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EFFECTS OF VARIOUS UTERINE TREATMENTS ON CALVING-TO-CONCEPTION INTERVAL

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Summary

Cows were given intrauterine infusions of enzymes, antibacterials, bacteria, or a combination of enzymes and antibacterials after calving to study basic changes in the post-partum uterus and effect on rebreeding. The group given nitrofurazone, an antibacterial compound, had the highest conception rate; however, calving-to-conception interval was lengthened. Combining proteolytic enzymes with the nitrofurazone gave an interval to conception similar to that of control cows. Nitrofurazone caused the uterine lining to erode. Combining enzymes with nitrofurazone prevented some of the erosion.

Innoculating the uterus with bacteria (*Lactobacillus acidophilus*) after calving did not affect the calving-to-conception interval.

Introduction

Failure to produce a calf and long calving intervals are costly in beef production. A cow normally is infertile 50 to 60 days after calving. Any complications that interfere with normal involution of the uterus or return to estrus further delay rebreeding. After calving the uterus must reduce in size, slough necrotic tissue, and regenerate a new lining for that lost. Sloughing necrotic tissue and bacterial content of the uterus after calving may be important in both the uterine involution process and regenerating new tissue to maintain the next pregnancy. We studied effects of an intrauterine infusion of nitrofurazone and/or proteolytic enzymes or *Lactobacillus acidophilus* on uterine repair and rebreeding.

Methods and Materials

Trial 1. Forty-five cows were allotted to one of four groups at parturition and administered either intrauterine infusions of (1) saline, (2) nitrofurazone, (3) alpha-chymotrypsin and collagenase or (4) alpha-chymotrypsin plus collagenase and nitrofurazone. The saline infused group served as controls. Infusions were given the first, second, and third weeks post-partum in volumes of 100, 50, and 25 ml., respectively. The proteolytic enzymes (Worthington Bio. Chem. Corp.; Freehold, N. J.) were administered in a concentration of mg per ml of sterile saline. Twenty-five ml of 0.2% Furacin solution (Eaton Lab; Norwich, N. Y.) was also diluted to the above volumes. Crystalline proteolytic enzymes were dissolved and combined not more than 24 hours before infusion.

The time of ovulation and diameter of the pregnant and nonpregnant uterine horns were determined at 7-day intervals after calving by rectal palpation. Uterine biopsies were obtained at 14, 21, and 28 days postpartum. Intervals from calving to ovulation, estrus, uterine involution, and conception were determined.

Trial 2. All pregnant cows were corralled once a week; those that had calved the previous week were placed in one of three uterine-treatment groups: (1) untreated controls, (2) Lactobacillus acidophilus in M.R.S. broth or (3) Lactobacillus acidophilus grown in M.R.S. broth and resuspended in 0.1% peptone water. The stock culture of Lactobacillus acidophilus was of bovine uterine origin and was administered at a rate to insure a minimum of 1.5×10^8 bacteria.

Results and Discussion

Trial 1. The uterine treatment had no statistically significant effect on intervals from parturition to either ovulation or estrus or on uterine involution (Table 1). Mean intervals from parturition to ovulation and to estrus were 22.7 and 31.4 days, respectively. Ovulations observed within the first 20 days postpartum were on the side of the previously nongravid horn in 92% of the cases. Although nitrofurazone-treated cows had best conception rates, nitrofurazone significantly lengthened the parturition-to-conception interval over controls, enzyme-treated, and enzyme-plus-nitrofurazone-treated groups.

Palpation data indicated that uterine regression was complete (previously pregnant horn less than 40 mm) by an average of 30 days postpartum; however, the epithelial lining of the uterus was still eroded. Nitrofurazone treatment increased tissue loss and lengthened the time required to obtain a complete uterine lining. Concurrent treatment with enzymes decreased the nitrofurazone-induced erosion.

Infusion of nitrofurazone or proteolytic enzymes or both to clinically normal cows did not shorten the calving-to-conception interval; however, the nitrofurazone-treated group took longer to rebreed. Two theories are proposed for the delayed breeding: (1) nitrofurazone may have caused local inflammation in the uterus which eroded the uterine lining and delayed uterine repair, while enzymes given concurrently had an anti-inflammatory response or (2) nitrofurazone eliminated bacteria that produce beneficial enzymes that aid in uterine cleaning and repair.

Nitrofurazone treatments only interference with conception was delaying rebreeding. Intrauterine treatment with antibacterials seems to delay fertility but then it returns and may be improved.

Trial 2. Conflicting reports on bacterial populations of the uterus, effects of uterine bacteria and of antibacterials on uterine bacteria led to a pilot study to identify bacterial populations of the postpartum uterus. The pilot study revealed that Lactobacillus sp. were prevalent. They are acid producing bacteria reported to be a common constituent of vaginal flora that are a natural defense against infection.

Table 1

Effects of Proteolytic Enzymes and Nitrofurazone on Intervals from Parturition to Ovulation and to Estrus and on Uterine Involution

Treatment groups	No. of cows	First ovulation	First estrus	Uterine involution	Conception	No. cows not rebred
Control	13	18.8 $\pm$ 3.3 ^a	27.0 $\pm$ 3.8	25.8 $\pm$ 3.6	53.8 $\pm$ 4.3	2
Nitrofurazone	10	25.6 $\pm$ 3.1	36.1 $\pm$ 4.2	31.5 $\pm$ 4.1	72.8 $\pm$ 4.7*	0
Chymotrypsin & Collagenase	10	24.5 $\pm$ 3.0	31.8 $\pm$ 4.0	30.5 $\pm$ 3.5	60.1 $\pm$ 4.9	2
Nitrofur. + Chy. & Coll.	12	22.0 $\pm$ 3.2	30.7 $\pm$ 3.6	32.9 $\pm$ 4.1	53.2 $\pm$ 4.4	1

^aValues represent days postpartum $\pm$ S. E.

*Differ significantly from controls ($P < 0.05$)

A second study then evaluated effects of intrauterine administration of Lactobacillus acidophilus on interval to conception.

The intrauterine inoculation of Lactobacillus acidophilus in either 0.1% peptone water or M.R.S. broth did not alter the average parturition-to-conception interval (Table 2). Uteri of treated cows appeared to involute normally and more rapidly than those of untreated cows. Although sloughing of necrotic tissue was not measured histologically, rectal palpation indicated it was more rapid in treated than in untreated uteri.

The treatment regimes in clinically normal cows did not significantly shorten the parturition-to-conception interval; however, the anti-inflammatory properties of the proteolytic enzymes, as well as inoculation with specific types of bacteria, deserves serious consideration in the treatment of cows with clinically abnormal uteri.

Table 2
Effect on Rebreding after Calving of
Uterine Inoculation with
Lactobacillus Acidophilus (LA)

Treatment	No. of cows	Days from calving to conception $\pm$ SE
Control (No treatment)	11	54.7 $\pm$ 4.1
LA in peptone water	11	55.8 $\pm$ 5.5
LA in MRS broth	10	53.6 $\pm$ 2.5