Morphofunctional changes in rabbit thymus with simultaneous vaccination and disinsection

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Abstract. The work carried out a morphometric study of the thymus of rabbits vaccinated with the associated vaccine against myxomatosis and viral hemorrhagic disease of rabbits (VHD) at a dose of 0.5 ml subcutaneously and treated with an insecticide preparation "Stronghold" (selamectin 6%) at a dose of 0.1 ml / kg at the withers ... Chinchilla rabbits, live weight 2-2.5 kg, aged 6-8 months were used as experimental material. In total, 20 animals were examined. The thymus was examined by conventional histological methods. The nature of changes in the morphofunctional parameters of the thymus with the combined use of the investigated factors revealed a dependence on the time of application of the drug "Stronghold" in relation to the vaccine. Our studies on rabbit immunogenesis with simultaneous vaccination against myxomatosis and viral hemorrhagic disease of rabbits (VGBD) and treatment with the Stronghold insecticide with the active ingredient selamectin in the form of a 6% solution did not show significant morphofunctional changes in the thymus with increased stress load on a living organism.

1. Introduction
The state of the immune system in animals after preventive veterinary measures is of growing interest among veterinary specialists. Factors of different etiology can influence the immune status of the animal organism.

Therefore, for example, vaccinated rabbits against the background of viral hemorrhagic disease in the subclinical course of eimeriosis show insufficiently intense immunity [1-2].

Vaccination with emulsified and thiosulfate vaccines against leptospirosis in rabbits caused a narrowing of the cortical and expansion of the medulla of the lobules, a decrease in the number of thymocytes in them, which indicates an active migration of cells outside the organ, exceeding their proliferative capacity [3-4], similar changes were noted in salmonellosis in cattle [5].

Dysbacteriosis of the rabbit intestine causes a decrease in the concentration of T-lymphocytes, B-lymphocytes, phagocytic activity of neutrophils [6-7].

Biostimulants contribute to an increase in the number of thymic bodies in the brain zone of rabbits, which makes it possible to judge the active synthetic activity of cells, an increase in the volumetric density of the brain zone of the thymus, which leads to a rapid response of highly labile mechanisms of cellular interaction of cell proliferation and differentiation [8-11].

Insecticides have a certain effect on the immunological reactivity of animals, after the application of which on the 12th day, there is an increase in phagocytes and medium lymphocytes [12-15].

Vaccination and disinfection of rabbits from the main infectious and invasive diseases is a mandatory veterinary measure in rabbit breeding. By neglecting vaccinations, the breeder runs the risk
of losing all of his livestock of rabbits, and ignoring pest control leads to unjustified material costs. At the same time, the separate implementation of these two necessary measures leads to a loss of time and increases the labor intensity of preventive veterinary measures. Despite the sufficient volume of scientific studies presented in the literature, we did not find comprehensive information about the structure of the organs of the immune system after the use of modern drugs and with the simultaneous use of drugs that pursue various goals of prevention.

The aim of the research is to assess the immune status of the rabbit's body in the analysis of morphofunctional changes in the thymus with the simultaneous use of the associated vaccine against myxomatosis and viral hemorrhagic disease of rabbits (VHDV) and insecticide "Stronghold" with the active ingredient selamectin in the form of a 6% solution.

2. Materials and methods
The work carried out a morphometric study of the thymus of rabbits vaccinated with the associated vaccine against myxomatosis and viral hemorrhagic disease of rabbits (VHD) at a dose of 0.5 ml subcutaneously and treated with an insecticide preparation "Stronghold" (selamectin 6%) at a dose of 0.1 ml / kg at the withers. Chinchilla rabbits, live weight 2-2.5 kg, aged 6-8 months were used as experimental material. In total, 20 animals were examined. The thymus was examined by conventional histological methods. For the histological assessment of the cellular elements and tissue structures of the rabbit thymus, serial paraffin sections with a thickness of 5-7 μm were made on a sledge microtome “C. Reichert wien”, with subsequent staining with hematoxylin-eosin according to Karacci. Histological preparations were examined using a Levenhuk microscope. Micro-morphometric measurements were carried out using the Levenhuk C 510 NG 5 M pixels software.

3. Results and Discussion
Our studies have shown that on the third day after vaccination in the thymus, there is an increase in the processes of cell reproduction and transformation. An increase in the number of thymocytes and an increase in the relative area of the medulla are morphological criteria for the enhancement of intraorgan migration of lymphocytes from the cortex to the medulla. As a result of antigenic stimulation, an increase in the number of dying cells, mainly young ones, was noted. On the tenth day, the processes of activation and transformation in the organ die out. The decrease in the number of thymocytes occurred due to their increased emigration from the thymus.

When rabbits were treated with a 6% solution of selamectin (Stronghold drug) on the third day, an increase in the relative area and total number of thymocytes in the medulla was noted, which is a sign of the accumulation of cells in it. On the tenth day, along with a decrease in the mass of the organ and the total number of thymocytes, an increase in the density of thymocytes by 1 mm$^2$ was noted, mainly due to activated thymocytes and an increase in the blast transformation index. These facts indicate the end of the processes of emigration and the beginning of the restoration of the original state of the organ.

With the combined use of a vaccine and an insecticide, on the third day, a convergence of the densities of thymocytes in the cortex and medulla is noted, which indicates a sufficiently high functional tension of the organ. The number of dying cells in the cortex more than triples. On the tenth day, no morphological signs of cell emigration to the periphery were observed in the thymus, which took place at the same time during vaccination. An increase in the number of small and activated lymphocytes was also noted. The density of cells per 1 mm$^2$ of the cortical substance increases 1.87 times. These indications may indicate the beginning of the process of colonization of the thymus with bone marrow pre-T cells. However, this process is not intensive enough and over a longer period.

When rabbits were treated with 6% selamectin solution (Stronghold drug) seven days after vaccination, on the tenth day, there was a significant increase in organ weight and cell density in 1 mm$^2$, due to small and activated lymphocytes. Apparently, the use of the insecticide seven days after vaccination on the tenth day stimulates the repopulation of the thymus with bone marrow pre-T cells.
At the same time, there is a high intensity of both the process of colonization of the organ and the processes of transformation and activation of newly arrived migrants.

4. Conclusion
The nature of changes in the morphofunctional parameters of the thymus with the combined use of the investigated factors revealed a dependence on the time of application of the drug "Stronghold" in relation to the vaccine.

Our studies on rabbit immunogenesis with simultaneous vaccination against myxomatosis and viral hemorrhagic disease of rabbits (VGBD) and treatment with the Stronghold insecticide with the active ingredient selamectin in the form of a 6% solution did not show significant morphofunctional changes in the thymus with increased stress load on a living organism.

The results of our research allow us to recommend vaccination and disinfestation in rabbit farms at the same time without compromising the health and immune status of the animal organism.

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