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Theriogenology
ELSEVIER
Theriogenology 65 (2006) 1145–1158
www.journals.elsevierhealth.com/periodicals/the

Seasonal effects on attempts to synchronize estrus and ovulation by intravaginal application of progesterone-releasing device (PRID™) in mares

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Received 23 January 2005; received in revised form 7 July 2005; accepted 31 July 2005

Abstract

To investigate seasonal effects on the efficacy of estrus synchronization in mares, we administered a progesterone-releasing device (PRID™) intravaginally to eight Haflinger mares for 11 days. In January 3 of 8 mares responded to the treatment with estrus and ovulation, in March 7 with estrus and 6 of 7 mares with ovulation, in June 6 of 7 and in October 7 of 8 mares with estrus and ovulation. Follicle distribution patterns at PRID™ insertion were different between January/October, March/June and June/October ($P < 0.05$). Number of follicles decreased during PRID™ treatment in January, March and June (difference of number of follicles at Day 12 minus number of follicles at Day 1: -4.2 ± 2.7, -0.9 ± 0.9 and -4.9 ± 1.5 follicles), while it increased in October (3.9 ± 1.2 follicles; $P < 0.05$). Mean progesterone concentrations were lowest in January (0.3 ± 0.1 ng mL^{-1}) 1) when compared with March (3.5 ± 1.8 ng mL^{-1}; $P = 0.063$), June (4.4 ± 1.4 ng mL^{-1}; $P < 0.05$) and October (2.2 ± 0.9 ng mL^{-1}; $P < 0.05$). At Day 2 of PRID™ treatment, mean progesterone concentrations significantly increased in all mares. Except from January, mean LH concentrations decreased within one day after PRID™ insertion and remained at low levels during treatments in

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doi:10.1016/j.theriogenology.2005.07.013

January and March. Total secretion of LH during PRID™-treatment was significantly lower in January and March when compared with June and October. In the 5 of 7 mares that ovulated during PRID™ treatment a distinct increase of plasma LH concentrations after ovulation was detected. Administration of the progesterone releasing intravaginal device PRID™ combined with the PGF2α analogue cloprostenol was able to induce estrus and ovulation in mares at different times of the year. However, efficacy of the treatment was not satisfactory concerning effectiveness in relation to season and synchrony of intervals from removal of PRID™ to ovulation in mares.

Keywords: Mare; Embryo transfer; Estrus synchronization; PRID™; Season

1. Introduction

Synchronization of estrus and ovulation between donor and recipient mares is inevitable for the success in embryo transfer programs. This is due to the fact that, beside from anecdotal reports, freezing protocols for equine embryos (reviews: [1,2]) are not very well established until now. Therefore, equine embryos have to be transferred to estrous cycle synchronous recipient mares immediately after flushing or after short storage in well-defined transport media [1]. Maximum divergence between donor and recipient mares should not exceed plus one to minus three days [3]. However, protocols for synchronization of estrus and ovulation are much more unreliable in mares than in cattle [3]. High individual response and seasonal conditions cause varying results of synchronization protocols, which make it useful to investigate mechanisms contributing to these factors.

One approach to induce estrus and ovulations in mares bases on the inhibitory effect of progesterone on the hypothalamic-pituitary-axis by exogenous administration of progestins. Various routes of administration of synthetic and natural progestins—alone or in combination with prostaglandins, GnRH and/or hCG—have been tested in mares. Intramuscular application of progesterone in oil has been shown to be of poor practicability, because daily injections are necessary [4–6]. Therefore, depot-preparations have been developed [7], which are not commercially available in the European Union. The synthetic progestin altrenogest can be administered orally. Altrenogest was given during anestrus or the transitional phase from winteranestrus to the ovulatory season [8,9], and in cyclic mares [10–12]. Another method to administer progesterone is the application of progesterone-releasing devices into the vagina. Dinger et al. [13] was the first to insert progesterone-impregnated vaginal sponges. By now, three different types of comparable devices are available: PRID™, CIDR-B™ [14–19], and Cue-Mare™ [20]. PRID™ was developed for estrus synchronization [21–23] and the treatment of ovarian disorders [24] in cattle. However, only few reports exist on its use in mares [25–27].

Previous studies concentrated on the efficiency of treatment with PRID during particular time periods throughout the year with the main focus on the breeding season. In contrast to these studies, we investigated the effects of intravaginal administration of progesterone on estrous cycle characteristics and hormone secretion in mares at four different times of the year. Therefore, possible seasonal differences in the responsiveness of the hypothalamic-pituitary axis to progesterone were determined.