

THE MORPHOMETRIC PARAMETERS OF GONADS AND STEROID LEVELS IN CATS ACCORDING TO THE AGE AND ESTRUS CYCLE PHASE

I.V. SHCHERBAKOVA

PHD, PROFESSOR B.V. SMOLYANINOV

Odessa state agrarian university

Recently, much attention is paid to the study of the estrus cycle of small domestic animals, including research problems estrous cycle cats. It is connected with the fact that many species of wild cats entered in the Red Data List and more species in need of protection of the environment. To save these animals require detailed knowledge of current reproductive cycles. But the study of the estrous cycle in small domestic animals, especially cats, have paid insufficient attention to hormonal regulation. Thus, changes in the level of hormones, particularly estradiol and progesterone in the blood of cats during different phases of the estrous cycle is rarely described in the literature [2, 6]. Do not explored the issue of changing the concentration of these hormones in the blood depending on the breed and age characteristics. Only Verstegen J. P. et al. indicates that during anestrus and interestrus estradiol concentration is maintained at basal levels increased in recent days of anestrus and reaches its maximum value during estrus [7]. If ovulation does not occur, the level of estradiol decreased to basal levels within 5-10 days, whereas after ovulation - for 2-3 days. During anestrus, interestrus, proestrus and estrus progesterone concentration is maintained at basal levels before ovulation [1, 3]. In cats, as in pregnancy and if there is no content in plasma progesterone begins to rise after ovulation through 24-50 hours after the release of luteinizing hormone. We have not found literature, which highlights the issue of changes in hormones in cats of different breeds, depending on the age and so on. Thus, this issue requires further in-depth study [4, 5].

The aim of our research was to find out the level of hormones in the blood of cats in different periods of ontogeny, depending on the phase of the estrus cycle.

Materials and methods. The study was conducted on 56 clinically healthy mongrel cats aged 1 to 9 years of age who have the same conditions and feeding. The animals were divided into two age groups: - I - 1-5 years, n = 30 and II - 5-9 years n = 26. The ovariohisterektomy performed in accordance with all requirements of this surgery. Selected venous blood in them, it was centrifuged and the serum was measured concentrations of estradiol, progesterone and cortisol. Morphometric indices were determined gonads within an hour after receiving the internal reproductive organs. In ovarian follicles counted the number of different diameter and corpora lutea, and depending on the measured phase of the estrus cycle. The concentration of estradiol, progesterone and cortisol were determined using test kits firms DRG (USA) according to the instructions on the microplate enzyme-linked immunosorbent Labline-022 analyzer (Austria). The obtained data were treated using standard statistical functions of Microsoft Exel.

Results and discussion. In the study of morphological parameters of internal reproductive organs cats two age groups found that in the follicular phase of the estrus cycle in which there was no significant difference in the number of small follicles ($d < 1$ mm) (Table 1).

1. Number of follicles of various sizes and corpora lutea in domestic cats in different phases of the estrus cycle

Study group	Phase of estrus cycle	Number of follicles in the ovaries						Number of corpora lutea in the ovaries	
		$d < 1$ MM		$d = 1-2$ MM		$d \geq 3$ MM			
		right	left	right	left	right	left	right	left
I (age 1-5 years)	Follicular	5,16± 2,8	5,10± 2,18	5,56± 1,13	5,71± 1,45	3,34± 0,91	3,78± 0,93	-	-
	Luteal	4,31± 1,08	4,11± 1,12	3,39± 1,29	3,45± 1,23	2,12± 0,87	2,16± 0,54	3,08± 1,11	3,12± 1,08
II (age 5-9 years)	Follicular	5,14± 2,11	5,12± 2,09	5,0± 1,49	4,87± 1,34	1,12± 0,33*	1,24± 0,45*	-	-
	Luteal	4,16± 1,19	4,22± 1,12	3,0± 1,38	2,97± 1,26	0,87± 0,11 ^x	0,64± 0,31 ^x	1,52± 0,97 [•]	1,43± 0,88 [•]

* - for $p \leq 0,05$ compared to the number of follicles in the ovaries $d \geq 3$ mm in the follicular phase in cats of the first group

^x - for $p \leq 0,05$ compared to the number of follicles in the ovaries $d \geq 3$ mm in the luteal phase of the cats of the first group

• - for $p \leq 0,05$ compared to the number of corpora lutea in the ovaries in the luteal phase of the cats of the first group

No significant difference in the number of small follicles and not observed during the luteal phase. Therefore young cats (under 5 years) and middle-aged (5 to 9 years) cats by the number of follicles at the beginning of the estrous cycle did not differ, and probably their development depended on the concentration of FSH, about the same for animals of different age groups [7]. Number of follicles average diameter ($d = 1-2\text{mm}$) in cats of both groups in follicular phase is the same. Comparing the number of different phases found in the luteal phase of follicle diameter on average 39-41% lower compared to the follicular phase. This relationship was observed in cats 1-5 - and 5-9-year-olds. The most significant difference observed between cats of different age groups by the number of follicles of large diameter ($d \geq 3$ mm). So during the follicular phase in cats aged 1 to 5 years versus 5 to 9 annual number of large follicles was greater in 2,98-3,04 times, and during the luteal phase of 2,43-3,37 times. This is probably due to the fact that with age ovary fade functionality and is more follicular atresia [1, 4]. As a result, in cats older reduced ability to birth a large number of kittens. At the age of 1 to 5 years, compared with 5-9-year-old cats number of corpora lutea in the ovaries at most 50.64 - 54.16%, which is connected with a number ovulation follicles become the corpus luteum [2, 7]. The data showed that the number of corpora lutea in cats 5 to 9 years of age correlates with the number of large follicles during different phases of the estrous cycle. Due to the established patterns of morphometric indices of internal reproductive organs of cats is interesting studies concentrations of estradiol, cortisol and progesterone in their blood, depending on the phase of the estrus cycle (Table 2).

2. The concentration of hormones in the blood of cats in different phases of the estrus cycle

Study group	Phase of estrus cycle	Estradiol, pg/ml	Progesterone, ng/ml	Cortisol, nmol/l
I (age 1-5 years)	Follicular	120,15±2,10	12,22±0,83	94,12±1,16
	Luteal	39,11±2,18	18,79±0,87	100,60±1,22
II (age 5-9 years)	Follicular	88,14±3,41*	5,64± 1,32•	105,81±2,76
	Luteal	28,06±2,67**	9,80±2,23••	114,13±2,51

* - for $p \leq 0,05$ in comparison with the level of estradiol in the follicular phase in cats of the first group

** - for $p \leq 0,05$ in comparison with the level of estradiol in the luteal phase of the cats of the first group

• - for $p \leq 0,05$ in comparison with the level of progesterone in the follicular phase in cats of the first group

•• - for $p \leq 0,05$ in comparison with the level of progesterone in the luteal phase of the cats of the first group

Found that during the follicular phase estradiol concentration in serum cats 1-5-year-olds in 1.36 times more than the 5-9-year-olds. The direct correlation between the concentration of estradiol during the follicular phase and morphometric parameters in cats of all ages, indicating the dependence of the content of this hormone on the number of active follicles. Thus, simultaneously with a decrease in the number of large follicles in cats aged 5-9 years decreased the concentration of estradiol. The same relationship between the number of follicles and estradiol levels in serum was observed during the luteal phase. The content of progesterone in cats aged 1 to 5 years in the follicular phase of the estrus cycle was 2.16 times higher than in the 5-9-year-olds. During the luteal phase progesterone concentrations in cats aged 1-5 years 47.84% higher than in cats 5-9-year-olds. On the functional activity of corpora lutea can be judged by the content of progesterone in blood serum. Thus, in cats 1-5-year-old corpora lutea active and

produce more hormone. Noted a correlation between progesterone and the number of corpora lutea in the ovaries of morphometric was study. The reasons for which cats aged 5-9 years had fewer kittens, and some have problems connected with their miscarriage [3, 5]. The level of cortisol showed no significant difference between cats of different age groups. The concentration of cortisol responsible physiological norm, but noted the trend towards increasing its concentration as they grow older animals.

Conclusions

1. In cats aged 1-5 years, the number of follicles of large diameter ($d \geq 3$ mm) were significantly higher than in the 5-9-year-olds as during the follicular and luteal phases during the estrus cycle. A tendency to reduce the number average diameter of follicles in the luteal phase of the estrus cycle in cats 5-9 years.

2. The concentration of estradiol and progesterone in serum correlates with morphometric features of the internal reproductive organs of cats.

3. The content of estradiol and progesterone in cats aged 1-5 years more than 5-9-year-olds, which characterizes the functional activity of the gonads. Significant changes in cortisol concentrations in cats of all ages, depending on the phase of the estrus cycle were observed.

LIST OF LITERATURE

1. Banks D.H. Luteinizing hormone release in the cat it response to coitus on consecutive days of estrus / D.H. Banks, G.Y. Stabenfeld // *Biology of Reproduction*. – 1999. – N 26. – p. 603–611.

2. Burke T.J. Feline reproduction / T.J. Burke // *Veterinary Clinics of North America*. – 2006. – N6. – P. 317–321

3. Concannon P. Reflex L. H. release in estrous cats following single and multiple copulations / P. Concannon, B. Hodson, D. Lein // *Biology of Reproduction* – 2001. – N 23. – P. 111–117.

4. Reproductive biology of the domestic cat with special reference to

endocrinology, sperm function and in-vitro fertilization / K.L. Goodrowe, J.G. Howard, P.M. Schmidt, D.E. Wildt // Journal of Reproduction and Fertility Supplement. – 1993. – N 39. – P. 73–90.

5. Hurni H. Daylength and breeding in the domestic cat. / H. Hurni // Laboratory Animals. – 1997. – N 15. – P. 229–233.

6. Reproductive endocrinology and physiology of the bitch and queen./ [P.N. Olson, P.W. Husted, T.A. Allen, T.M. Nett] // Veterinary Clinics of North America: Small Animal Practice. – 1996. – N 14. – P. 927–946.

7. Verstegen J. P. Regulation of progesterone during pregnancy in the cat: studies on the roles of corpora lutea, placenta and prolactin secretion. / J. P. Verstegen, K. Onclin, L. D. Silva // Journal of Reproduction and Fertility Supplement. – 1993. – N 47. – P. 165–173.

МОРФОМЕТРИЧНІ ПОКАЗНИКИ ГОНАД ТА РІВЕНЬ СТАТЕВИХ СТЕРОЇДІВ У КІШОК ЗАЛЕЖНО ВІД ВІКУ ТА ФАЗИ СТАТЕВОГО ЦИКЛУ

Ю.В. ЩЕРБАКОВА, Б.В. СМОЛЯНИНОВ

Розглянуто морфометричні особливості внутрішніх репродуктивних органів свійських кішок віком 1–5 та 5–9 років залежно від фази статевого циклу. Встановлено, що у кішок віком 1–5 років кількість фолікулів великого діаметра ($d \geq 3$ мм) в 2,98–3,04 рази вища, ніж у 5–9-річних у фолікулярну фазу статевого циклу. Кількість жовтих тіл у кішок віком 1–5 років в 2,02 рази більша, ніж у 5–9-річних. Відмічений взаємозв'язок між кількістю фолікулів великого діаметра і вмістом естрадіолу в сироватці крові, а також кількістю жовтих тіл та концентрацією прогестерону. Концентрація естрадіолу та прогестерону у кішок віком 1–5 років вища, ніж у 5–9-річних у фолікулярну та лютеїнову фазу статевого циклу. Вміст кортизолу залишається стабільним у різні фази статевого циклу та суттєво не змінюється з віком.

Ключові слова: свійські кішки, морфометричні показники, естрадіол, прогестерон, жовті тіла, фолікули.

Морфометрические показатели гонад и уровень половых стероидов у кошек в зависимости от возраста и фазы полового цикла

Ю.В. Щербакова, Б.В. Смолянинов

Рассмотрены морфометрические особенности внутренних репродуктивных органов домашних кошек в возрасте 1-5- и 5-9 лет в зависимости от фазы полового цикла. Установлено, что у кошек в возрасте 1-5 лет количество фолликулов большого диаметра ($d \geq 3\text{мм}$) в 2,98-3,04 раза выше, чем у кошек 5-9-летнего возраста в фолликулярную фазу полового цикла. Количество желтых тел у кошек 1-5-летнего возраста в 2,02 раза больше, чем у кошек 5-9 лет. Отмечена прямая взаимосвязь между количеством фолликулов большого диаметра и содержанием эстрадиола в сыворотке крови, а также количеством желтых тел и содержанием прогестерона. Концентрация эстрадиола и прогестерона у кошек в возрасте 1-5 лет была выше, чем у кошек 5-9 лет в фолликулярную и лютеиновую фазу полового цикла. Содержание кортизола в разные фазы полового цикла остается стабильным и существенно не меняется с возрастом.

Ключевые слова: домашние кошки, морфометрические показатели, эстрадиол, прогестерон, желтые тела, фолликулы.