Dynamics of changes in morpho-histological parameters of the ovary of the egg-bearing hens in postnatal ontogenesis

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Abstract. At various physiological stages of postnatal ontogenesis of egg-laying hens, the linear size and weight of the ovary, as well as the changing properties of their histological structures, were studied. Absolute indicators of the linear size and weight of the laying of hens show a slight increase in the intensity of postnatal ontogenesis from 15 days to 35 days, and this condition lasts up to 120 days due to the period of puberty of hens, while the physiological stage of maturity (168 days) is the highest; it was found that the morphometric parameters of the ovary decrease to 570 days in relation to the stage of generative withering of ovarian function in postnatal development after 168 days; it was recorded that the growth coefficient of morphometric parameters of the ovary of chickens is higher in weight than in linear dimensions, from 15 days to 570 days, days of postnatal ontogenesis; it was found that there are not so many primary follicles in the ovaries of chickens and that they are mainly located in the submesothelial connective tissue of the folds of the cortex of the bottom of the ovary, the presence of single and group gonocytes not surrounded by follicular epithelial cells, medium-sized gonocytes, hyperchromia of the ovaries of the nucleus, in which the nuclei are indistinctly visible and it was found that in a well-formed primordial In the follicle, the egg cell occupies the entire space.

1 Introduction

The relevance of the topic. Poultry farming is of great economic importance for the national economy, as it allows us to provide the population with valuable products at minimal prices in a short period of time. The cost per unit of products obtained is on average 2-3 times lower than in other livestock sectors. Poultry accounts for more than a third of meat and meat products consumption. Today, the growth of the world population based on progress in meeting their food needs is creating global problems throughout the world. To solve these global problems, all complex factors are of a demographic, environmental, economic, technological, socio-political nature and make it difficult to find solutions to interconnected

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problems. Today, poultry farming has become one of the important sources of economic development of society, providing work for thousands of people throughout our republic. The development of poultry farming is of particular importance in ensuring sustainable food security. Poultry farming is one of the most dynamically developing branches of livestock farming, which makes it possible to provide the population with dietary meat and egg products.

Knowledge of age-related morphofunctional changes in the ovaries and oviducts of laying hens provides a theoretical basis for improving existing technologies in order to increase poultry productivity and improve product quality [1].

According to scientists, mortality and forced slaughter of laying hens due to diseases of the reproductive system at egg poultry farms range from 25 to 50%. In some cases this figure exceeds 70-80%. In America, these diseases account for 35%; in poultry farms of the Altai Territory, these pathologies occupy more than 30% and cause great economic damage

Morphological differentiation of turkey ovaries has been studied at different stages of ontogenesis. According to the author, the formation of inferential gonads in turkey embryos occurs on the 3rd day of development and begins with the proliferation of the integumentary epithelium of the mesonephros and underlying mesenchyme. In turkey embryos on the 4th day of development, the reproductive primordia are filled with gonocytes, which are initially located between the cells of the integumentary epithelium and then penetrate into the mesenchymal base. By the end of embryonic development on the 10th day, a number of biochemical changes occur in some gonocytes associated with a decrease in the amount of proteins, glycoproteins and glycogen in the cytoplasm, which indicates the appearance of early cytoplasmic signs. On the 11th day of incubation in the gonads of turkey embryos, the processes of differentiation of the main organotypic structures continue. In the left gonad, the formation of the mesentery begins and its separation from the mesonephros, the white shell (tunica albuginea), the cortex and the core are formed. The cortex contains a large number of oogonia and various types of cells: epithelial derivatives, mesenchymocytes, poorly differentiated fibroblasts [2].

According to the authors, the number of longitudinal folds of the oviduct of birds is 20-25, their height is 1500 microns, width is 140 microns, and the height of the integumentary epithelium reaches 8 microns. In the protein part of the reproductive organs of laying hens, there are two types of glands - tubular and unicellular. The circular layer of the muscular layer is denser, the myocyte bundles are located close to each other. In 6-month-old chickens, the thickness of the muscular membrane is 161.9 microns, and at 12 months it becomes significantly smaller. This mainly depends on changes in the thickness of the private plate and the functional state of the reproductive tract of chickens [3] .

Today, modern highly productive egg-laying crosses of the Lohmann (Germany), Hisex, Bovans, Dekalb (Holland), Highline (USA) and Rhodonit-3 breeds can be kept in poultry farms. According to the authors, during the period of egg production, the composition of the chicken diet is improved taking into account the indicators of daily egg production and the nutrient needs of chickens in each 10-day period. It is recommended to avoid radical changes in feed composition between cycles [4].

When eggs are treated before being placed in the incubator with Chelavite, which contains a number of vitamins and minerals, hatchability increases by 4-5%, and the live weight of chickens after hatching is 6.8% higher than in the control group. , the number of lymphocytes in the immunocompetent organs increases, and when processing the eggs of cross-country chickens “Conkurent” before placing them in an incubator with lemontar, it was found that the hatch of chickens increased by 4-5%, the weight of chicks after hatching increased by 9%, the immunity of birds increased [5].

The reproductive organs of hens include the fallopian tubes and ovaries. The oviduct is a tubular organ in which the maturation and fertilization of the egg, the formation of the

tertiary membranes of the egg (albumen, shell, cortex, subshell) and the first stages of embryonic development of the embryo occur. The oviduct is located on the left side of the abdomen, hanging from the fourth rib to the cloaca in the ventral and dorsal ligaments. The infundibulum is the anterior part of the fallopian tube that opens into the wide, bell-shaped portion of the ovary. Based on morphofunctional characteristics, they are divided into a partial funnel and its neck. The funnel itself is thin-walled, cone-shaped, and opens towards the ovary. Its diameter is about 8-9 cm. The length of the infundibulum varies from 4 cm to 14 cm. The mucous membrane of the infundibulum has longitudinal folds that form small secondary folds, the mucous membrane of which is covered with ciliated cuboidal or columnar epithelium [6].

According to researchers, poultry meat makes up 67% of the live weight of an average bird and is a valuable dietary product with a protein content of 16-25%. Poultry provides the population with valuable food products such as eggs. Eggs contain a large amount of nutrients and biologically active, easily digestible substances. The protein contains lecithin, which is 96% absorbed by the human body. Eggs also contain a lot of vitamins. When a person eats one egg, 15% of the daily requirement for vitamin A, 10-40% for vitamin D, and 50-100% for vitamin B12 are met [7].

The wall of the oviduct of a sexually mature chicken is made of mucous, muscular and serous membranes The mucous membrane of the fallopian tube consists of a covering epithelium formed by porous connective tissue and a private plate. In the covering epithelium, ciliated and goblet cells are distinguished. The surface of the mucous membrane is folded. The submucosal layer is not developed. A thin layer of serous connective tissue is covered with a single layer of squamous epithelium [8].

Using the example of a duck, the researcher proposed the following periods of antenatal ontogenesis of birds.

- The first period is the period when the egg is in the fallopian tube.
- The second period, embryopause, lasts until the egg is laid for incubation.
- The next period is the incubation period - the time from laying eggs in the incubator to 9 days.
- After the fertile period, the pre-fertility period lasts from 10 to 16 days.
- The fifth period - the embryonic period - lasts from the 17th to the 19th day of development. The last period of embryonic development - neonatal - lasts from 26 days to the first day after hatching [9].

The purpose of the study. Egg production of hens consists in studying the changing characteristics of their morphometric parameters in the period from the beginning to the termination of the egg-laying process at various stages of postnatal ontogenesis of the ovary

It has been found that the response to mineral deficiency in laying hens is very rapid, acute calcium deficiency causes thin-shelled eggs, and this condition is caused by a sudden change in the amount of phosphorus while keeping the amount of calcium in the diet at a normal level [10].

2 Materials and methods

Scientific research work was carried out in the Laboratory of “Pathomorphology” of SamSUVMLB, department of animal anatomy, histology and pathological anatomy. As an object of research were taken 15, 35, 85, 120, 168, 280, 420 and 570-day-old hens of egg direction. The hens were slaughtered, bleed, and their left ovaries were separated from the body of the hens and KERN.PBJ-N was measured at an accuracy of 0.01 g on the electrical scales and linear dimensions were obtained.

Digital data of macro- and micrometric indicators obtained as a result of the study were processed by methods of variational statistics using Microsoft Excel computer programs.

To determine the dynamics of morphometric size changes depending on age, the growth coefficient was calculated. The growth factor was determined by dividing the morphometric parameters of the ovaries of older hens by the corresponding indicators of younger hens, and the entire studied period of postnatal ontogenesis was determined by the formula developed by K. B. Svechin:

$$K = \frac{V_t}{V_0} \quad (1)$$

K – growth rate; V_t – the absolute indicator of the morphometric size of the ovary of an adult hen; V_0 – the initial indicator of the morphometric size of the ovaries.

3 Results and Discussion

As a result of scientific research, it has been established that the morphohistological parameters of the ovary demonstrate specific dynamics at different physiological stages of postnatal ontogenesis of laying hens.

It was found that, the absolute indicator of the length of laying hens intensively from the 15th to the 35th day of postnatal ontogenesis from 0.518 ± 0.012 cm to 0.67± 0.02 cm, or its growth coefficient during this period is 1.31 times, and this condition continues in stages until the next 168 days. That is, this indicator is Day in 85 increases to - 2.56±0.06 cm (K=3.8; p<0.02), on day 120 - to 8.20±0.19cm (K= 3.2; p<0.03), and on 168 –to 35.24±0.71cm (K=4.29; p<0.03). It is noted that This indicator of the ovary does not change significantly in the studied stages of postnatal ontogenesis after 168 days and at 280 is equal to 20.25±0.49 cm (K=0.39; p<0.03), on day 420 - 9.92±0.34 cm (K=0.58), and on day 570 - 5.38±0.19 cm (K=0.54; p<0.03). It was found that during the period from the 15th to 570 days of postnatal ontogenesis of hens, the growth coefficient of the absolute indicator of ovarian length increased to 10.55 times.

It was determined, that the absolute indicator of the diameter of the ovary gradually increases from the 15th to the 168th day of postnatal ontogenesis of hens, that is, this indicator on the 15th day was 0.316±0.011 cm, on the 35th day -0.378±0.008 cm (K=1.19; p<0, 03), by 85 on the day - 0.414±0.011 cm (K=1.09; p<0.03), on the 120th day - 1.58±0.04 cm (K=3.81; p<0, 02), and on the 168th day - 13.12±0.25 cm (K=8.3; p<0.02). There was a decrease in this indicator of the ovary after the 168th day of postnatal ontogenesis of hens, i.e. in the period of postphysiological maturity, namely on the 280 days - up to 13.02±0.15 cm (K=0.99), on the 420th day - up to - 12.08±0.20 cm (K=0.67), and by 570–day 1 – up to - 5.5±0.17 cm (K=0.62). It was noted, that the of growth coefficient of the absolute indicator of the diameter of the ovary laying hens increases to 23.73 times during the period from 15 days to 570 days of postnatal ontogenesis.

The absolute indicator of the mass of the oviduct of hens in the direction of the egg is a slight rapid increase in postnatal ontogenesis from the first 15 days to 35 days, in accordance with its linear dimensions, and from 0.084±0.002 g to 0.176±0.005 g, or during this period, its growth coefficient increases to 2.09 times, and; (P<0.03), that is, this indicator is Day in 85 increases to - 0.382±0.010 g (K=2.17; p<0.02), after 120 days – 15.22±0.23 g (k=39.8; P<0.03), after 168 days - 28.78±0.63 g (k=1.8; P<0.03), after 280 days – an increase of 51.24±0.54 g (K=1.78) was recorded. There was a significant decrease in this indicator of the ovary at later stages of postnatal development, i.e. on the 420th day (43.00±0.93 g; K=0.83), up to, and on the 570th day to 29.08±0.55 g (K=0.67). It was found that the growth coefficient of the absolute indicator of ovarian mass increases from 15 to 570 days of postnatal ontogenesis of hens by 346.19 times.

Therefore, the absolute indicators of the linear dimensions and weight of laying hens in the egg direction, they have certain morphological features in connection with the functional and physiological processes occurring in their body.

As a result of the studies, it was established that primordial follicles in the ovaries of hens are few in number and are mainly located in the submesothelial connective tissue of the folds of the ovarian cortex. There are single and groups of gonocytes not surrounded by follicular epithelial cells. Such gonocytes are small, with relatively clear cytoplasm. The nuclei are hyperchromatic, the nucleoli are not expressed in them. In a well-formed primordial follicle, the oocyte occupies its entire cavity.

It is noted, that the base of the follicle stalk is composed of loose fibrous connective tissue and bundles of smooth muscle cells oriented in different directions, arterial and venous blood vessels and a few interstitial cells. The entire cavity of the follicle is occupied by the oocyte.

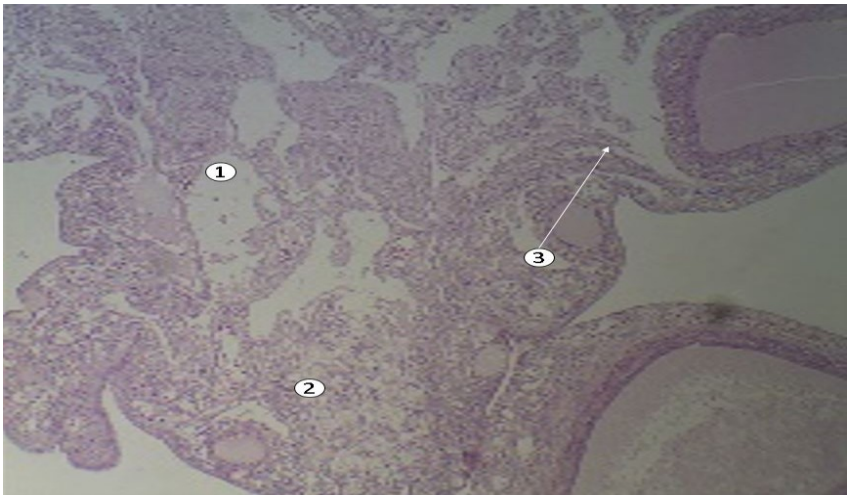

Fig. 1. Histological picture of the chicken ovary. Age 120 days. Hematoxylin-eosin staining (×100). 1 – Vascular layer, 2 – Numerous small follicles, 3 – Follicle stalks.

As a result of the study, it was found that in the immediate vicinity of the follicle there is a dense network of collagen fibers. There are primordial follicles, the epithelium of which contains one or two or three follicular cells. Such follicles are probably in a state of formation. Follicles at the stage of initial growth processes are located in the connective tissue basis of the folds of the ovarian cortex and, most often, directly under the tunica albuginea. The cavity of the follicle is occupied by an oocyte. The oocyte nucleus is relatively large and can be located either in the center or shifted to the periphery. Its chromatin is presented in clumps. The so-called light perinuclear space is clearly visible around the nuclei.

The thickness of the follicle wall is not uniform throughout. The follicular epithelium is single-layer cubic. Epithelial cells are large. Their nuclei are hyperchromatic, round, sometimes somewhat flattened, and displaced apically. The coarse chromatin of the karyoplasm has a pronounced karyolemmal attachment. Dust-like eosinophilic granularity is visible in the cytoplasm of epithelial cells.

The internal theca is a rather dense narrow section of the wall. It is based on loose connective tissue. At this stage of follicle development, only delicate layers of collagen fiber bundles and individual smooth muscle cells are detected in the theca. The microcapillary vascular zone of the external theca is not expressed.

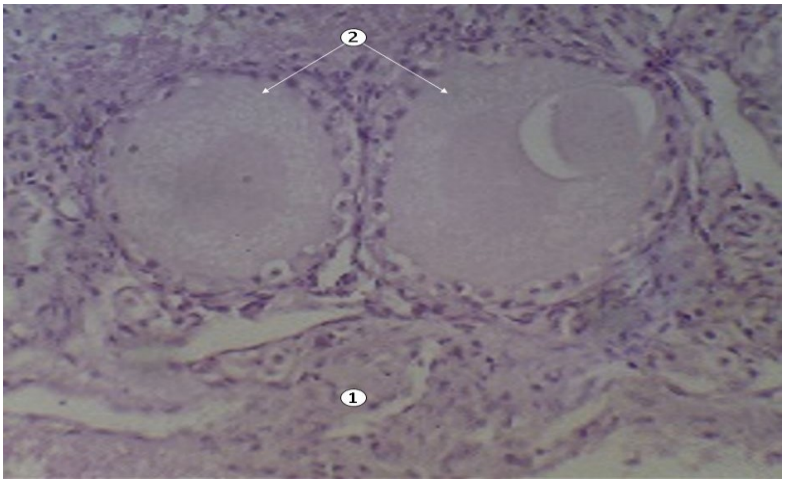

Fig. 2. Histological picture of a chicken ovary. Age 168 days. Hematoxylin-eosin staining (×400). 1– Cortical layer, 2 – Maturing follicles.

As the follicle grows, it puts pressure on the tunica albuginea, it becomes thinner, and the follicle, at the stage of rapid growth, emerges on the surface of the ovary. In this case, a stalk, or stalk, of the follicle is formed, with the help of which it connects to the stroma of the ovary. The base of the follicle stalk is composed of loose fibrous connective tissue and bundles of smooth muscle cells oriented in different directions, arterial and venous blood vessels and a few interstitial cells. The entire cavity of the follicle is occupied by the oocyte. The cytoplasm of the oocyte is heterogeneous, contains large vacuoles, and dust-like inclusions are found in it, located mainly on the periphery of the oocyte.

4 Conclusion

- Absolute indicators of the linear size and mass of the hen ovary in the direction of the egg showed an unimaginable increase in postnatal ontogenesis from 15 days to 35 days, and this condition lasts up to 120 days due to the period of puberty of hens, while the physiological stage of maturation (168 days).
- It was found that the morphometric parameters of the ovary of hens in the egg direction decrease to 570 days due to the stage of generative withering of ovarian function at the stages of postnatal development after 168 days of development.
- It was noted that the growth coefficient of morphometric parameters of the ovary of hens is higher in weight than in linear dimensions from 15 days to 570 days of postnatal ontogenesis;it was found that there are not so many primary follicles in the ovaries of hens, and they are mainly located in the submesothelial connective tissue of the folds of the ovarian fundus cortex, the presence of single and group gonocytes not surrounded by follicular epithelial cells, medium-sized gonocytes, hyperchromic nuclei in which the nuclei are not clearly visible.

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