

EFFECT OF CLEARANCE OF UTERINE FLUID ON PREGNANCY RATE IN MARES SUSCEPTIBLE TO ENDOMETRITIS

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SUMMARY

Endometritis affects many mares and results in reduced fertility and economic losses to the horse breeding industry. Mares that are susceptible to postmating endometritis have impaired uterine clearance resulting in accumulation of fluid and inflammatory products within the uterine lumen. The effect of clearing uterine fluid on the pregnancy rate was studied in 36 Thoroughbred mares. Mares were allocated to 4 treatments: 1) Untreated controls, 2) Intrauterine infusion of broad-spectrum antibiotics, 3) Oxytocin injection, and 4) Oxytocin injection followed by intrauterine infusion of antibiotics. Pregnancy rates of all treated groups were significantly higher than the untreated controls and it was accompanied by a significant decrease in intrauterine fluid accumulation monitored by ultrasonography. Pregnancy rate in mares treated with oxytocin and antibiotics was higher than that of groups 2 and 3. It appears that this combination treatment, which had two

modes of action (antibacterial activity and fluid drainage) might assist in the clearance of intraluminal uterine fluid and in increasing pregnancy rate in mares susceptible to postmating endometritis.

INTRODUCTION

Following mating many mares suffer from a transit endometritis (Ricketts and Mackintosh, 1987). Endometritis is a major cause of reduced fertility in mares and considered the third overall most important clinical problem in equine practice after colic and respiratory disorders (Traub-Dargatz et al., 1991). Breeding is considered a source of uterine contamination as intrauterine deposition of semen causes an inflammatory reaction from bacterial contamination of ejaculate or from spermatozoa (Troedsson, 1995). The transit uterine inflammation following breeding is physiological and necessary to clear the uterus from excess

spermatozoa and seminal plasma, however the condition may develop into a persistent inflammation in mares with impaired uterine defense mechanism (Troedsson, 1999). In the normal genitally healthy mare, the induced postcoital endometritis resolves within 48-72 hours, as the microorganisms and inflammatory byproducts are cleared from the uterus to leave the endometrium in a satisfactory state to receive the fertilized ovum at about 5 days after ovulation (Allen and Pycock, 1989). Mares that are unable to resolve this acute endometritis, mares with persistent and recurrent endometritis, are said to be susceptible to infection. In reproductively normal mares, the uterus is well protected from contamination by uterine defense mechanisms that includes: A) physical barriers including vulva, vagina, and cervix, B) several classes of immunoglobulins that have been isolated from equine uterus (Williamson et.al., 1983), C) polymorphic neutrophils that migrate into the uterine lumen and phagocytose any foreign agent (Watson et.al., 1987), D) physical clearance (uterine clearance) of intrauterine fluids and inflammatory products that accumulate in mares susceptible to endometritis (Troedsson et.al., 1993). Postcoital physical clearance of uterine fluids is a critical factor in the defense against uterine infection (Pycock and Allen, 1990; Le Blanc et.al., 1989; Troedsson and Liu, 1991) and any impairment in this function would render a mare susceptible to persistent endometritis (Allen, 1993).

The present study was designed to evaluate the effect of treatment of postmated mares that are susceptible to endometritis, with three treatment regimes for the clearance of intrauterine fluids and its effect on pregnancy rate.

MATERIALS AND METHODS

A total of 36 thoroughbred mares resident in two private farms were included in this study. All mares had a history of recurrent and persistent endometritis. The age of mares ranged from 10-15 years. The study was conducted during spring and early summer. Mares were teased daily by a stallion to monitor estrous behaviour. The reproductive organs of mares in estrus were examined by rectal palpation. Mares in estrus were naturally bred by previously tested, healthy and fertile stallions.

Immediately after mating mares were assigned to one of four treatment groups, as follows: Group 1: No treatment (control).

Group 2: Intrauterine antibiotic treatment. A suspension of 1200 mg procaine penicillin and 1500 mg dihydrostreptomycin (Penicillin PS injection: Univet), and 1500 mg gentamicin (Gentajel: 10%; Franklin Pharmaceuticals). The total volume was 20ml infused into the uterus.

Group 3: Oxytocin treatment, by intravenous injection of 20U oxytocin (Oxytocin: Farvet), 4-12

hours postmating.

Group 4: Antibiotics and oxytocin treatment. The treatment regime was the same as group 3 except that antibiotics infusion (as for group 2) was given 30 minutes after injection of oxytocin.

The uterus was examined ultrasonographically by a 5MHz linear-array transrectal transducer (Aloca Co. Ltd. Tokyo) for the presence of intraluminal fluid both before and within 2 days after mating. The quantity of intrauterine fluid was recorded as the maximum depth of fluid in the uterine body.

Pregnancy was diagnosed by rectal palpation and by ultrasonic examination of uterus 60 days postmating.

Statistical analysis of data was carried out using ANOVA (between groups), T-test (within group), and LSD for tests of significance (Noursis, 1986).

RESULTS

All treated groups showed significantly ($P<0.01$) higher pregnancy rates compared with the untreated group (table 1 and figure 1). There was no significant ($P<0.16$) difference in pregnancy rates between group 2 (intrauterine antibiotics) and group 3 (oxytocin administration). Mares in group 4 (antibiotics and oxytocin combination) had the highest (67.8%) pregnancy rate ($P<0.001$).

The intraluminal uterine fluid depth, monitored by ultrasonographic examinations, showed a significant ($P<0.05$) decrease from group 1 to group 4 (table 1). Among the treated groups, the intrauterine fluid depth was the lowest ($P<0.001$) in mares treated with both antibiotic and oxytocin (group 4).

Means with different letters (a,b,c) in the same column are significantly different ($P<0.01$)(LSD).

Table 1: Pregnancy rates and intrauterine fluid depth in control and treated mares.

Treated groups	No. of Mares	Number of mares with intrauterine fluid depth		Pregnancy rates (%)
		0-5 mm	6-20 mm	
1	9	2	7	22.5 ^a
2	9	4	5	57.3 ^b
3	9	5	4	52.5 ^b
4	9	6	3	67.8 ^c

Values are means \pm SEM.

Means with different letters (a,b,c) in the same column are significantly different ($P<0.01$) (LSD).

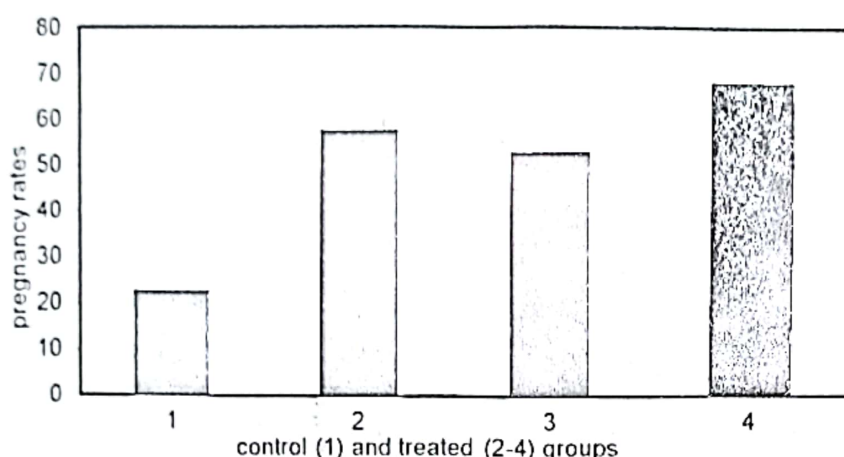


Figure 1: Pregnancy rates in control and treated mares.

DISCUSSION

Endometritis is a normal consequence of breeding mares and result from uterine contamination with both bacteria (Troedsson et.al., 1993) and semen (Troedsson, 1995). The reproductively healthy mare efficiently resolves the endometritis so that the intrauterine environment is optimal for embryo survival. However, some mares develop a persistent postmating endometritis leading to prolonged inflammation of the endometrium and early embryonic loss (Allen and Pycock, 1989). Mare's reproductive anatomy, defective myometrial contraction, overproduction of mucus, inadequate lymphatic drainage, or a combination of these factors will predispose the mare to postbreeding endometritis (Watson, 2000). Mares susceptible to postmating endometritis accumulated more fluids in their uterine lumen than did resist-

ant mares (LeBlanc et.al., 1989). The drainage of the intrauterine fluid, which is normal inflammatory exudates, is impaired in susceptible mares (Allen and Pycock, 1989; Troedsson, 1999).

In this study the effect of three treatment regimes on the establishment of pregnancy was investigated in postmated mares susceptible to endometritis, either to eliminate the intrauterine fluid accumulation or to reduce its production. Control untreated mares showed low pregnancy rates and increased amount of accumulated intrauterine fluids. The accumulation of uterine fluids is important in the pathogenesis of postmating endometritis, as these fluids have been reported to have spermicidal (McKinnon et.al., 1988) and embryocidal effects (Adams et.al., 1987).

Broad-spectrum antibiotics combination used in

this study showed its efficacy by the high pregnancy rates in treated mares (group 2). Similar results were recorded by Ricketts and Mackintosh (1987) who reported that such antibiotics combination were particularly successful against the majority of organisms isolated from cases of equine endometritis.

Oxytocin treated mares (group 3) had high pregnancy rates and decreased amounts of intrauterine fluid that could be contributed to the effect of oxytocin on uterine contraction and clearance of accumulated uterine fluid. Administration of oxytocin after mating stimulates the expulsion of uterine fluid and enhances uterine clearance and does not adversely affect fertility of mares (Allen, 1991; LeBlanc et.al., 1994). The importance of physical uterine clearance was confirmed by the observations that administration of uterotonic drugs to mares with delayed uterine clearance resulted in normal clearance of colloids from the uterus, and by treatment of mares with prostaglandin inhibitors made them susceptible to delayed uterine clearance (LeBlanc et.al., 1994; Cadario et.al., 1995). LeBlanc et.al. (1998) have suggested that the position of the uterus within the abdomen may affect a mare's ability of rapid uterine clearance. They reported that a uterus that tilts ventrally in relation to the pelvic prim might contribute to the inability of mares, with delayed uterine clearance, to rapidly clear their uterine lumen of contamination. In a recent study by Rigby et.al. (2001), have reported that mares suscep-

tible to postmating endometritis have delayed physical clearance of uterine contents that was associated with dysfunctional uterine contractility that could be developed from repeated and prolonged stretching of the myometrium during pregnancy. They have also reported that prostaglandin F metabolites are elevated following oxytocin release in reproductively normal mares while, in mares susceptible to postmating endometritis lower levels of prostaglandin metabolites were measured. On the other hand, administration of oxytocin immediately after breeding mares (30 minutes after insemination) may cause sufficient uterine contractions to evacuate the uterine contents prior to optimal colonization of the oviductal isthmus by spermatozoa (Rigby et.al., 1999).

The pregnancy rates were highest in mares given both antibiotics and oxytocin. This result suggests that treatment of mares (group 4) had two modes of action: antibacterial activity and physical uterine clearance. Uterine contractility is important in the clearance of uterine fluid, but not necessarily for the elimination of bacteria. Impaired uterine contractility in mares with delayed uterine clearance, could be contributed to the pathogenesis of persistent mating-induced endometritis (Nikolakopoulos and Watson, 1999). The antibacterial activity of antibiotics and the reduction in the amount of intrauterine fluid, brought by oxytocin administration, could have acted together to eliminate or reduce the adverse effects of uterine fluid accumulation and the subsequent increase in pregnancy

rates.

It could be concluded that treatment with antibiotics combination and oxytocin appeared to have an additive beneficial effect on increasing the pregnancy rate in mares susceptible to endometritis.

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