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INFERTILITY IN CATS

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Pure bred cats are increasing in popularity and more medical data in this field has been collected in the past few years. Thus, cat breeders having an infertile female will ask veterinarians to be as effective as if faced with canine infertility. The normal fertility rate in the feline species is difficult to determine with certainty. It probably depends quite a lot on the breed concerned, and so does the number of kittens per litter (average prolificity).

Infertility is the inability to give birth to live kittens. In practice, the term encompasses very different situations: inability to be bred by a male, to conceive after successful breeding or to carry a pregnancy to term. Therefore, veterinarians must check with precision the whole reproduction cycle of the queen, and when possible check the quality of the semen of the male.

1. In the queen

1.1. Failure to cycle/Abnormalities of estrus

1.1.1. Anestrus (or decreased frequency of estrus)

We have to remember that the queen normally exhibits normal anestrous periods. In Europe and United States, it happens during autumn and early winter. Some breeds may suffer from even longer anestrous periods: some female Persians for instance may have only one or two estrus periods each year. At the opposite, some Siamese queens, kept inside, will cycle throughout the year, even if the breeders can notice a decrease of fertility during non breeding season. Puberty is reached at different ages depending on the breed and on the date of birth. Silent heats represent a frequent concern for breeders taking care some breeds more frequently in older queens (Persians, Himalayans, Exotic Shorthair). Vaginal smears (every week in the breeding season) and blood estradiol assays may help diagnosing silent heats. Modification of social environment should be considered.

Inadequate lightning may prevent the beginning of follicular waves when the breeding season occurs. Stress is another important factor: queens that are stressed during the journey to the male’s house may stop exhibiting estrus. Genetic or congenital defects like pseudohermaphroditism, true hermaphroditism, mosaicism, and testicular feminization have been described in feline species. Congenital hypoplasia or aplasia of the ovaries has been described. It is often unilateral. More frequently, the absence of the ovaries (due to a previous ovariecotomy or ovariohysterectomy) is the original cause of anestrous. It is often difficult to confirm, as anestrous ovaries are difficult to visualize by
ultrasonography. Veterinarians could try either to induce heats with hormones (see later) or, if it does not work, to perform laparotomy.

Some may induce prolonged anestrous progestogens corticosteroids, ketoconazole). As in bitches, progesterone- secreting ovarian cysts or ovarian neoplasms may exist. This is not very frequent. Diagnosis is based on non-basal (> 1.0 ng/ml) serum progesterone concentrations in non pregnant queens that persist for several weeks.

If all these different causes seem appear to be excluded, one can attempt to induce an estrus cycle. Several attempts have been made in order to induce a fertile cycle in the queen.

- Social interactions: sometimes, placing a tom cat nearby or together with anestrous queens may stimulate them enough to induce heats;
- Increasing the length of daily light given to the breeding queens may greatly help them to come in heat. The optimal photoperiod consists of 14 hours of light per day, during at least one month. Under such protocols, queens may exhibit two estrus periods each month. One month is needed usually to induce the first estrous phase Continuous lighting must be avoided.
- Medical protocols may also be used. Repeated injections of eCG (PMSG) are used by some authors. Recommended dosage varies depending on the period of the year. but the fertility results are not very good (mating failures, increased number of non-ovulatory follicles). These protocols are often associated with hCG – 100- 250 UI – or 25µg GnRH to induce ovulation. eCG treatments may be used together with light increasing treatments, at a unique dosage. Fertility results seem then to be much better. More recently, protocols associating and hCG have been described to induce estrous during non seasonal period.

- 1.1.2. Infertility with shortened interestrous periods or persistent estrus.

Several causes may induce prolonged estrus in the queen. Such a clinical state is not always associated with infertility. For example, overlapping of two successive follicular waves may occur. Repeated ultrasound observations of the ovaries may help following the follicular waves and mate the queen at the proper time. Pregnancy may normally occur in such conditions.

In some breeds like Siamese or Oriental (but it may happen in any breed), the interval between two successive anovulatory cycles may be very short, i.e. one or two days, so that it is hardly noticeable. Here again, repeated ultrasonography investigations of the ovaries are especially recommended.

Follicular cysts have been reported to be common in feline specie, and their frequency increases with age. Diagnosis is easily done using ultrasonography, when the diameter of the “follicles” exceeds 4.0 mm or if they do not disappear at the time of atresia of the other surrounding follicles. Treatment could involve luteinization with hCG (200 to 500 UI), GnRH (25 mg IM), ultrasonography guided puncture and removal of the intra-cystic fluid, or surgical removal of the cyst or of the ovary.
Ovarian tumors inducing persistent estrus are mainly Granulosa Cells Tumors (GCT). They may secrete estradiol, progesterone, or both. Unilateral ovariectomy in order to restore fertility may be considered only if the state of the uterus is good. Otherwise, bilateral neutering is preferable.

### 1.2. Failure to conceive

#### 1.2.1. Mating failure
Many factors may prevent a normal mating to occur. Stress has to be avoided. Some queens that lack socialization may refuse to be mounted. Some females refuse certain males and will accept others. Breeders have to make sure that the post coital yowl of the queen has occurred, stating that the queen has been penetrated by the penis of the male. Anatomical abnormality of the vulva, vestibule or vagina can compromise the mating. Congenital defects like persistence of the hymen have been described in the queen. Acquired diseases or abnormalities of the posterior genital tract (scars after a bad parturition, episiotomy, violent mating, vaginitis, vaginal tumor…) may also lead to lack of copulation. Artificial insemination may sometimes represent a good solution for a mating failure.

#### 1.2.2. Anovulatory cycles
Mating do not always induce ovulation in queens. The number of coitus may be insufficient to induce LH peak leading to ovulation. Also, if the queen is mated during the first two days of the estrous period, ovulation may not occur. Some sedative drugs used by breeders in order to calm the queens at the mating period may counteract ovulation. Because ovulation is induced by coitus in the queen, lack of ovulation is easily detected by assaying progesterone blood level 5 days after the mating period. Spontaneous ovulation may occur in some females, thus being mated too late.

#### 1.2.3. Lack of fertilization/Implantation failure
Queens with cystic endometrial hyperplasia (CEH) are often infertile due to implantation failure after conception. If they still give birth, the litters are more often reduced to one or two kittens. Often, no clinical signs is noticed during the heat period and ovulation. Somehow, ultrasonography usually permits the visualization of the glandular endometrium. CEH often leads to pyometra.

### 1.3. Failure to give birth
Early embryonic resorption and abortion may be unnoticed by the owner. In fact, to confirm early embryonic resorption, veterinarians have to check first that a normal cycle, with mating with a fertile male and ovulation, did occur. An early ultrasonographic diagnosis is also important.

#### 1.3.1. Hormonal problems.
Queens may also suffer from hypoluteoidism, but in practice, this condition seem to be rare. Progesterone replacement therapy has been describes in literature and may be given to the queen (daily 1 to 2 mg IM injections); but only after a proper diagnose, and particularly an evidency of sudden progesterone decrease.
during gestation, with viable kittens. This kind of treatment may induce prolongation of pregnancy over the usual time

1.3.2. Infectious diseases
FeLV is the most important viral cause of infertility in the queen. Excretion of the virus in the blood during pregnancy may induce early embryonic or fetal death, abortion or stillbirths or neonatal death. Its detection must be proposed to breeders in case of any embryonic resorption.
Panleucopenia may also sometimes play the same role. Attenuated vaccines given to pregnant queens may be dangerous. Herpesvirus infection during pregnancy has been associated with embryonic resorption.
Bacterial causes of infertility may be quite common. It is often due to lack of hygiene in the cattery. Frequently, E.coli, Streptococcus sp., Staphylococcus sp. or Salmonella sp. are identified as potential causes of abortion. Genital infection with Chlamydia sp. is often suspected in queens suffering from infertility. Its role is however still unclear.

1.3.3. Nutritional causes
Nutritional deficiencies (vitamin A or arachidonic acids...) or excess food-intake may lead to decrease of libido in male. Some deficiencies have been clearly linked with reproductive disorders:
- Taurine deficiency. In adult cat, in case of secondary deficiency, reproduction disorders are preponderant and early embryonic resorptions (before 25d), with or without relaxine increase,
- Arachidonate deficiency . this fatty acid has been recognized as essential, due to a limiting desaturation capacity of the desaturase delta 6. Recent studies have shown that deficient Tom cats are able to sustain normal reproduction but not queens.
- Copper requirement have been specifically studied in cats. Source of copper (oxide copper, sulphate or chelated form) influence assimilation, oxide copper being unassimilated, and minimum level being above 10mg/kg diet.

2. Infertility of the male cat
Male infertility is a common cause of conception failure in queens presented with infertility. If a normally cycling queen accepting to be mated has remained infertile, it is important to check the quality of the semen of the male. Very young males or, on the contrary, old cats may have a reduced fertility capacity. If a male is overused (when more than 4 daily coitus occur), the quality of semen may decrease.

Male cats may be infertile because of a lack of libido, may be reduced due to psychological problems (earlier mating with aggressive queens). Gingivitis or may prevent the male from biting the neck of the female during coitus, thus preventing immobilization and penetration. In long-haired breeds, strangulation of the penis by the hair located in the genital is frequently noticed. A pain of the pelvis or lumbar vertebra may compromise intromission too. In case of urinary infection or calculus, pain may induce a full retrograde ejaculation.
In all cases, semen collection and analysis should be performed. It can be done by electroejaculation, urethral catheterization (under anaesthesia with the α2 agonist metedomidine) or sometimes manual collection (in trained cats only).

3. Infertility in cats: a practical approach

3.1. Before the heat period
- Begin with a complete physical examination, a thorough medical and breeding history, complete blood cell count, serum chemistries, and urinalysis.
- Feline leukaemia virus (FeLV) and feline immunodeficiency virus (FIV) testing is recommended
  - Progesterone assay: level has to be basal
  - Vaginal smear: interoestrus
  - Ultrasonography: homogeneous ovary, normal uterus
  - Check the history of the male (previous litters?)

3.2. During the heat period
- Vaginal smear: oestrus
- Try to observe the mating
  - Numbers? Frequency?
- Ultrasonography: check follicular maturation and ovulation

3.3. Four days after the last mating
- Progesterone assay: +/- 5ng/L

3.4. Early pregnancy diagnosis:
- 14-15 days after mating
  - Progesterone assay: >10ng/L
  - Check male’s fertility: spermogramm
  - Check uterus: Pyometra, CEH?: return to estrus in less than 18 days → indicates failure to ovulate

3.5. If the queen undergoes a resorption or abortion
- Investigate infectious diseases: FeLV, FIV, FPV, FHV-1, FCV,
- Progesterone assay