MORPHOMETRIC ANALYSIS OF CHANGES IN THE DIAMETER OF PRIMARY, SECONDARY, AND TERTIARY FOLLICULES OF THE EGGS IN POSTNATAL ONTOGENESIS OF GOATS.

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Abstract. In this scientific work, the morphometric changes in the diameter of primary, secondary, and tertiary follicles of the ovaries of goats at the stages of postnatal ontogenesis were studied. The results of the study showed that the diameter of the follicles consistently increases with age. Growth was especially rapid in the period from 3 to 12 months. No significant differences were observed between the right and left ovaries, but in some cases, the follicles of the left ovary showed a slightly larger diameter. The overall growth coefficient was 2.89 times in primary follicles, 3.38-3.39 times in secondary ones, and 2.05-2.07 times in tertiary ones.

Keywords. Goats, ovary, postnatal ontogenesis, follicle, morphometry, diameter, primary, secondary, tertiary follicle.

Introduction. In-depth study of the morphological development of the reproductive system of goats is important for improving the effectiveness of selection, breeding quality, and artificial insemination. In particular, the study of phased changes in ovarian follicles during postnatal ontogenesis provides important information about the maturation of egg cells and ovulation processes. Therefore, the main goal of this work was defined as the morphometric assessment of changes in the diameter of primary, secondary, and tertiary follicles in the ovaries of goats**.** The ovary is divided into two

functional parts: cortex and medulla. The cortex of the ovary is covered with simple cuboidal cells. The capsule is lined with thick, soft connective tissue beneath the superficial epithelium. In the ovary, cells of the white membrane, primary, secondary, and graafian follicles at different stages of development are visible. The brain consists of large vascular and neural networks with frequently, irregularly arranged connective tissues (Haque Z 2015).[1]

D.O. Sein, M.S. Kononova, I.M. Umerankov (2011), in puberty, along with the formation of the hypothalamic-pituitary connections, the formation of female genitalia occurs. In pigs, the functional activity of the ovaries increases, the number of secondary and tertiary follicular and atretic bodies increases. This indicates the preparation of the female reproductive organs for the upcoming reproductive process. [2]

Folliculogenesis is a complex and step-by-step biological process that determines the main reproductive function of the ovaries, consisting of the formation, growth, and maturation of follicles. Primordial follicles, which are the source of follicle development, are gradually consumed throughout ontogenesis as a physiological reserve of the ovaries. Most follicles undergo atresia during development, but some follicles mature to the ovulation stage and form a corpus luteum as a result of luteinization.

Depending on the stage of follicle development, three main forms of follicles are distinguished:

Primary follicles, containing somatic cells with squamous epithelium, represent the initial stage of development;

Secondary follicles, somatic cells are multilayered, and the formation of a follicular cavity begins.

Third-order (mature) follicles, or Graafian follicles, have a fully formed follicular cavity and are ready for ovulation.

The follicular zone is located in the cortex of the ovary, where follicles and corpus luteum at different stages of development are detected. This zone is the main functional layer that ensures the reproductive function of the ovary. The sequential and coordinated implementation of the folliculogenesis process plays an important role in maintaining the normal reproductive cycle and hormonal balance in females [3].

According to Yu.N.Fisenko, N.I.Ryadinskaya (2012), the linear dimensions and weight of the ovaries in West Siberian meat breeds grow unevenly. Their absolute mass increases from the neonatal period to 4 months: 4 times to the left and right. From the neonatal period to 4 months, the relative mass also

increases: to the left by 1.4 times, and to the right by 1.05 times. From the neonatal period to 4 months, the linear dimensions of the organ increase: the length of the left side by 2 times and the right side by 2.5 times, the width of the left side by 3 times and the right side by 2.5 times. In newborn lambs, there are primary, primary, and secondary follicles in the ovary. By the first month, cortical and medullary zones are visible, the isolated follicles are clearly distinguished from each other, and third-degree follicles with distinct granulose and theca appear. By the fourth month, the follicles are fully formed[4].

Newborn lambs have the largest number of primary follicles compared to one-month-old and four-month-old lambs. Primary and secondary follicles are present in small quantities. In one-month-old lambs, compared to newborn lambs, the number of primary follicles increased by 3 times, the number of secondary follicles - by 6 times, while the number of primary follicles decreased by 5 times. Also, a 2-fold increase in the number of third-degree follicles is observed. By four months, the number of primitive follicles decreases by 6 times, they are arranged in a linear arrangement. The number of primary and secondary follicles, on the contrary, increases by 11 and 12 times, respectively. [5]

Object and method of research. For the study, healthy goats were studied in a 7-year-old group from 3 days to 60 months. In each age group, 5 animal samples were analyzed. The ovaries were taken from experimental animals, fixed, and placed in paraffin blocks according to histological methods. Sections 5-7 μm thick were stained with hematoxylin-eosin and morphometrically analyzed under a microscope. Diameter measurements were recorded in the form of an average ± standard deviation and were carried out on the basis of statistical analysis **($p<0.05$).** In many studies (Jumaev, 2019 [6]; Karimova et al., 2020 [7]), although age-related changes in ovarian function in goats have been studied, systematic data on morphometric changes in the diameter of follicles are insufficient. In foreign literature (Noakes et al., 2019 [9]; Hafez, 2000 [8]) covers general reproductive physiology, but there is no in-depth study of follicular morphology in local breed goats. This work serves to fill this gap.

Diameter of primary follicles of left ovary

The absolute size of the diameter of the primary follicles of the left ovary during the period from the first 3 days to 60 months of postnatal ontogenesis of goats showed the following indicators with intensive growth. At 3 days, this indicator was 20.17±0.495 μm, and at the stage up to 3 months, it increased to 29.08±0.689 μm, and the growth coefficient was 1.44 times. At 6 months of age,

the diameter reached 32.27±0.67 μm (K=1.11; p<0.03), and at 12 months - 39.51±0.94 μm. At 18 months, this value reached 40.51±1.52 μm (K=1.03; p<0.04). In subsequent stages, that is, at 36 months, 46.68±1.30 μm (p<0.03), at 48 months - 49.30±0.96 μm (K=1.06), and at 60 months - 58.26±1.48 μm (K=1.18) were recorded. In general, the coefficient of growth of the diameter of the primary follicles of the left ovary in the period from 3 days to 60 months was 2.89 times.

Right ovarian secondary follicle diameter

The absolute size of the diameter of the secondary follicles of the right ovary also consistently increased during postnatal ontogenesis. At 3 days, this indicator was 30.06±0.793 μm, and at 3 months it increased to 57.60±1.422 μm, the growth coefficient was 1.92 times. At 6 months, the diameter reached 75.82±2.53 μm (K=1.32; p<0.03), at 12 months - 92.94±2.32 μm (K=1.23), and at 18 months - 96.40±2.52 μm (K=1.04; p<0.03). At the 36-month stage, the maximum value reached 100.04±2.00 μm (p<0.04), at 48 months - 101.86±2.81 μm (K=1.02), and at 60 months - 101.78±2.22 μm (K=1.00). The overall growth coefficient for these stages was 3.39 times.

Left ovarian secondary follicle diameter

The secondary follicles of the left ovary also showed the same growth dynamics. At 3 days of age, the diameter was 30.03±0.771 μm, and at 3 months of age it increased to 57.82±1.308 μm (K=1.93). At 6 months, it was 73.48±2.33 μm (K=1.27; p<0.03), at 12 months - 95.18±2.45 μm, at 18 months - 98.36±2.43 μm (K=1.03; p<0.03), and at 36 months - 99.40±1.54 μm (p<0.02). At 48 months, the highest value was 101.98±2.73 μm (K=1.03), and at 60 months - 101.46±2.24 μm (K=0.99). The overall growth coefficient was 3.38 times.

Changes in the diameter of tertiary follicles (right and left ovaries)

Right ovary

The absolute size of the diameter of the tertiary follicles of the right ovary increased rapidly during the period from 3 to 60 months of postnatal ontogenesis of goats and showed the following indicators. At 3 months of age, it was 293.60±9.878 μm, at 6 months of age, this indicator reached 399.02±8.46 μm, and the growth coefficient was 1.36 times.

At 12 months, the diameter was 514.80±16.68 μm (K=1.29; p<0.03), at 18 months it reached 531.12±19.61 μm (K=1.03), and at 36 months it reached 549.60±20.65 μm (K=1.03; p<0.03). In subsequent stages, that is, at 48 months, this value was 573.60±15.92 μm (p<0.02), and at 60 months, the maximum level was 601.78±9.22 μm (K=1.05).

Thus, the coefficient of growth of the diameter of the tertiary follicles of the right ovary from 3 to 60 months was 2.05 times.

Left ovary

The thirdary follicles of the left ovary exhibited a similar dynamic. At 3 months of age, the diameter of the follicle was 290.80±8.961 μm, and at 6 months of age, this indicator reached 388.73±7.21 μm (K=1.34). At 12 months, the diameter increased to 523.98±12.49 μm (K=1.35; $p<0.03$), at 18 months - 529.52±19.52 μm (K=1.01), at 36 months - 554.40±17.46 μm (K=1.04; $p<0.03$).

At 48 months, this indicator reached 565.00±14.87 μm ($p<0.03$), and at 60 months, the maximum value was 602.96±11.14 μm (K=1.07). In general, the coefficient of growth of the diameter of the tertiary follicles of the left ovary from 3 to 60 months was 2.07 times.

Conclusion

The results of the study showed that the diameter of primary, secondary, and tertiary follicles in the ovaries of goats consistently increases during postnatal ontogenesis. The most intensive growth occurred up to 3 months and slowed down after 18 months. Although the parameters of the right and left ovaries were similar, the follicles of the left ovaries at some stages had a slightly larger diameter. These results are an important factor in assessing the reproductive potential of goats and developing breeding programs.

List of references

1.Haque Z, Haque A. Abul Quasem MD. Gross and histomorphology of the ovary of Black Bengal Goat (Capra hircus). MJVR. 2015; 7(1): 37–42.

2.Сеин Д.О., Кононова М.С., Умеранков И.М. Гистологическая структура гипофиза и яичников у свиней в период пубертата /Д. О. Сеин, М.С. Кононова, И.М. Умеранков // Вестник КурскойГСХА. Выпуск № 2 / том 2 / 2011

3.Анатомия и физиология животных : учебник для студ. образоват. учреждений сред. проф. образования / Н. В. Зеленевский, А.П. Васильев, Л.К.Логинова. — 2-е изд., испр. — М. : Издательский центр «Академия», 2009. — 464 с.

4.Фисенко, Ю.Н., Рядинская, Н.И. Макромикроморфология яичников самок овец западно-сибирской мясной породы в раннем постнатальном онтогенезе / Ю.Н. Фисенко, Н.И. Рядинская // Аграрный вестник Урала. – 2012. - № 3. – С. 16-18.

5.Куга С.А. Морфофункциональные характеристики яичников на ранней стадии постнатального онтогенеза у овец романовской породы / С.А. Куга // Иппология и ветеринария. 2013. № 4 (10). С. 70-73.
6.Jumaev A.M. (2019). Echkilar reproduktiv tizimi morfologiyasi. Toshkent.
7.Karimova Z.Sh., Xodjayev D.A. (2020). Veterinariya anatomiya va gistologiyasi. Samarqand.
8.Hafez E.S.E. (2000). Reproduction in Farm Animals. 7th ed. Lippincott Williams & Wilkins.
9.Noakes D.E. et al. (2019). Veterinary Reproduction and Obstetrics. 10th ed.