Morphophysiology of Endocrine Glands in Young Hogs during Postnatal Ontogeny under Conditions of Treatment with Biogenic Compounds

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Combined trepel+suvar or trepel+polystim treatment of young hogs under biogeochemical conditions of the Chuvash Center ecological subregion stimulates structural and functional organization of the thymus and thyroid and adrenal glands and is therefore physiologically justified.

Key Words: *young hogs; thymus; thyroid; adrenals*

The physiological function of endocrine secretion is realization of the relationships and interactions between individual organs, thus providing the integrity of the organism and all its functions under conditions of exposure to environmental factors or fluctuations in the chemical composition and physicochemical characteristics of endocrine secretion [1-4].

We studied the ontogenetic characteristics of the structural and functional status of the thymus, thyroid, and adrenals in young hogs treated with trepel, suvar, and polystim under biogeochemical conditions of the Chuvash Center ecological subregion.

MATERIALS AND METHODS

Two series of experiments were carried out on 48 young hogs deparated from mothers. Each group consisted of 8 animals matched by clinical physiological status, bread, age, gender, and body weight. All animals received balanced diets in accordance with the standards and rations recommended by the Russian Academy of Agricultural Sciences [2].

Group 1 young hogs (controls) received basic ration (BR) on days 60-300 of life (period of observation). Animals of experimental series I receiving BR (groups 2 and 3) were treated with trepel in a daily dose of 1.25 g/kg. In addition to trepel, animals of group 3 received suvar (25-50 mg/kg every 20 days with an interval of 10 days) until the age of 240 days. In experimental series II, young hogs of groups 2 and 3 receiving BR were treated with trepel. In addition, animals of group 2 received suvar in the above specified dose. Animals of group 3 were intramuscularly injected with polystim in doses of 0.1, 0.03, and 0.03 mg/kg on days 60, 180, and 240 of life, respectively.

The animals were sacrificed by decapitation at the age of 60, 210, and 300 days. Weights and morphometric characteristics of structures of the thymus, thyroid, and adrenals were evaluated by the common histological methods [3].

RESULTS

Experimental series I showed (Fig. 1) that the width of the thymus cortex decreased from 0.35±0.05-0.37±0.05 to 0.21±0.04-0.27±0.04 mm with animal growth, while the width of the medulla increased from 0.39±0.13-0.41±0.05 to 0.46±0.02-0.53±0.04 mm ($p>0.05$).

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Thymocyte count in the cortical matter of animals decreased with animal growth from 2867.00±51.32-3021.00±99.15 to 2089.00±70.50-2835.00±90.61 cells. Thymocyte counts in groups 2 and 3 animals aged 210 and 300 days was 471-746 cells higher (p<0.005-0.001) than in the controls of the same age.

Similar regularity was detected for shifts in thymocyte counts in the medulla. The count of Hassall bodies increased from 0-5 to 3-9 with growth of experimental animals. At the age of 300 days it was the maximum in young hogs of group 1 and the minimum in group 3.

The diameters of the follicles gradually increased with aging from 0.054±0.005-0.059±0.005 to 0.103±0.005-0.117±0.050 mm. The parameter was virtually the same at the age of 60 days, while at the age of 210 and 300 days the diameters of follicles in group 3 were 0.008-0.011 mm greater (p>0.05) in comparison with the controls.

Quite a different regularity was revealed for changes in the thickness of the thyroid follicular epithelium, which decreased from 0.010±0.003-0.012±0.004 to 0.005±0.001-0.009±0.001 mm. The parameter was 41.7 and 44.4% higher (p<0.001-0.005) in group 3 young hogs aged 210 and 300 days treated with trepel+suvar, in comparison with age-matched controls.

Brown's index in experimental animals increased from 4.70±0.65-5.40±0.63 to 13.00±0.97-20.60±0.90 during their growth, this increase being the greatest in comparison with the control in group 3 young hogs (p<0.001-0.005).

The adrenal weigh in young hogs increased with age from 1.38±0.01-1.40±0.01 to 5.71±0.03-5.96±0.02 g. In 300-day-old animals of group 3, this parameter was 0.25 g greater than in age-matched controls (p<0.05).

The dynamics of the cortical matter width was in complete agreement with the course of changes in the adrenal weight.

Changes in the width of the glomerular, bundle, and reticular zones correlated with the dynamics of cortical matter width.

A similar regularity was revealed for the dynamics of the medulla width, which also increased from the age of 60 to 300 days in control and experimental hogs (from 0.91±0.04-0.98±0.04 to 1.24±0.01-1.37±0.04 mm). The cortical width was about the same in animals aged 60 and 210 days (p>0.05), while at the age of 300 days this value was significantly higher in groups 2 and 3 than in control animals of the same age.

Experimental series II showed that the width of the cortical matter in the thymus decreased with age from 0.39±0.02-0.41±0.03 to 0.28±0.05-0.34±0.03 mm, while the width of the medulla increased from 0.42±0.04-0.45±0.06 to 0.50±0.05-0.56±0.02 mm (p>0.05).

The count of T-lymphocytes in the cortical matter decreased with age from 3167.00±78.64-3192.00±4781 to 2189.00±56.45-2534.00±75.21 cells. The count of T-lymphocytes in group 2 hogs aged 300 days was 340 cells higher and in group 3 hogs aged 210 and 300 days 187-345 cells higher than in the controls of the same age (p<0.05-0.01).

A similar regularity was observed for the dynamics of thymocyte count in the medulla. The count of Hassall bodies in the thymic medulla increased with age from 0-6 to 4-10.

The diameter of thyroid follicles increased with age from 0.064±0.002-0.072±0.004 to 0.107±0.004-0.120±0.010 mm. A different regularity was observed for the dynamics of changes in the thyroid epithelium thickness, which decreased in all hogs from the age of 60 to 300 days from 0.011±0.003-

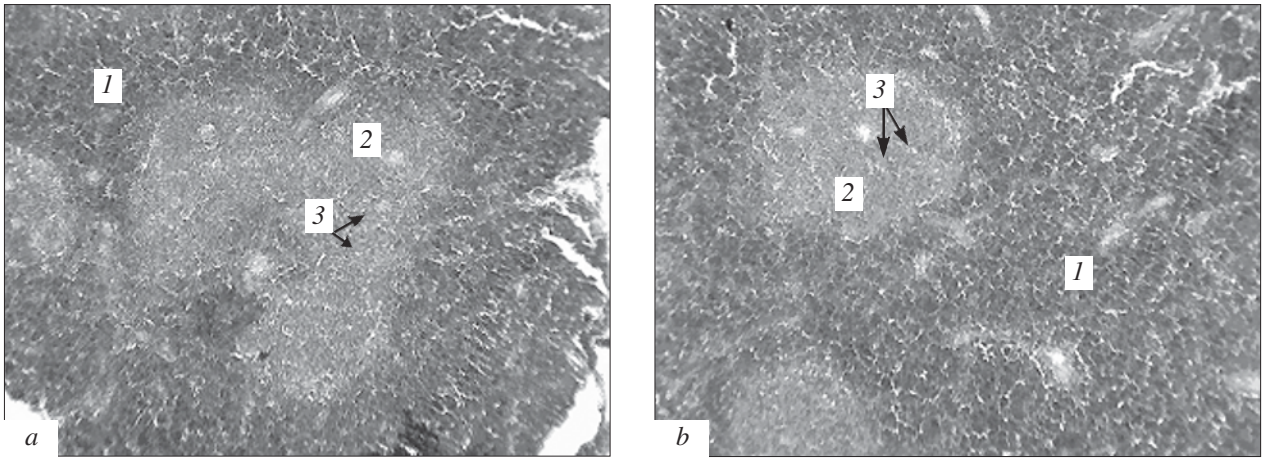

Fig. 1. Microstructure of the thymus in 300-day-old hogs in group 1 (control; *a*) and 3 (*b*). Hematoxylin and eosin staining, ×64.8. *1*) cortical matter; *2*) medulla; *3*) Hassall bodies.

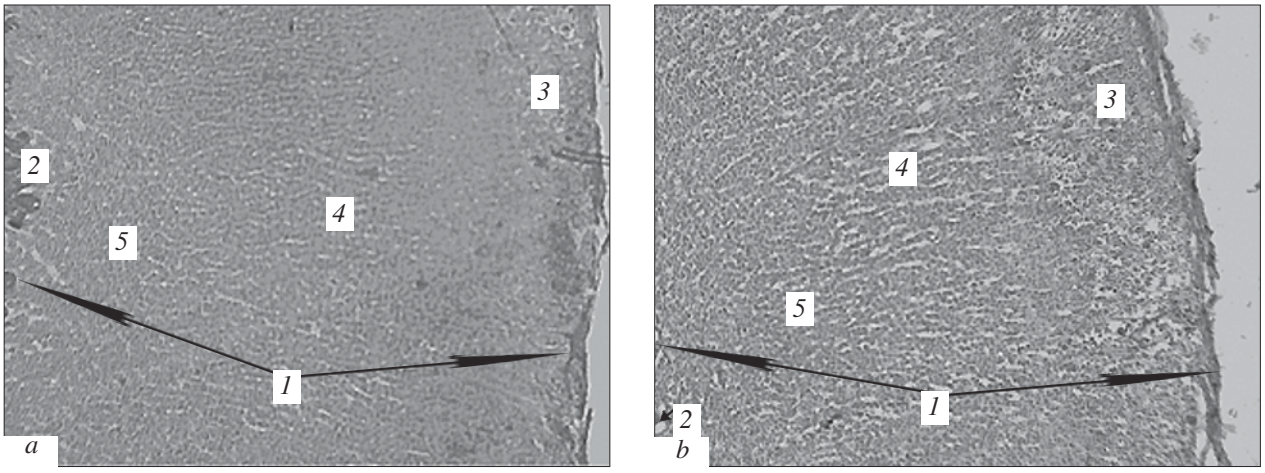

Fig. 2. Microstructure of the adrenocortical matter in 300-day-old hogs in group 1 (control; *a*) and 3 (*b*). Hematoxylin and eosin staining, ×52. *1*) cortical matter; *2*) medulla; *3*) glomerular zone; *4*) bundle zone; *5*) reticular zone.

0.013±0.002 to 0.006±0.001-0.010±0.001 mm. The parameter in groups 2 and 3 animals aged 210 and 300 days was 0.002-0.004 (p<0.05-0.001) and 0.001-0.002 mm (p>0.05) higher than in age-matched control, respectively.

The changes in Brown's index were in general in line with the dynamics of the follicular diameter.

The adrenal weight increased with age in all animals from 1.10±0.20-1.30±0.17 to 5.40±0.23-6.20±0.20 g. In groups 2 and 3 hogs aged 210 and 300 days it was 0.10-0.40 (p>0.05) and 0.80 (p<0.05)-0.30 (p>0.05) g higher, respectively, than in the control.

The width of the adrenal cortex also increased with age (Fig. 2) from 0.849±0.030-0.880±0.020 to 0.955±0.020-1.028±0.010 mm. This parameter in group 2 300-day-old hogs was significantly higher than in age-matched controls.

The pattern of changes in the width of the zone glomerulosa, zona fasciculata, and zona reticularis fully corresponded to the dynamics of changes in the adrenal cortex width.

The same regularity was detected for the dynamics of the width of adrenal medulla in the studied hogs. It increased from the age of 60 to 300 days from 1.339±0.070-1.444±0.030 to 1.436±0.040-1.543±0.010 mm. The parameter in group 2 animals aged 210 and 300 days was significantly higher than in age-matched controls (p<0.05-0.01).

Hence, treatment of young hogs with trepel, suvar, and polystim under biogeochemical conditions of the Chuvash Center had a positive impact for the morphology and physiology of the thymus, thyroid, and adrenals. The growth-stimulating effect was more pronounced in combined therapy with trepel and suvar than in trepel+polystim therapy.

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