Abstract

Control of oestrus in dog and cat can be divided into 2 parts, contraception and induction of oestrus and ovulation. For contraception, either dog or cat is operated by hormonal applications in the same way. Progestins have been used for a long time to postpone estrus with their major side effects. Nowadays, other hormonal remedies become more accepted such as a long term implants of GnRH agonist, GnRH vaccine and melatonin implant. Those preparations seem to exhibit good contraceptive impact with less unfavorable effect. For induction of estrus and ovulation, different approaches in dog and cat have been reported due to the differences in oestrus cycle characters. Dopamine agonist (Bromocriptine or Carbergoline) and short term GnRH implantation are stated to be successful protocols for fertile estrous induction in dog. Whilst in cat, a conventional administration of FSH and hCG appears to achieve the induction of oestrus and ovulation appropriately.

Keywords: cat, contraception, control, dog, oestrus, ovulation

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The bitch has been usually classified as non-seasonal monoestrus which is a long period of anestrus. Estrous cycle of the bitch is a unique physiological period that contains four stages. These stages include proestrus, oestrus, dioestrus, and anoestrus. Proestrus typically lasts about 9-11 days, then directly leads to estrus. At this stage, ovarian follicles mature and oestradiol concentration increases resulting in the swollen of vagina and uterus. Changing of vaginal epithelium, vulvar edema and diapedesis of erythrocytes from capillaries of reproductive tract also occur from the hormonal influence. The bitch still refuses for mating. Peak concentrations of oestradiol in late proestrus prepare the pituitary and hypothalamus for an ensuing surge-release of LH. Progesterone level begins to increase in late proestrus at the onset of the LH surge. Then, the mating is accepted at estrus that lasts for about 6-11 days. This period the progesterone is gradually rising. This causes the softening of vulvar and mating behavior. Ovulation takes place spontaneously at the beginning of estrus. Subsequently, dioestrus starts and the bitch rejects mating, this stage predominates by progesterone which inhibits uterine contraction throughout the period. Dioestrus varies among bitches approximately 9-11 weeks. Anoestrus is a quiescent period for reproductive organs and sexual behavior. This prolonged stage lasts for 3-5 months (Noakes et al., 2001).

The oestrous cycle of the cat is also unique among domestic species which is seasonally polyoestrus and consists of five stages: proestrus, oestrus, interoestrus, dioestrus, and anoestrus. A broad range of individual variation in cycle length exists among cats with the influence of day-light period in various seasons at different parts of the world. Proestrus is short and the signs may be overt or subtle or not observed regularly in all cats. Many cats swiftly transfer from anoestrus receptive estrous. Ovulation may be induced by both copulatory and noncopulatory stimulation, some spontaneous ovulation may also occur (Wildt et al., 1980; Feldman and Nelson, 1996; Johnston et al., 2001).

In general, the estrous cycle of dog and cat is controlled by Hypothalamic-gonadal axis as shown in other species: a) the hypothalamus and pituitary gland, where primary control resides. b) the ovary, the source of the steroid hormones estrogen and progesterone. c) the reproductive tract, response to sex steroid hormones. In conclusion, the reproductive cycle of female dog and cat is under the control of neuroendocrine system especially in gonadotrophin secretion. Both gonadotrophins, luteinizing hormone (LH) and follicle stimulating hormone (FSH) are necessary for ovarian folliculogenesis and ovulation (Concannon, 1989; Concannon et al., 1993; Feldman and Nelson, 1996; Johnston et al., 2001).

Several methods have been developed to control the oestrum and ovulation in dog and cat, each approach reveals advantages and disadvantages.

For contraception, progestin has been widely used as contraceptive agent to prevent estrus for several years, whereas, its side effects such as mammary cancer, cystic endometrial hyperplasia, pyometra, ovarian cysts and hormonal disorders are well recognized (Concannon and Meyers-Wallen, 1991). Recently, GnRH agonist deslorelin, in a slow release implant, can be used to suppress estrus for up to 12 months following one implantation with minimal observation of unexpected results (Trigg et al., 2001). As the same contraceptive effect, GnRH antagonist analogues were produced. By contrast, the antagonists preferentially bind to the GnRH receptor, but fail to activate the second messenger cascade. Thus, both agonist and antagonist analogues can be used to suppress the reproductive functions of the pituitary gland (Lincoln, 1992). Unfortunately, the high dose required to prevent oestrous cycles of the antagonists make the cost per unit dose considerably much higher than agonists. (Vickery, 1985; Vickery et al., 1989; Olson and Johnston, 1993).

There are still some obstacles for the development of an immunocontraception GnRH vaccine and Zona Pellucida vaccine that the results in dog or cat are not yet successful (Gorman, et al., 2002; Levy et al., 2005). However, immunocontraception targeting LH and its receptor have been successful in dog and cat. Reproductive function in male dogs immunized against LH was severely impaired for up to 1 year. LH receptor vaccination of the bitch and queen resulted in oestrus suppression for >11 months, with a reversible effect on reproductive status (Saxena et al., 2002; Saxena et al., 2003).

Gimenez et al. (2009) reported a successful oestrous control in cat using melatonin implants which mimic the releasing of melatonin and suppression of sexual activity during short photoperiod.

In dog, induction of fertile oestrus is challenging. Numbers of hormone such as oestradiol, FSH, eCG and GnRH have been applied with unsatisfied conceptions.

Subsequently, many potential utility of methods for induction of a fertile estrus in bitch using several compounds including dopamine agonist and GnRH agonists have been studied. Dopamine agonist such as Bromocriptine is traded as a human drug and is not recommended for animal while Cabergoline is a veterinary drug for treatment of pseudopregnancy in dogs. Bromocriptine administered orally once or twice per day at doses of 50 µg/kg induced proestrus in 17-28 days (Concannon, 1993) while using 5 µg/kg Cabergoline daily induced fertile proestrus in 15-25 days, 10-20 days, or 4-10 days when administered to bitches in early, middle or late anoestrus, respectively (Verstegen et al., 1994). Dopamine agonist may cause unpleasant side effects such as anorexia and vomiting (Concannon, 1993). On the other hand, dopamine agonist seems to give unsuccessful induction of proestrus in cat (Kutzler, 2007).

Up to now, the using of GnRH agonist to induce oestrus has been continuously developed because its process likes natural stimulation of pituitary gland, causes a releasing of FSH and LH, and results in follicular development sufficient to produce proestrus, oestrus and spontaneous ovulation (Vanderlip et al., 1987; Cain et al., 1988; Concannon et al., 1997). Kutzler et al. (2002) reported
the success of 5 pregnancies from 8 bitches induced by vulvar mucosa implantation of Deslorelin. GnRH-agonist administration for 10-14 days via subcutaneous osmotic-pumps requiring only a single administration has also been observed to result in a high rates of proestrus induction, spontaneous ovulation, and pregnancy (Concannon et al., 1997). Short term implantation of high dose GnRH agonist deslorelin or at dosage of 2.1 mg is an efficient method for estrus induction in dog (VolkMann et al., 2006).

In cat, oestrus can be induced by increasing photoperiod artificially to 24 hours light, this stimulates longer period of oestrous and increase folliculogenesis (Leyva et al., 1989; Michel, 1993). Cline et al. (1980) described a number of oestrous induction procedures in anoestrous queen. Gonadotropins such as FSH, eCG, hCG and GnRH were reported to induce estrus in cat (Chakraborty et al., 1979; Romagnoli et al., 2002). The effective regimen is 2 mg FSH, IM, daily until onset of estrus. Natural mating (3 times daily for the first 3 days of estrous) followed by 250 IU of hCG, IM on day 2 and 3 of oestrus enhances the ovulatory response of cats (Johnston et al., 2001; Romagnoli et al., 2002).

Administration of naloxone, an opioid antagonist, inhibits endogenous opiodergic tone and induces the onset of proestrus in bitches (Concannon, 1993) and domestic queens (Aiudi et al., 2001).

In conclusion, a long term implantation of GnRH agonist appears to offer a promising reversible estrous control for contraception in both dog and cat with minimal side effect. For the induction of oestrus and ovulation, many protocols have been utilized for reliable induction of fertile estrus in dog and cat. GnRH agonist and dopamine agonist seem to be encouraging schemes in dog, while to conventional FSH and hCG work well for induction of oestrus and ovulation in cat. Nevertheless, fertility and conception rate may vary among animals. The expense for clinical veterinary practice is also considerable factor. The best regimen depends on availability, safety, security and efficiency for animal in the region.

References


