2 week intervals and handled as above.

Retained fetal membranes (RFM) were recorded in the health records. Therapy consisted of infusing approximately 5 mg of soluble tetracycline powder in a liter of water into the uterine cavity daily or each second day until the membranes were released. No attempt at manual removal was made, but the protruding portion was cut off at the base of the udder. Parenteral antibiotics were administered if the body temperature rose above 104° F, or if there were signs of systemic illness.

Statistical Analysis:

For all pregnancy data a contingency table was used to calculate frequencies for each treatment. A test statistic was then calculated and a X² distribution was used to test differences. For days to conception and services per conception a one way ANOVA was used to compare treatment means. A Student-Newman-Keuls test was used to test for significant differences.

Results

In the 5 year survey period there were 1108 total parturitions, 184 cows with RFM (16.6%) and 374 cases of metritis (33.8%). Cows with RFM had a significantly higher

a—Dinoprost tromethamine, Upjohn Co.
 b—Estradiol cypionate - Upjohn Co.
 c—Oxytocin Injection - W.A. Butler Co.
 d—Vetquamycin - 324 - Pfizer

incidence (P<0.005) of metritis (53% of 184) than did cows without RFM (30% of 924).

After one treatment 78% of all treated cows were classified as normal. There were no significant differences between treatment groups in the percent of cows recovering after one treatment: C 77%, IN 75%, PG 83%, PG & E 85%, E & O 72% and E 74%. There were cows from each treatment group that were placed in both groups II and III following first post treatment exam. Of the 374 cows with metritis 74% conceived after 1 to 6 services and prior to 210 days postpartum, and the groups did not differ significantly with regard to conception rate: C 70%, IN 71%, PG 78%, PG & E 69%, E & O 73% and E 81%.

There were no differences among the groups in the number of days to conception, the services per conception and the percent conception to first service (TABLE I). The percent of cows conceiving before 86 days and before 110 days postpartum did not differ between groups (TABLE II).

There was a significant difference (P<0.05) in the percent of cows conceiving with RFM and metritis (66%) and those with metritis only (77%). However, days to conception and services per conception did not differ between cows conceiving after RFM and metritis and metritis only (TABLE III). There were no differences between cows treated one time and more than once with regard to percent of total pregnant, days to conception and services per conception (TABLE IV).

TABLE 1. Days to Conception, Services per Conception and Percent Conception to First Service by Treatment Groups*.

| Treatment Groups | Total Number In Group | Days to Conception** | Services Per Conception** | Percent Conception To First Service |
|------------------|-----------------------|----------------------|---------------------------|-------------------------------------|
| C | 30 | 107.8 | 1.95 | 47.6 |
| IN | 101 | 97.4 | 1.83 | 52.8 |
| PG | 36 | 100.3 | 1.75 | 53.6 |
| PG & E | 75 | 110.0 | 2.11 | 44.2 |
| E & O | 29 | 103.7 | 1.80 | 47.6 |
| E | 103 | 111.8 | 2.24 | 36.1 |
| TOTALS | 374 | 105.7 | 2.00 | 45.5 |

* Calculated on pregnant cows only

** Mean

TABLE 2. Percent of Cows Conceiving Prior to 86 Days and Between 86-110 Days Postpartum by Treatment Groups*.

| Treatment Groups | Total Number of Pregnant Cows | Pregnant Prior To 86 Days | Pregnant Prior To 110 Days |
|------------------|-------------------------------|---------------------------|----------------------------|
| C | 21 | 33.3 | 66.7 |
| IN | 72 | 52.8 | 68.0 |
| PG | 28 | 39.3 | 67.9 |
| PG & E | 52 | 40.4 | 57.7 |
| E & O | 21 | 42.9 | 57.1 |
| E | 83 | 30.1 | 56.6 |
| TOTALS | 277 | 40.0 | 61.7 |

* Calculated as a percentage of the pregnant cows

TABLE 3. Percentage Pregnant, Days to Conception and Services per Conception for Cows with RFM and Metritis or Metritis Only*.

| Group | Total No. | No. Pregnant | Percent Pregnant** | Days To Conception*** | Services Per Conception*** |
|----------------|-----------|--------------|--------------------|-----------------------|----------------------------|
| RFM & Metritis | 97 | 64 | 66.0 | 106.3 | 1.91 |
| Metritis Only | 277 | 213 | 76.9 | 105.5 | 2.04 |

* Calculated on pregnant cows only
 ** Significant (P < 0.5)
 *** Mean

TABLE 4. Percentage Pregnant, Days to Conception and Services per Conception for Cows Treated One Time or Two or More Times*.

| Group | Total No. | No. Pregnant | Percent Pregnant | Days To Conception** | Services Per Conception** |
|---------------------------|-----------|--------------|------------------|----------------------|---------------------------|
| Treated one time | 290 | 221 | 76.2 | 105.9 | 2.02 |
| Treated two or more times | 84 | 56 | 66.7 | 104.7 | 1.96 |

* Calculated on pregnant cows only
 ** Mean

Discussion

The incidence of metritis following RFM (1,3,4,5,9) and the total percent of metritis (1-6) in this herd are similar to other reports.

The metritis complex can be divided into those occurring prior to the first ovulation and CL formation and those after. Uterine infections in the early and intermediate postpartum periods (prior to first CL) may vary from an acute toxic condition shortly after parturition to a mild endometritis later and all gradations in between. After the first CL formation infections may exist as a pyometra with anestrus or a chronic endometritis without fluid accumulation but the occurrence of estrous cycles.

Treatment of pyometra with prostaglandins for their luteolytic effect is well documented and undisputed. (17-19) However, the accuracy of diagnosis (in some cases), the effects on fertility and milk production and the proper therapy for the metritis complex prior to the first CL formation can be disputed.

Rectal palpation is no doubt the most widely used method to diagnose metritis. During the first week postpartum accurate assessment of the uterine condition is difficult or impossible. In the second week accuracy of evaluation is much improved. By the end of the second week the entire normal involuting uterus can be outlined and sometimes retracted onto the pelvis and free of fluid accumulation. During the third week the normal uterus is retractable, and in many well fed dairy cows an ovulation has occurred.

Reproductive tract discharges may be misinterpreted. It

has been suggested that purulent vaginal discharge may not mean a uterine infection, but rather be a part of the normal defense reaction or reflect inflammation posterior to the uterus. (15) Cattle caretakers need to be educated to the normal lochial discharge i.e., appearance and duration of drainage. There are still dairymen who think this normal discharge is an indication of infection and administer unnecessary treatments.

The optimal time for the first postpartum uterine exam can be debated, but approximately 2 weeks would appear to be best. There is little doubt that errors, particularly in the absence of vaginal discharge, will be made when evaluating the uterus prior to this time. If the first routine postpartum exam is not carried out until 4 weeks, as is done in some fertility programs, a larger percentage of cows will be judged to be normal. In the presented survey the metritis incidence was 33.8% at 1-3 weeks postpartum, however, if the first examination had not been performed until 2 weeks later and assuming a spontaneous recovery rate equal to the control group, the incidence of metritis would have been 7.8%. However, it would appear that the prevalent feeling is that the sooner metritis is identified and treatment instituted, the less adverse the effect on fertility.

Vaginoscopic or manual exploration of the vagina to aid in diagnosing uterine infections is not commonly done. The time required to carry out these procedures and the likelihood of contaminating a normal cow are deterrents to their use. In one report, however, vaginal exams were more accurate than rectal exams in identifying endometritis. (8)

In our study one of the criteria for selecting cows classified as having early postpartum metritis was a lack of luteal tissue, and the presence or absence was based solely on rectal palpation. This method is subject to error. In 4 reports the average compatibility of palpation of CLs and progesterone concentration was 77%. (20-23) The major error was inability to identify a CL but progesterone levels were high indicating the presence of luteal tissue. Assuming errors of the same magnitude we would have included cows with CLs, and they should have responded favorably to prostaglandins. While not significantly different from other treatment groups, groups PG and PG & E did have the highest percent of recovery to one treatment.

Uterine infusions are widely used in the treatment of postpartum metritis. Many varying mixtures and volumes of antibiotics, sulfonamides and disinfectants have been infused into the cow's uterus, and in most instances there is clinical recovery. Unfortunately, in the case of severe metritis, treatments have been ineffective in restoring fertility to normal. (1,7,8) Tetracyclines have been recommended as the treatment of choice for early postpartum metritis with daily infusions for 3 days. (10) Disinfectants, in particular, and some antibiotics have been reported to depress in utero phagocytosis thus having an undesirable effect on the uterine defense mechanism. (15,24) For this reason it has been recommended that disinfectants not be used in the postpartum uterus. (15,24) While Lugol's iodine infusions did not

depress conception in this herd, others have reported lower fertility following its use. (7,25) Regardless of the type of medication it seems very questionable how effective and how well intrauterine infusions are distributed throughout a uterus full of exudate.

Evacuation of the uterus either with drugs that promote uterine contractions or by mechanical removal is an alternative to intrauterine infusions.

The luteolytic effect of prostaglandins is well established; however, their effectiveness as therapy for uterine infections in the absence of a CL is not clear. The uterotonic effect of prostaglandins has been reported. (12,26,27) Whether these induced myometrial contractions are of adequate intensity and duration to evacuate the uterus has not been clearly determined. Based on clinical recovery and reproductive efficiency, prostaglandins have been reported to be an effective treatment for postpartum metritis. (3,28,29,30)

Estrogens have long been employed for their effects on the reproductive tract i.e., stimulation of myometrial contractions, increased mucus secretion, increased blood supply and stimulation of the uterine defense mechanism by increased phagocytosis. Opponents of their use are concerned about the possible uptake of uterine toxins due to the increased vascularity and the development of cystic ovarian disease. Estrogens have been used either alone or followed by oxytocin for 2-3 days. Oxytocin is uterotonic, however, high doses have been reported to create uterine spasms. (15) Therefore, 20 units 3-4 x daily for 2-3 days after the priming effect of estrogen has been recommended. (15) In 2 reports estrogens were as effective as other treatments in bringing about a clinical recovery. (3,7)

Siphoning is a possible means of removal of uterine exudate, however, great care must be practiced. A soft hose should be used with very gentle manipulation. The uterine wall is quite friable, particularly in early postpartum acute metritis, and its rupture has occurred in attempting to siphon out the contents.

In conclusion, the make-up of the data of this survey could be criticized on several points. No attempt was made to classify the metritis cases according to severity so there could possibly be an unequal number of more severe cases in some groups. Without the use of progesterone analysis some cows with CLs were likely included. And with the subjective methods of diagnosis the chance that some normal cows were treated is very likely. However, as presented, the data for this herd would indicate a significant degree of spontaneous recovery, and the various treatments used neither aided nor hindered the clinical recovery or reproductive efficiency. Likewise none of the treatments were effective in preventing the development of some pyometras; however, repeated treatments at the initial diagnosis may have been beneficial.

Summary

A retrospective study of the incidence and treatment of postpartum metritis as well as the response and subsequent

fertility following therapy was done in a dairy herd. Diagnosis of metritis was made between 1 and 3 weeks postpartum and only cows without apparent luteal tissue were included. The study covered a 5 year period during which time there were 1108 parturitions, 184 cows with retained fetal membranes (RFM) (16.6%) and 374 cases of metritis (33.8%). Cows with RFM had a significantly higher incidence ($P < 0.005$) of metritis than did cows without RFM. Six treatment groups included: iodine infusion of the uterus, prostaglandin IM, prostaglandin and estrogen IM, estrogen and oxytocin IM, estrogen IM and no treatment. There were no significant differences between treatment groups in the percent of cows recovering after one treatment, conception rate, days to conception, services per conception, first service conception, percent of cows conceiving before 86 days postpartum and percent conceiving before 110 days postpartum. There was a significant difference ($P < 0.05$) in the percent of cows conceiving with RFM and metritis (66) and with metritis only (77%). Days to conception and services per conception did not differ between cows conceiving after RFM and metritis and metritis only. There were no differences between cows treated one time and more than once with regard to percent of total pregnant, days to conception and services per conception.

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C. F. B. Hofmeyr is professor emeritus and former Dean of the Department of Surgery, Faculty of Veterinary Science, University of Pretoria, South Africa. This position followed a long career in private practice and as a professor specializing in veterinary surgery. He continues to be consulted internationally, particularly on urogenital conditions. He has given lectures in Europe, South America, and the United States.

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