Effect of Oxytocin and PGF2α on Luteal Formation, Function, and Pregnancy Rates in Mares

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Administration of the PGF2α analogue cloprostenol on Days 0 and 1 following ovulation resulted in decreased progesterone production and pregnancy rates in mares. Oxytocin administration at the same time had no detrimental effect. On the basis of this study, oxytocin is the uterotonic agent of choice for postovulatory therapy to assist uterine evacuation. Author’s address: P.O. Box 2187, Corvallis, OR 97339. © 2001 AAEP.

1. Introduction

Endometritis is the most common cause of subfertility in the mare. A recent review categorized endometritis into 4 groups: (1) sexually transmitted disease, (2) chronic infectious endometritis, (3) persistent breeding-induced endometritis, and (4) chronic degenerative endometritis (endometrosis). Although infectious infertility is an important cause of endometritis, persistent breeding-induced endometritis has been suggested to be a more significant cause of infertility in susceptible mares. The goal of treatments of mares with persistent breeding-induced endometritis is to assist the uterus in the physical clearance of uterine fluid and inflammatory products. Recommended therapies include uterine lavage and the administration of uterotonic drugs, oxytocin or PGF2α. Prostaglandins have been demonstrated to be released very early in mares with endometritis and have subsequently been shown to play a useful role in increasing myometrial activity and assisting uterine clearance. An advantage cited for the PGF2α analogue cloprostenol is its longer duration of activity (5 hours) compared to oxytocin (45 minutes). Equine practitioners are currently incorporating the use of cloprostenol in the management of breeding-induced endometritis with limited clinical data on potential adverse effects.

The goal of this study was to investigate the effects of cloprostenol and oxytocin on corpora luteal formation, function, and pregnancy rates in mares when administered in the immediate postovulatory period.

2. Materials and Methods

Eight mature, reproductively normal, cyclic mares were included in the study. Estrus was induced by the administration of 250 μg cloprostenol, and mares were examined daily by transrectal palpation and ultrasonography to monitor follicle development and time of ovulation. Once a 35 mm follicle was identified, the mares were inseminated with 500 × 10⁶ progressively motile, morphologically normal spermatozoa from one stallion. Semen was collected with the aid of an artificial vagina and extended in a skim milk based extender containing...
amakacin and penicillin. The mares were inseminated every other day until ovulation was detected. Each mare received 2500 IU human chorionic gonadotropin (hCG) at the time of the first insemination to facilitate ovulation and minimize the number of inseminations. Following ovulation, the mares were randomly assigned to 1 of 4 treatment groups. Mares received the following treatments once daily by intramuscular (IM) injection on the day ovulation was detected (Time 0) and at 24 hours: Group 1, saline (SAL; 1.0 ml); Group 2, cloprostenol (CLO; 250 μg); and Group 3, oxytocin (OT; 20 IU). Additionally, Group 4 mares received oxytocin (OT; 20 IU) twice daily at 12 hour intervals on Days 0 and 1. Blood samples were collected from all mares daily from the day of ovulation (Day 0) to 14 days postovulation (Day 14). The blood samples were centrifuged, and the plasma was harvested and frozen until assayed for progesterone concentrations by radioimmunoassay. All mares were examined for pregnancy by transrectal palpation and ultrasonography on Day 14. Mares that were found to be pregnant at Day 14 received 500 mg cloprostenol to induce luteolysis and return them to cyclicity. Mares were then reassigned to another treatment group so as to follow each mare through a total of 4 ovulatory cycles. Pregnancy rates between groups were compared using a one-way analysis of variance (ANOVA). Progesterone concentrations and pregnancy rates were combined and are reported together. There was no difference in progesterone concentrations between the groups before the start of treatments (day of ovulation). Mares receiving CLO had significantly lower (P < 0.01) progesterone concentrations than mares receiving OT or SAL on Days 1–7 (Fig. 1). Afterward, progesterone concentrations were comparable to OT- and SAL-treated mares. Pregnancy rates at 14 days were lower (P < 0.05) in mares treated with CLO than OT or saline, 3/8 (37.5%; CLO), 11/16 (68.8%; OT), and 5/8 (62.5%, SAL).

4. Discussion
The influence of postovulatory prostaglandin F2α administration on luteal formation, function, and pregnancy rates has not been previously reported. Based on this study, luteal formation and function, as evidenced by progesterone concentrations, were significantly altered in mares receiving single doses of CLO on the day of ovulation and at 24 hours. Oxytocin administration in the same time periods had no effect on progesterone production. Administration of multiple doses of OT on the day of ovulation and Day 1, likewise had no effect on progesterone concentrations. Pregnancy rates were lower in mares receiving CLO on the day of ovulation and Day 1 compared with mares receiving saline or OT. Multiple doses of OT on the day of ovulation and the day following ovulation had no effect on pregnancy rate. No effect of sequential ovulating and breeding cycles was noted as the per cycle pregnancy rate for OT- and SAL-treated mares remained consistent throughout the 4 treatment cycles (3/4, 2/4, 3/4, 3/4; overall 11/16, 68.8%; OT) and (1/2, 2/2, 1/2, 1/2; overall 5/8; 62.5%; SAL).

Fig. 1. Blood progesterone concentrations at Days 0–14 in mares treated with 2500 IU hCG at the time of artificial insemination and 1 ml saline on Days 0 and 1 after ovulation (●); 2500 IU hCG at the time of artificial insemination and 20 IU oxytocin on Days 0 and 1 after ovulation (▲); 2500 IU hCG at the time of artificial insemination and 20 IU oxytocin every 12 hours on Days 0 and 1 after ovulation (●); 2500 IU hCG at the time of artificial insemination and 250 μg cloprostenol on Days 0 and 1 after ovulation (●). Different letters (a, b) corresponding to the same day indicate significant differences (e.g., P < 0.05).
In a previous study in which mares were not inseminated, a single dose of CLO on the day of ovulation did not significantly alter progesterone concentrations at 72 hours and beyond postovulation compared with saline-treated controls. An initial decrease in progesterone concentrations was noted, but a resurgence occurred by 72 hours. Whether this decrease would have an effect on pregnancy rates requires further investigation. Additionally, administration of CLO prior to ovulation had no effect on luteal formation or progesterone production. In summary, multiple doses of oxytocin on the day of ovulation and the day following had no effect on progesterone production or pregnancy rates. Cloprostenol is capable of interfering with normal luteal formation resulting in decreased progesterone production and reduced pregnancy rates. Oxytocin is the uterotonic agents of choice to facilitate uterine clearance to manage mating-induced endometritis with delayed uterine clearance. If cloprostenol is required after ovulation to assist in reducing persistent uterine edema, progesterone supplementation is warranted.

References and Footnotes

*aEstrumate, Haver Mobay, Shawnee, KS.
*bKenney Semen Extender with Amakcin & KPen G, Har-Vet, Springville, WI.
*cChorulon, INTERVET, Inc, Millsboro, DE.
*dOxytocin Injection, VEDCO, St. Joseph, MO.
*eCoat-A-Count Progesterone, Diagnostic Products Corporation, Los Angeles, CA.