

ANNOTATION
dissertation work of Zhakiyanova Meiramgul Sailaubaeвна
on the topic “Vascularization and microstructure of the liver and pancreas of
sheep and rabbits in postnatal ontogenesis” submitted for the degree of
Doctor of Philosophy (PhD) in the specialty
6D120100- Veterinary medicine

Relevance of the research topic. As a result of the economic crisis in the first years after Kazakhstan gained independence and some unsuccessful reforms in livestock farming, sheep farming experienced a serious decline.

Currently, there are 12.3 million head of small ruminants in Kazakhstan. The bulk of it is grown on private farms. “Kazakh Research Institute of Livestock and Feed Production”, “Kazakh Technological Research Institute of Sheep Breeding”, “Kazakh Research Veterinary Institute” are engaged in research work in the field of breeding, keeping and feeding animals.

Rabbit farming is considered one of the new emerging industries in the country. In this regard, the demand for rabbit products among the population is growing every year, and the number of small farmers engaged in rabbit breeding is increasing. In our country, special attention is not paid to the biological characteristics and economic efficiency of this industry. That is why the number of these animals, which can be used to produce valuable leather and fur raw materials and dietary meat throughout the year, is small.

At this time, the most relevant are studies devoted to identifying the anatomical and histological patterns of the organization of internal organs in animals, depending on their species and breed. This is due to the fact that at the moment the current direction of modern morphology is the study of the norms of the structure of organs, which reflects the patterns of their individual variability.

Knowledge about the peculiarities of liver morphology is essential for the development of effective methods for diagnosis, treatment and veterinary and sanitary examination of slaughter products. It is very important for experienced veterinarians and veterinary students to have detailed information about the structure of the wall digestive glands.

This information allows us to better understand and evaluate pathomorphological changes in the diagnosis of various infectious, parasitic and non-infectious diseases. Macroscopic data on the structure of the organ facilitate the work of surgeons and thereby make a significant contribution to morphology and veterinary hepatology.

Currently, the morphology of the liver and pancreas of animals of the mammalian class (sheep, belonging to the bovid family, as well as rabbit, belonging to the lagomorph family), has not been sufficiently studied. There is no data in the literature on the macro-micromorphology and patterns of ultrastructural features of the liver and pancreas in the postnatal ontogenesis of the Kazakh fat-tailed semi-coarse-wool sheep and the Giant rabbit. Therefore, we devoted our research to the study of the sheep (*Ovis aries*) as a ruminant artiodactyl animal and the rabbit (*Oryctolagus cuniculus*), belonging to the class mammals. Both species are

herbivores. However, since the sheep's stomach is multi-chambered, the process of breakdown of fibers and protein molecules of food occurs in the rumen, and since the rabbit's stomach is single-chambered, this process occurs in the large intestine.

In this regard, the purpose of our research work was to study the morphology of the liver and pancreas of Kazakh fat-tailed semi-coarse-wool sheep and rabbits of the "Giant" breed.

The purpose of the dissertation is to establish the morphological features of the liver and pancreas, as well as their macro-micromorphology, including ultrastructural features at the stages of postnatal ontogenesis of the Kazakh fat-tailed semi-coarse-wool sheep breed and the "Giant" rabbit breed.

Research objectives.

1. To establish the macro-micromorphological features of the liver and pancreas of the Kazakh fat-tailed semi-coarse-wool breed of sheep and rabbit of the "Giant" breed in postnatal ontogenesis.

2. To establish the patterns of vascularization of the liver of the Kazakh fat-tailed semi-coarse-wool breed of sheep and rabbit of the "Giant" breed in postnatal ontogenesis.

3. To establish the ultrastructural patterns of the liver and pancreas of the Kazakh fat-tailed semi-coarse-wool breed of sheep and rabbit of the "Giant" breed in postnatal ontogenesis.

4. Identification of the morphological features of the liver and pancreas of the Kazakh fat-tailed semi-coarse-wool breed of sheep and rabbit of the "Giant" breed in postnatal ontogenesis.

Materials and research methods

Research work was carried out in accordance with the theme of the project "Study of the morphofunctional characteristics of the wall glands of the digestive system of farm animals and fur-bearing animals during invasions" for 2021-2022. JSC "National Center for State Scientific and Technical Expertise", state registration No. 0121RKI0072, 04/05/2021, from 2018 to 2024.

The purpose of our study was to determine the morphological characteristics of the liver and pancreas of the Kazakh fat-tailed semi-coarse-wool breed of sheep and rabbit of the "Giant" breed in postnatal ontogenesis.

Research work was carried out from 2018 to 2024 in: NJSC Shakarim University of Semey, Faculty of Veterinary Medicine and Agricultural Management, under the Department of Veterinary Medicine; scientific research center "Agrotechnopark"; Regional engineering testing laboratory "Scientific Center for Radioecological Research"; "National Nuclear Center of the Republic of Kazakhstan", Kurchatov; at the special slaughterhouse "Sary" for the slaughter of sheep raised on private farms in the Abay region, at the Sayan state farm in the village of Aksuat in the East Kazakhstan region, at the small rabbit breeding farm "Maxim" in the city of Semey.

In total, material for scientific research was taken from 270 heads of sheep and rabbits of different ages. The liver from 80 animals and the pancreas from 50

animals were studied. The age of the livestock was determined using the original farm documents and the farm animal identification portal.

When conducting the study, a complex of traditional and modern morphological methods was used:

1. Visual research. Anatomical and topographic research methods included the following stages: slaughter and bleeding; opening of the chest and abdominal cavities; study of the topographic location of the liver and pancreas in relation to anatomical structures; a visual assessment of the organ was carried out by examining the color, consistency, grooves, the presence of pathological changes and the weight of the examined organs were determined. The obtained information was processed by methods of variation statistics. The significance of differences in indicators between age groups of animals was determined using Student's t-test. And the parts of the organ being studied, their length and thickness were determined using a caliper and a micrometer.

2. Study of the structure of organs by making histological sections. When studying histological preparations of the liver, attention was paid to the hepatic beams, hepatocytes, sinusoidal capillaries, and when studying the pancreas - to the acini, stroma and islets of Langerhans; presented comparative results.

3. To establish the patterns of vascularization of the studied organs, angiography was performed. For this purpose, the vascular bed was injected with a suspension of red lead in turpentine. Subsequently, the shooting was carried out using the "Roentgenography RU-76" apparatus. When studying angiograms, the course and topography of the vessels were studied.

4. To identify the spatial organization of the blood vascular bed, a corrosion method was used: introducing cold polymerized plastic into the vascular bed. Using this method, the system of large and small vessels of the liver was determined by injecting a special solution into the portal vein of the liver. The corrosive preparation EDP-2 was prepared from 100 ml of epoxidizing liquid.

5. We used the method of intraorgan injection according to D. Zhdanov, the founder of the study of the parts of the hemomicrocirculatory bed.

6. Determination of the ultrastructure of the parenchyma and stroma of organs was carried out using a scanning electron microscope. To study the ultrastructural features of the liver and pancreas of sheep and rabbits, a JEOL 6390LV Scanning Electron Microscope with an INCAENERGY-250 X-ray microanalysis system was used. The material is fully prepared according to the research methodology. The image obtained using a microscope made it possible to study in detail the structure of the organs being studied and obtain clear photographs.

Main provisions submitted for defense:

- macroscopic morphology of the liver and pancreas of sheep and rabbits in postnatal ontogenesis
- microscopic morphology of the liver and pancreas of sheep and rabbits in postnatal ontogenesis;
- vascularization of the liver of sheep and rabbits in postnatal ontogenesis;

- ultrastructural features of the liver and pancreas of sheep and rabbits in postnatal ontogenesis.

Description of the main results of the study.

Based on the research results, a positive conclusion was received on the issuance of 3 patents for utility models:

- “X-ray contrast device” No. 5460 (application No. 2020/0672.2 dated October 23, 2020)

- “X-ray contrast liquid” No. 109114 (application No. 2020/0834.2 dated September 15, 2020)

- “Method for the manufacture of anatomical corrosion preparations” No. 9061 (application No. 2024/0252.2 dated April 26, 2024)

The scientific novelty and value of the results obtained lie in the fact that for the first time, using traditional and modern morphological research methods, a number of unique patterns of postnatal ontogenesis of the liver and pancreas were established in the Kazakh fat-tailed semi-coarse-wool sheep breed and the “Giant” rabbit breed.

For the first time, the patterns of postnatal ontogenesis of the circulatory system, as well as the patterns of the histological organization of the liver and pancreas of the Kazakh fat-tailed semi-coarse-haired sheep and the “Giant” rabbit have been established.

For the first time, the patterns of ultrastructural organization of the liver and pancreas have been established in the Kazakh fat-tailed semi-coarse-wool sheep breed and the “Giant” rabbit breed. The technique for studying the circulatory system of the liver has been improved by introducing corrosive solutions into the vessels of the organ.

The obtained data on the patterns of postnatal development of the liver and pancreas, their macro-, micro- and ultrastructural organization, as well as data on the structure of the circulatory system of the liver in the Kazakh fat-tailed semi-coarse-wool sheep breed and the “Giant” rabbit significantly enrich and complement comparative anatomy. They are fundamental to the development of the theory of evolution and can be applied to:

- study of the species, comparative and breed morphophysiology and pathomorphology of the stent digestive glands;

- assessment of the morphofunctional state of the liver in order to determine the boundary between normal and pathological;

- conducting research work in laboratories studying the morphophysiology of the gastrointestinal tract;

- studying the pathogenesis of diseases of the liver and digestive system;

- carrying out preventive, diagnostic and therapeutic measures;

- compilation of textbooks, atlases, teaching aids and reference books on the anatomy and histology of animals.

The method developed during the study for studying the circulatory system of the liver by introducing a corrosive solution can be recommended as the basis for studying the morphology of the liver and the physiology of its hemocirculation.

Description of the doctoral student's contribution to the preparation of each publication

Based on the results of the doctoral student's scientific research, 8 scientific works were prepared and published under the guidance of scientific supervisors, including:

Of these, 3 (three) articles were published in scientific journals recommended by the Committee for Control in the Field of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan:

1. Morphology of the liver and pancreas of the rabbit // Bulletin of the Shakarim University of Semey. – 2020. – No. 1(89). – pp. 318-322.

2. Koyannyn postembryonics kesenindegi bauyrdy korektendiretin tamyrlar // Izdenister men natizheler gylymi magazines. – 2020. – No. 3(087). – B. 28-33.

3. Age-related changes in the wall glands of the digestive system in the postembryonic period in sheep // Multidisciplinary scientific journal of Kostanay Regional University named after Akhmet Baitursynuly. – 2023. – No. 4. – pp. 39-47.

4 (four) articles were presented and published at international scientific and practical conferences:

1. Anatomical structure of the liver of rabbits of the “Black Giant” breed // IV International Scientific and Practical Conference “Science and Education in the Modern World: Challenges of the 21st Century” (Nur-Sultan, 2019. – P. 90-). 96).

2. Microstructural structure of the pancreas of rabbits depending on age characteristics // Research, results - Research, results. – 2021. – No. 1(89). - B. 47-55.

3. Age-related changes in the microstructure of the liver in the postembryonic period in rabbits // Journal “Biological Sciences” of Kyzylorda University named after Korkyt Ata. - 2023. - Vol. 1, number 1. - B. 21-29.

4. Anatomical structure of the salivary glands of a rabbit. Omarbekov E.O. Materials of the republican scientific and practical conference dedicated to the 75th anniversary of “Achievements of modern veterinary science in the 21st century: innovations, experience, problems and ways to solve them.” 1 section. // "University named after Shakarim of Semey." 2021 - B. 50-53.

An article was published in the Scopus and Web of Science databases (Age-related changes in the extramural digestive glands of sheep and rabbits in the postembryonic period // Open Veterinary Journal. - 2023. - Volume 13, No. 1. - P. 123-130. Scopus). 60th percentile data based on) one article.

3 (three) patents of the Republic of Kazakhstan for a utility model were received (No. 5460 dated 10.23.2020; No. 109114 dated 09.15.2020; No. 9061 dated 04.26.2024).

Obtained unique data on the patterns of postnatal development of the liver and pancreas, their macro-, micro- and ultrastructural organization, data on the structure

of the circulatory and biliary systems of the liver, which were introduced into the Shakarim University of Semey, Department of Veterinary Medicine, Veterinary Sanitation and Technology for the Production of Livestock Products in bachelor's and master's degrees (Minutes No. 1 of 03/14/2019, No. 4 of 04/17/2019, No. 10 of 02/18/2020, No. 12 of 04/07/2020, No. 14 of 06/19/2020) "Veterinary", "Veterinary sanitation", "Technology of production of livestock products" are included in the educational process of JSC "Kazakh National Agrarian Research University", NJSC "Kazakh Scientific Research Agrarian University named after S. Seifullin", faculty of "Veterinary Medicine and Livestock Technology", for students studying in the course "Veterinary Medicine": "Veterinary Safety" (bachelor's degree); "Diagnostics, treatment and prevention of animal diseases" (master's degree) was included in the educational process during coursework, diploma and dissertation work.

JSC "National State Scientific and Technical Center for Expertise", state registration number 0121RKI0072 dated 04/05/2021, "Study of the morphofunctional characteristics of the wall glands of the digestive system of farm animals and fur-bearing animals during invasions", the initiative topic of the project was approved.

She took part in the project on the basis of order No. 113-1 dated May 24, 2019 as part of agricultural development projects in the East Kazakhstan region.

Scope and structure of the dissertation. The thesis is presented on 119 pages of computer text. Consists of a literature review, the results of one's own research, including materials and research methods, a discussion of the results of one's own research, conclusions, practical suggestions and recommendations for production, a bibliography including 174 sources. The dissertation contains 11 tables, 70 macro- and microphotographs.