

Feline Reproductive Physiology

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Puberty and Seasonality

Seasonality of the estral phase

The queen is an induced ovulator with seasonal polyestrus. The anestrus exists from October to December in the Northern Hemisphere due to variations in melatonin secretion during dark hours. [1]

Since seasonal anoestrus results from decreasing photoperiod, it can be modified by changing natural light conditions. Cats exposed to artificial lighting (14 L 8 N) may continue to cycle year-round, while cats kept in 8L 14 N remain in persistent anoestrus. [2, 3]

Seasonal anoestrus can vary depending upon the breed of the cat: long haired queens exhibit an increased sensitivity to light conditions compared to short-haired queens.

Onset of puberty

Puberty generally occurs when the female reaches 80% of adult body weight (2.3 to 3 kg at 6 to 9 months for a common short-haired cat). Purebred cats, particularly long-haired such as Persian, reach puberty later (sometimes not before 12-15 months).

Environmental factors can affect the age at which puberty commences:

- Photoperiodism** or light exposure. If the female reaches 80% of her adult body weight during the short-day season, puberty will be delayed until the hours of daylight increase. On the other hand, a female born in July will reach this weight at the start of the breeding season.

- Social contact** with other cats, particularly Tom cats or queens in estrus. This explains why free roaming cats reach sexual maturity earlier than those kept inside the home.

Sexual Cycles of the Queen

Feline estrus cycles occur in most queens every three weeks during the long-day seasons in the absence of ovulation.

Three kinds of cycles can exist in the queen. At the end of estrus, if ovulation fails, an anovulatory cycle can be observed. If ovulation occurs, a pregnancy or a pseudo-pregnancy will take place, therefore increasing the interestrus period. The pseudo-pregnancy in queens lasts 40 days on average. The behavioral expression and lactation commonly seen in the bitch are extremely rare in the queen.

The breed plays a considerable role on the length and frequency of the estrus. Frequently, long-haired purebred cats (Persian, Norwegian Forest...) experience shorter and less frequent estral phases than short-haired cats (such as Siamese or Abyssian).

Sexual behavior

Some authors describe a period of proestrus including male attraction but without sexual receptivity. In fact, proestrus is observed in a minority of queens. [4] Neither the vaginal cytology nor hormonal assay can easily differentiate proestrus and estrus.

Estrus behavior in the queen includes persistent vocalization, rolling, rubbing, lordosis, tail deviation and repeated monotonous howling. During estrus, follicular maturation is

associated with follicular estrogen secretion (>20 pg/mL). Unlike the bitch, progesterone levels stay basal during the follicular phase before ovulation.

Breeding of the Queen, Physiology of Ovulation

Mating

After a careful approach from the side, the tom cat grasps the skin of the neck with his teeth, places his forelegs over the shoulder and mounts the queen. The length of intromission is short: 10 to 15 seconds. After a coït, the queen displays typical behavior. The post-coital yowl is followed by an aggressive attack and impressive disoriented rolling, stretching and genital licking.

As the length of time between neck biting and intromission can vary from ten seconds to thirty minutes, the occurrence of the mating can only be appreciated by observing this post-coital reaction of the queen, and not only by the mount.

Optimal breeding period

Few authors have studied the influence of the day during estrous at the time of mating. Some authors consider that during the first two days of estrus, the queen is unable to ovulate if mated (perhaps due to a lack of estradiol impregnation). Usually, it's not an important question for natural breeding (but it is for artificial insemination!) because the cats are allowed to mate during the whole estrus.

As the tomcat can be impotent if undergoing environmental or territorial changes, the queen is often brought to the tom's location.

The chances for a successful mating are then improved if the queen is first allowed to visit the tom's location for several days. Even if mating with ovulation generally occurs during the third or fourth day of estrus, the queen must be in contact with the male at the beginning of estrus. Proper time and acclimation will result in an acceptance of the male before the end of sexual receptivity.

For young, novice or anxious females, transportation must be done during interestrus. Often, the young females transported to the tomcat's home during estrus immediately stop exhibiting sexual behavior for a couple of days, before successful acclimation.

Occurrence of ovulation

Mating or comparable vaginal stimulus is generally needed to initiate endocrine sequence and LH release, which result in ovulation in the domestic cat.

The frequency of coital stimulation plays a major role in influencing the proportion of animals which ovulate. Multiple copulations in a short-time period enhance the magnitude and duration of LH release. Therefore, a single coït would lead to ovulation in only 50% of the queens while multiple mating during a few hours would increase the rate of ovulating queens. [5-7]

The interval between coital stimulation and ovulation has been reported to vary in cats, ranging from 25 to 50 h, but it is commonly accepted that this interval is closer to 25-30h. [7] Some authors suggest that the occurrence of ovulation may shorten the period of sexual receptivity. Other studies reveal no significant difference in estrus length between ovulating queens and unmated, non ovulating queens. [8, 9]

In our experience, some queens can still be bred three or four days after ovulation even with a high progesterone level. The stop of the sexual receptivity cannot be an accurate indication to

evaluate the occurrence of ovulation in a queen which has been mated. As interestrus can greatly vary, the only way to confirm ovulation is to assay progesterone.

Spontaneous ovulation

Several authors have described spontaneous ovulation without vaginal stimulation. [10, 11] The percentage of spontaneous ovulation surely varies depending upon environmental conditions, social contacts (viewing of a male or neck biting by another queen), and age of the female.

Managing the Breeding

Behavior

Intimidated queens may fail to demonstrate typical estrus behavior. Eventually, if an experienced tomcat is refused by the queen, the owner can carefully try to hold her. But often the tomcat may refuse to mount her. In this case, it could prove helpful to check if the queen is acclimated to the territory and if so, to try another male. Some queens refuse all tom cats, in which case the only way to have a litter is through AI.

Follicular maturation

During estrus the follicular maturation is difficult to follow in the queen. There is no pre-ovulatory progesterone increase, and vaginal cytology at the beginning of estrus does not significantly differ from the middle or the end of estrus. Therefore, it can be useful to perform a single vaginal cytology to ensure that the queen is really experiencing follicular maturation while she accepts the male. Some queens allow mating without being in follicular estrus. Ultrasonography can be extremely useful to follow follicular maturation in the queen. Ovarian follicles appear as anechoic spherical structures. Ultrasonography shows that during the follicular wave, follicles progressively grow from 2 to 4.2 mm in diameter. [12]

Ovulation control

Even if ultrasonography facilitates the diagnosis of ovulation failure in the queen, the progesterone assay acts as a more simple and reliable method to confirm the diagnosis. As the progesterone level begins to increase 24-48 hours after ovulation, it is recommended to perform the progesterone assay 72 hours after the last mating for a valuable result. Ovulation failure is associated with serum progesterone of less than 1 ng/mL. On the other hand, high progesterone level 3 days after the last mating confirms ovulation. With a hypothesis of ovulation failure, it is recommended to perform an assay before mating to rule out a luteal cyst or progesterone secretant ovarian tumor. For the practitioner, the colorimetric progesterone assays used in the bitch are efficient in the queen. [13]

Pregnancy in queen

The length of the pregnancy in the queen is 64-66 days. The average litter size varied with the breed with the most prolific being the Burmese (5.0) then the Siamese (4.5), Persian (3.9), Abyssinian (3.5) and Chinchilla (2.8). [14]

The earliest ultrasonographic observation of the gestational sac is 10 after ovulation [15]. 16 days after ovulation, pregnancy diagnosis is easier, because the size of gestational sac (1-1.5cm in diameter) allowing its visualization with common ultrasonographic probes (7.5 MHz).

As in the bitch, radiography can be performed after 45 days, with the same indications.

The relaxine assays, available for bitches, seems to be accurate in queens after the 27 days post ovulation. But these preliminary results needs to be confirmed before a routinely use in practice.

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