Clinical approach to infertility in the queen - The feline estrous cycle
[Abordagem clínica da infertilidade na gata - O ciclo éstrico nos felinos]

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Puberty

Puberal heat in queens generally occurs between 4 and 12 months of age, provided that
the length of daylight (photoperiod) is increasing and that the cat has reached a good body condition (a
minimum weight of 2.3-2.5 kg is considered a necessary requirement) (Lofstedt, 1982). Short-
haired breeds tend to be more precocious, while puberty in long-haired breeds and Manx queen may
occur as late as 11-21 months.

Stages of the Cycle

The feline reproductive cycle is divided into proestrus, estrus, postestrus, diestrus and
anestrus. Proestrus is indicated by continuous rubbing of the head and neck against any object,
some vocalizing but refusal of mating, and it is reported to be very short and often not observed
(Shille et al., 1979). It lasts an average of 1.2±0.8 days. Estrus behaviour in the queen, as in other
mammals, is indicative of receptivity to mating, and is characterized by signs which are similar to
those of proestrus but more intense, more frequent vocalizing, crouching with the forequarters
pressed to the ground and hyperextension of the back which causes lordosis, so that the vulva is
presented for mating. Unlike canine estrus which begins with decreasing serum estradiol
concentrations, estrus in the queen occurs at peak follicular activity. Feline ovulation is induced by
LH released from the pituitary in response to a neural reflex originating from the vagina stimulated
by the Tom's penis. Based on recent studies performed in experimental catteries where queens are
kept in single cages throughout their lives, it has been become clear that up to 30-35% of queens
may ovulate spontaneously (Lawler et al., 1993; Romagnoli et al, 1996). Occurrence of ovulation
does not shorten duration of estrus which averages 8.5±4.2 days (range 2-19 days) in bred queens
(regardless of whether or not follicle(s) ovulated). Instead, absence of coitus is associated with a
shorter duration of estrual behaviour (6.2±2.9 days). The number of follicles ovulating has been
related to the number of matings, with one mating/estrus not being sufficient to cause ovulation in
up to 50% of bred females, and 4 matings/estrus being associated with high numbers of follicles
ovulating (Concannon et al., 1980).

The term Postestrus has been used to indicate the stage which follows one estrus and
precede the next in queens which did not ovulate (Lofstedt, 1982). The term metestrus is sometime
used, but may be a source of confusion as it indicates a phase of corpus luteum development which
does not occur in non-ovulating queens. Queens that ovulate show evidence of corpus luteum
development, therefore going through a normal Diestrus whose length varies depending on
occurrence of conception. Diestrus lasts approximately 40 days in non-pregnant queens, and
approximately 60 days in pregnant queens. Following luteolysis, cyclicity resumes with a 7-10 days
delay both in pregnant and non-pregnant females, although lactation and suckling may inhibit
resumption of cyclicity for 2-3 weeks post-weaning. Queens exposed to natural photoperiod
undergo Anestrus, a phase of reproductive quiescence, during late Fall and early Winter (October-
December).

As in the canine, the feline estrus cycle can be easily staged with vaginal cytology. Exfoliated vaginal epithelial cells can be collected with a saline-moistened cotton-tipped swab
gently inserted for approximately 2 cm into the vagina and then rolled onto a glass slide; or by
flushing 0.5 cc of saline into the vagina with a Papanicolaou-type pipette, placing a drop of vaginal
fluid on glass slide and then smearing it. Any of the Romanowsky-type stains can be used
satisfactorily (Giemsa, Wright's, New methylene blue, Leishman blue, Diff-Quik) to stain vaginal smears once the veterinarian becomes familiar with vaginal cell morphology, which in the queen does differ greatly from that of the bitch. Percentage of anuclear squames is reported to be 10% on the first day of estrus, and to increase to 40% on the fourth day of estrus, with the percentage of intermediate cells falling from 40% to 10% during the same period (Shille et al., 1979)

Feline Infertility

The Anestrus Queen

Primary anestrus is a condition characterized by absence of behavioural signs of puberty. Investigating a primary anestrus case should be postponed until the queen is 24 months old, and provided that over the last few months she has been housed with cycling queens and exposed to an adequate photoperiod (14L:10D). Diagnostic approach should include a karyotype, serum thyroid hormone and progesterone assay, and possibly serum gonadotropin assay. If these tests are normal, a gonadotropin treatment can be tried (2 mg FSH IM daily), monitoring its efficacy with daily vaginal smears. If no effect is observed, laparotomy can be performed to assess condition and perform biopsy of ovary(ies) and uterus: pathologic conditions of the queen reported to be responsible of infertility are cystic ovaries and villous hyperplasia of the oviduct (Acland and Butcher, 1974; Cline et al., 1981).

Estrus Induction

The feline reproductive cycle is typically described as seasonally polyestrous. Estrous cycles last 4-30 (14-19 modal) days, and their frequency reaches a peak in early Winter (January-February), which is followed by a gradual frequency decline until early Fall (September-October). Photoperiod and temperature to which queens are exposed play an important role in modulating cyclicity, as for instance a constant temperature but access to seasonal light induce queens to cycle seasonally, whereas a constant photoperiod is associated with almost no interruption in cycling throughout the year. Increasing the photoperiod may induce estrus in normal non-cycling queens, while decreasing the photoperiod or using melatonin suppresses cycling.

Therapeutic regimes to induce cycling in normal anestrous queens have been reported. Follicle stimulating hormone (FSH) at the dose of 2 mg daily IM for 3-7 days until onset of estrus is considered an effective treatments, which should be followed by natural mating or administration of 150-250 IU human corionic gonadotropin (hCG) or of 25 ug gonadotropin releasing hormone (GnRH) (Wildt et al., 1978; Chakraborty et al., 1979). A more recent protocol which seems to give better results consists of administering 150 IU PMSG im followed by 100 IU hCG 84 hours later (Swanson et al., 1996)

The Cycling Queen

Feline serum progesterone concentrations start rising between 76 and 100 hours following ovulation. In order to diagnose ovulation failure P4 can be assayed between the 1st and 4th week following breeding. The cause of ovulation failure can be investigated by: a) carefully collecting history relative to number and time of observed breedings during heat and evaluating whether or not administration of hCG (100-250 UI IM) or GnRH (50 mcg IM) at a subsequent breeding may be advisable; b) performing a vaginoscopy using an otoscope with the queen under general anesthesia to check for vaginal abnormalities; c) checking the tomcat’s penis for presence of hair-rings. Diagnosis of pyometra in the queen is based on presence of one or more of the following signs: leukocytosis, uterine enlargement, abdominal enlargement, purulent vulvar discharge, anorexia, fever. Open cervix pyometra can be treated with specific antibiotic therapy and administration of natural prostaglandin F2alpha compounds (0.2-0.5 mg/kg BID until uterine size has returned to normal). Developmental defects of the reproductive tract can be diagnosed through ultrasound, contrast radiographic studies of vagina, cervix and uterus, or through laparoscopy/laparotomy. The
role of the male can be investigated performing a vaginal smear or a vaginal lavage with sterile saline right after breeding to check for presence of spermatozoa.

Clinical signs of pregnancy loss in the cat depend on the cause of the problem and are highly variable ranging from absence of signs to evidence of systemic illness with severe maternal compromise, with or without a 1-2 day course of bloody/purulent vulvar discharge. Diagnosis is based on observation of abortion following a positive pregnancy diagnosis. Fetal and vulvar discharge culture and histology as well as karyotype of aborted fetuses should always be attempted. The dam should be monitored with a hemogram, serology (FIP, FeLV, toxoplasmosis) should be performed to rule out infective causes, and supportive therapy should be instituted if necessary. Infection of the reproductive tract due to feline leukemia or toxoplasmosis can be ruled out by appropriate viral testing and serology. Early or late abortions are not considered life-threatening diseases in the feline, unless uterine hemorrhage occurs which may cause maternal death. Prognosis for both life and fertility is guarded to good.

Segmental aplasia, tubal/endometrial hyperplasia or scarring of the reproductive tract can only be detected on exploratory laparotomy, at which time uterine biopsy and/or culture and saline flushing to demonstrate patency can be performed.

Poorly substantiated causes of infertility include inbreeding, stress and use of progestogens to suppress estrus. Establishing a diagnosis of infertility in the queen may prove to be challenging and frustrating, as lack of reproductive abnormalities is reported in infertile female cats (Cline et al., 1981).

References
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