

# Treatment of Postpartum Metritis In Dairy Cows Caused by *Actinomyces Pyogenes*

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## Introduction

Metritis is a commonly diagnosed disorder in the postpartum dairy cow. Metritis occurs in the first three weeks postpartum and prior to an ovulation in contrast to pyometra which is preceded by an ovulation and corpus luteum formation which usually occurs during the third week after parturition.<sup>1</sup>

There is a high degree of bacterial contamination of the uterus concurrent with parturition. In a study of dairy cows following parturition, bacteria were recovered from 93% of the uteri three to 15 days postpartum, however, the infection rate decreased to 9% between days 46 to 60.<sup>2</sup> Any condition which allows for increased bacterial contamination of the uterus i.e. prolonged dystocia, retained fetal membranes or prolapse of the uterus will increase the chances of metritis development. Unsanitary calving areas, dirty cows and unclean manipulative procedures will enhance contamination of the uterus. Underlying these predisposing conditions are a weakened uterine defense mechanism and the capacity of the uterus to contract and expel fluid and debris. The effectiveness or failure of these two factors probably account in large part for spontaneous recovery or failure to recover from metritis.

Acute metritis, which occurs the first week postpartum is characterized by signs of septicemia or toxemia. Subacute metritis, which may occur anytime during the first three weeks, may or may not be accompanied by mild signs of systemic illness. There will be slow involution of the uterus, possible ballooning of the uterus, presence of crepitus and fluid and abnormal vaginal discharge. The character of the discharge ranges from red, thin, watery and fetid early to purulent or mucopurulent later.

A wide array of bacteria have been isolated from the postpartum uterus.<sup>1,4</sup> It is generally accepted, however, that *Actinomyces (Corynebacterium) pyogenes* (*A. pyogenes*) is the bacterium that is of prime importance.<sup>5,6</sup> It is most destructive to the endometrium, most likely to cause salpingitis and, therefore, most likely to reduce the fertility of currently infected or previously infected cows. *Fusobacterium necrophorum*<sup>1,7</sup> and *Bacteroides*

*melaninogenicus*,<sup>1</sup> two anaerobes, may potentiate the harmful effects of *A. pyogenes*.

Management and therapy of early postpartum metritis remains controversial. Accurate diagnosis of metritis, categorizing cows with metritis, obtaining sufficient numbers of affected cows and spontaneous recoveries make it difficult to design reliable therapy trials. Suggested treatments include antibacterial uterine infusions, systemic antibacterials, prostaglandins, estrogens, oxytocin and various combinations as well as manual drainage and uterine lavage. All listed treatments have met with some success as measured by gross involution of the uterus and alteration of some reproductive efficiency parameters.

The appropriate antibiotics for systemic and intrauterine use in cows with metritis have been outlined.<sup>8</sup> However, the irritating effects and possible suppression of the immune system by some intrauterine medications,<sup>9,10</sup> and the issue of antibiotic residues in milk have prompted the search for alternative therapy. Estrogens have long been used but are unpopular with some for fear of increased vascularity of the uterus and development of cystic ovaries. Prostaglandins, on the other hand, appear to be gaining favor. Since there is no luteal tissue present in the metritic cows in this study the lytic effect of prostaglandin is not an issue. Rather, the possible uterotonic effect may be beneficial. However, some studies have demonstrated significant myometrial stimulation<sup>11-14</sup> while others have not.<sup>15,16</sup>

A small trial was designed to compare intrauterine oxytetracycline, systemic prostaglandin and no treatment as therapy for metritis in cows from which only *A. pyogenes* had been cultured from the uterus.

## Materials and Methods

Holstein cows from the Purdue University Dairy Center which calved between March 1987 and August 1988 were used. Accurate records of all pertinent events were kept. Rectal examinations of the reproductive organs were done nine to 23 days postpartum. The mean initial examination was 16 days postpartum. While palpation of uterine fluid, crepitus and retarded involu-

tion were suggestive of metritis the determining sign was a red-fetid, purulent or mucopurulent vaginal discharge. Only cows which exhibited such a discharge and were determined to the best of the examiner's ability by rectal palpation to have no luteal tissue were considered metritic. Neither blood nor milk progesterone levels were done. At this time a uterine fluid sample was obtained aseptically.

After cleansing the vulva a small sterile speculum with a sterile infusion pipette enclosed was introduced to the external os of the cervix by the recto-vaginal method. The pipette was then passed through the cervix to the uterine body and fluid was aspirated into the pipette by use of a sterile rubber adapter and syringe fitted onto the pipette. The fluid-filled pipette was withdrawn through the speculum to the outside, capped on both ends with sterile polybulbs and submitted to the bacteriology laboratory within 60 minutes. Only aerobic cultures were performed. Antibiotic susceptibility tests were done on all isolates. Only cows from which *A. pyogenes* was isolated were included in the final results.

Immediately after the initial uterine sampling was done, treatments on alternate cows were begun. Cows in group OTC received infusions of three grams of oxytetracycline (Liquamycin-Pfizer) in 250 ml of water on three successive days. Cows in group P were injected with 25 mg of prostaglandin F<sub>2α</sub> (Lutalyse-Upjohn) IM daily on three successive days. Cows in group C served as untreated controls.

Fourteen days after the initial examination date all affected cows were re-evaluated by rectal palpation. Ovarian status, condition of the uterus and cervix and presence or absence of vaginal discharge were recorded. Another uterine sample, as outlined above, was obtained at this time and cultured for aerobic bacteria. No further treatments were given. All cows were bred by artificial insemination at the first estrus beyond 40 days postpartum.

## Results

According to the described criteria 24 cows were diagnosed with metritis. Of the 24 cases 21 were positive for *A. pyogenes* and included in the final results. The cows in the *A. pyogenes* group were two to eight years of age; seven gave birth to twins and 11 had retained fetal membranes. At the time of initial diagnosis of metritis and culture, days postpartum ranged from nine to 23; observed vaginal discharge was red and fetid in 15 cows and purulent or mucopurulent in six. Nine, six and six cows were included in groups OTC, P, and C, respectively. (Tables 1, 2 and 3)

Tetracycline susceptibility results on the *A. pyogenes* isolates in group OTC showed six resistant, one with moderate susceptibility and in two there was not sufficient growth to determine susceptibility.

Second rectal examination (range 23 to 37 days; mean 30 days postpartum) of all cows 14 days after initial exam revealed gross involution to be complete or near complete in all groups. No cows had palpable uterine fluid. Purulent or mucopurulent vaginal discharge was observed in none, four and two cows in groups OTC, P, and C, respectively. Results of the second uterine culture showed one of nine, four of six, and four of six cows were positive for *A. pyogenes* in groups OTC, P, and C, respectively. There was a significant reduction ( $P < 0.005$ ) in the *A. pyogenes* infected uteri in group OTC compared to groups P and C.

Rebreeding and fertility are outlined in Tables 1, 2 and 3. Numbers are too small to make any significant conclusions. All nine cows in group OTC were rebred and seven conceived, however, three subsequently aborted. Three of six cows in group P conceived and one aborted. Only four of six cows in group C were rebred and two conceived.

## Discussion

The correct or best approach to therapy of postpartum metritis is not clear, and reliable therapy trials are difficult to design. There is agreement that *A. pyogenes* is, without a doubt, the most significant bacterium recovered from the postpartum uterus. The small trial described is an attempt to evaluate two popular treatments (oxytetracycline infusions and prostaglandin injections) and no treatment in cows with a definite metritis from which *A. pyogenes* has been isolated. While numbers were limited, oxytetracycline infusions significantly reduced the number of cows with *A. pyogenes* when compared to prostaglandin and control cows. This occurred in spite of poor susceptibility results. Tetracycline infusions and systemic penicillin have been determined to be the therapy of choice for early postpartum metritis.<sup>8</sup> However, in a series of 28 uterine isolates of *A. pyogenes* from four dairy herds only two of 28 and four of 28 were susceptible to penicillin and tetracycline, respectively.<sup>17</sup>

Gross involution occurred the same in all groups fortifying the observation that spontaneous recovery, at least expulsion of uterine contents and gross involution, is common.

While numbers were too small to draw conclusions on subsequent rebreeding and fertility, there was a tendency for the cows in group OTC to be more fertile, however, three cows subsequently aborted. Two abortions were in the first trimester and the fetuses were not recovered, and the five month fetus was not submitted to the laboratory to determine if *A. pyogenes* was present. *A. pyogenes* has been well documented as a cause of bovine abortion.<sup>18-20</sup>

Combining all groups: 19 cows were rebred, 12

became pregnant within 180 days in milk, but four of the 12 aborted; one of the four conceiving again after aborting. Also five cows were culled because of failure to conceive by 180 days in milk, and only nine of 19 delivered a normal term calf. While other factors may well have contributed to the reduced fertility, it is reasonable to assume that the infection with *A. pyogenes* was a major contributor.

While the correct course of therapy is important, all efforts should be made to prevent development of metritis by attempted control of known predisposing conditions. As more knowledge is gained about the uterine defense mechanism and enhancement of uterine contractility, hopefully, it can be applied to prevention and treatment of metritis.

**Table 1. Oxytetracycline Group: Three grams in 250 ML of water infused daily for three consecutive days.**

Cow	Twins	RFM (a)	Days PP (b)	First Culture <i>A. pyogenes</i>	Second Culture <i>A. pyogenes</i> (c)	Days to conception	S/C (d)	Outcome (e)
1290	-	-	20	+	-	Not Pregnant	-	Culled for Low production
1542	+	+	17	+	-	Not Pregnant	-	Culled for reproduction
1737	+	+	21	+	+	99	1	Normal calf
1951	-	+	14	+	-	43	1	Aborted before 90 days
1822	-	+	13	+	-	115	1	Normal calf
1856	-	+	22	+	-	46	1	Aborted at 150 Days
1462	+	+	19	+	-	165	3	Normal calf
1849	-	-	18	+	-	105/176	1/1	Aborted before 60 days/ Normal Calf
2032	-	-	12	+	-	135	5	Normal calf

- a) Retained fetal membranes
- b) Days postpartum when metritis diagnosed and first culture taken
- c) Second culture taken 14 days after first
- d) Services per conception
- e) Cows culled for reproduction were at least 180 days in milk and not pregnant

**Table 2. Prostaglandin Group: 25 Mg. injected IM daily for three consecutive days.**

Cow	Twins	RFM (a)	Days PP (b)	First Culture <i>A. pyogenes</i>	Second Culture <i>A. pyogenes</i> (c)	Days to conception	S/C (d)	Outcome (e)
1709	+	-	9	+	+	125	2	Normal calf
1868	-	-	17	+	-	72	1	Aborted at 7 months
1805	-	+	16	+	+	Not Pregnant	-	Culled for Reproduction
1968	+	-	13	+	-	142	2	Normal Calf
1945	-	-	20	+	+	Not Pregnant	-	Culled for Reproduction
1989	-	+	14	+	+	Not Pregnant	-	Culled for Mastitis

- a) Retained fetal membranes
- b) Days postpartum when metritis diagnosed and first culture taken
- c) Second culture taken 14 days after first
- d) Services per conception
- e) Cows culled for reproduction were at least 180 days in milk and not pregnant

## Summary

Three treatments (oxytetracycline infusions, prostaglandin injections, and no treatment) were applied to Holstein cows with postpartum metritis from which *A. pyogenes* had been isolated from the uterus. Gross involution was not different between groups, but oxytetracycline infusions significantly reduced ( $P < 0.005$ ) the incidence of *A. pyogenes* infected uteri. Numbers were too small to pass judgement on fertility between groups, but when all groups were combined fertility was definitely reduced.

**Table 3. Control Group: No treatment.**

Cow	Twins	RFM (a)	Days PP (b)	First Culture <i>A. pyogenes</i>	Second Culture <i>A. pyogenes</i> (c)	Days to conception	S/C (d)	Outcome (e)
1858	-	-	13	+	+	Not Pregnant	-	Culled for Reproduction
1795	-	+	13	+	-	142	4	Normal Calf
1921	+	+	23	+	-	138	2	Normal Calf
1912	-	-	13	+	+	Not Pregnant	-	Culled for Reproduction
1709	+	+	14	+	+	Not Pregnant	-	Sold for Dairy Purposes Before Bred
1959	-	-	16	+	+	Not Pregnant	-	Sold for Dairy Purposes Before Bred

- a) Retained fetal membranes
- b) Days postpartum when metritis diagnosed and first culture taken
- c) Second culture taken 14 days after first
- d) Services per conception
- e) Cows culled for reproduction were at least 180 days in milk and not pregnant

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## Abstracts:

### **Increased reproductive losses in cattle infected with bovine pestivirus around the time of insemination**

M.R. McGowan, P.D. Kirkland, S.G. Richards, I. R. Littlejohns

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Unmated heifers seronegative to bovine pestivirus were used to investigate the effects on conception and embryo-fetal survival of pestivirus infection around the time of artificial insemination. The reproductive performances of three groups were compared, the control group did not become infected during pregnancy, group 1 heifers were infected by contact with a persistently infected cow and calf four days after insemination and group 2 heifers were infected intranasally nine days before insemination. Conception rates and embryo-fetal survival were monitored by serial serum progesterone assays, transrectal ultrasonography and manual palpation of the uterus. The conception rates (determined 20 days after insemination) of 60 per cent (nine of 15) and 44 per cent (eight of 18) for groups 1 and 2 were lower than the 79 per cent (11 of 14) achieved by the control group. The group 1 heifers subsequently experienced significant embryo-fetal loss, resulting in a pregnancy rate (determined 77 days after insemination) of 33 per cent (five of 15), significantly lower than the control group's 79 per cent (11 of 14). The pregnancy rate of the group 2 heifers (39 per cent, seven of 18) was also significantly lower than that of the controls, largely as a result of the group's poor conception rate. All the heifers diagnosed pregnant 275 days after insemination were induced to calve. No persistently infected calves were born.

### **Effects of administration of recombinant bovine somatotropin on the responses of lactating and non-lactating cows to heat stress**

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An experiment was performed to determine whether bovine somatotropin (BST) increases the severity of responses to heat stress and whether this effect depends on an increase in milk yield. Lactating and nonlactating cows received daily SC injections of BST (25 mg) or sodium phosphate solution for 12 days. Rectal temperatures and respiration patterns were not affected by BST when cows were maintained in a thermoneutral environment on day 9 of treatment. On day 12, cows were heat stressed by exposure to direct solar radiation. Rectal temperature, respiration rate, and the frequency of open-mouth panting increased as a result of heat stress. For lactating and nonlactating cows, those treated with BST had higher rectal temperatures and rate of open-mouth panting than cows treated with sodium phosphate solution. Administration of BST can increase the severity of responses of cows to heat stress without changing milk yield.