GENERAL CONSIDERATIONS ACCORDING TO PITUITARY VERSUS PLACENTAL GONADOTROPHINS ACTIVITIES IN BITCH

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Abstract

The reproductive cycle of the domestic bitch, a mono-estrous species, is characterized by a follicular phase with spontaneous ovulations, followed by a luteal phase of about 75 days, and a non-seasonal anestrous of 2-10 months. The reproductive cycle is under control of the hypothalamic-pituitary-ovarian axis.

The ovarian hormones exert a feedback at the hypothalamic-pituitary axis, thereby also influencing, in a differential way, the secretion of LH and FSH.

Key words: bitch, pituitary gonadotrophins, placental gonadotrophins

MATERIALS AND METHODS

The literature reported that each FSH pulse occurs concurrently with a LH pulse, differential regulation of FSH and LH. The frequency and amplitude of the pulses of the hypothalamic peptide gonadotrophin-releasing hormone (GnRH) can only partly explain this differential regulation.

The specific hypo-thalamic FSH-releasing factor may also play a role of our investigations.

RESULTS AND DISSCUTION

The ovarian hormones are inducing a feedback at the hypothalamic-pituitary axis, thereby also influencing, in a differential way, the secretion of LH and FSH (Patrick, 2011; De Gier, 2006).

In addition to its role in transporting molecules between mother and fetus, the placenta is a major endocrine organ. It turns out that the placenta synthesizes a huge and diverse number of hormones and cytokines that have major influences on ovarian, uterine, mammary and fetal physiology, not to mention other endocrine systems of the mother (Schaefers-Okkens et al, 2005).

Several protein and peptide hormones are synthesized in placentae of various species. They have effects on the mother's endocrine system, fetal

metabolism and preparation of the mother for postpartum support of her offspring.

In addition to exogenous pituitary gonadotrophins, pregnant mare serum gonadotrophin (PMSG) and human menopausal gonadotrophin (HMG) have been used for estrus induction in bitches.

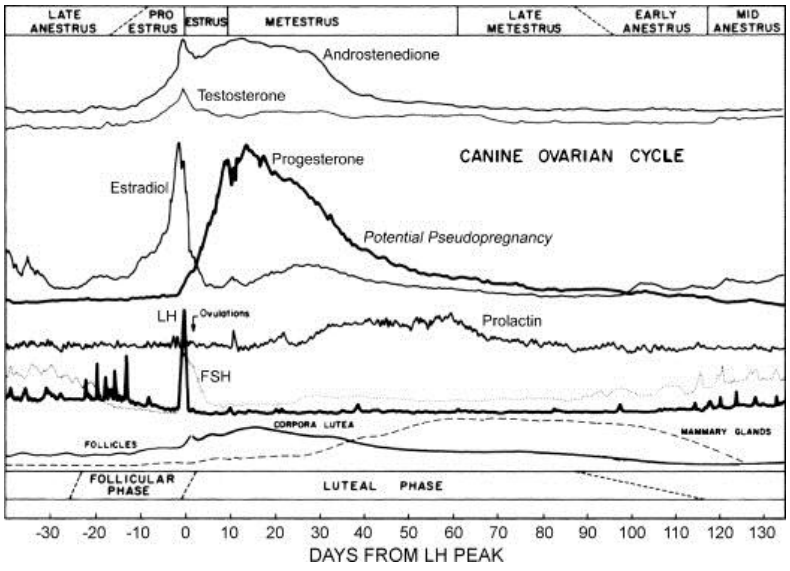
The most widely studied gonadotrophin for estrus induction in the dog is PMSG, with protocols ranging from daily to weekly injections using either subcutaneous or intramuscular routes of administration

As the name implies, chorionic gonadotrophins have the effect of stimulating the gonads, similar to the pituitary gonadotrophins. The only species known to produce a placental gonadotrophin are primates and equids.

The human hormone is called human chorionic gonadotrophin or simply HCG. This hormone is produced by fetal trophoblast cells. It binds to the luteinizing hormone receptor on cells of the corpus luteum, which prevents luteal regression.

Thus, HCG serves as the signal for maternal recognition of pregnancy. Equine chorionic gonadotrophin is also produced by fetal trophoblast cells. It is actually the same molecule as equine luteinizing hormone.

Chart 1. Schematic of typical changes in concentrations of reproductive hormones in the estrus cycle of the domestic dog



The most widely studied gonadotrophin for estrus induction in the dog is PMSG, with protocols ranging from daily to weekly injections using either subcutaneous or intramuscular routes of administration. Studies using PMSG (PG600®) have generally been more successful for estrus induction in bitches than those using FSH.

This product contains 80 IU PMSG and 40 IU HCG per ml. It was demonstrated that a single 5-ml injection of PG600® was highly effective at inducing proestrus in bitches. Unfortunately, the ovulation rate was poor (8 of 19), superovulation may have occurred and pregnancy rates were not reported. However, others have reported 50-84% whelping rates when PMSG and HCG are given in combination to induce estrus in bitches (Kooistra, 1999).

Histologically, luteal cells from *corpora lutea* formed in bitches following PMSG treatment have reticulated and vacuolated cytoplasm compared to luteal cells from corpora lutea of normal, non-fertile estrous cycles that have compact and granulated cytoplasm.

Administration of an ovulation induction agent in bitches as part of an estrus induction protocol is controversial since bitches are spontaneous ovulators and such a treatment would be unnecessary (Senovilla et al, 2005).

Administration of HCG has no positive effects on ovulation rates, pregnancy rates or number of offspring per pregnancy when administered at the onset of or during estrus.

In fact, treatment with HCG on the 1st and 3rd days of estrus significantly prolongs behavioral estrus and lowers serum progesterone concentration of day 5 of estrus.

(Shacham et al, 2001) found similar results when HCG was administered to bitches after day 40 of gestation; in that following an initial increase in serum progesterone concentrations, HCG dramatically suppressed progesterone secretion

CONCLUSIONS

Placental gonadotrophin administrations have been used for estrus induction in bitches.

Gonadotrophin administrations have varied in source, dosage, and bio-potency, as well as in pattern and frequency of administration.

PMSG administration at doses of 20 I.U.kg/day for 10 days, often causes hypersecretion of estrogen, with potential inducing uterine altered-function and/or uterine disease.

Improved pregnancy rates occurred when PMSG was administered for only 5 days and immediately followed by HCG administration (as a proestrus-enhancing) that apparently further stimulates ovarian follicle development such that the induced proestrus progresses and spontaneously culminates in an estrus in which ovulation occurs spontaneously.

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