

MORPHOLOGICAL AND FUNCTIONAL STATE OF THE ADRENAL GLANDS OF RATS IN NORMAL CONDITIONS AND CHANGES IN THE DIAMETERS OF THE CORTICAL SUBSTANCE AND MEDULLA AFTER EXPOSURE OF A FOOD ADDITIVE COMPLEX

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Introduction.

Food additives are widely distributed in the modern world. They give food products specific taste properties, extend their shelf life and give them an attractive appearance. The consumer of such products does not think and often does not know about the presence of chemical additives in food products, which, even in small quantities, can affect the function of organs and systems, and in this case, the adrenal glands [1, 2, 3].

Aim of the study.

To find out the morphological and metric changes in the structural components of the glomerular, fasciculate, reticular zone and medulla of the adrenal glands of rats under the conditions of long-term action of food additives complex: monosodium glutamate, sodium nitrite, and Ponceau 4R.

Main part.

An experimental study was conducted on 80 rats. The control group of rats consumed drinking water and saline orally. Rats from the experimental group were given to drink a 10% solution of sodium nitrite (E 250); monosodium glutamate (E621) was administered at a dose of 20 mg/kg in 0.5 ml of distilled water; Ponceau 4R – at a dose of 5 mg/kg in 0.5 ml of distilled water once a day orally. Dosages of food additives were two times lower than the permissible norm in food products. After 1, 4, 8, 12 and 16 weeks, rats were removed from the experiment by decapitation under ether anesthesia. Then, the fragments fixed in formalin were sealed in paraffin. Subsequently, the sections stained with hematoxylin and eosin were examined using a Biorex light microscope with a DSM 900 digital photomicroscope. In order to obtain semi-thin sections, the studied material was fixed in glutaraldehyde and sealed in EPON-812. Ready sections were stained with toluidine blue. The morphometric method determined the thickness of the adrenal glands' glomerular, fasciculate, and reticular zone and medulla. Data processing was carried out using the Excel program.

As a result of the morphometric study of the control group of rats, it was found that the average values of the total diameter of the glomerular zone were $(44.27 \pm 0.21) \mu\text{m}$; the average values of the total diameter of the fasciculate zone were $(401.87 \pm 2.68) \mu\text{m}$; the average values of the reticular zone were $(131.56 \pm 0.86) \mu\text{m}$. 1 week after taking the complex of food additives, the diameter of the glomerular zone was $(63.31 \pm 0.42) \mu\text{m}$, that is, it increased by 43.69%; the diameter of the fasciculate zone was $(196.46 \pm 0.91) \mu\text{m}$ – decreased by 50.62%; the diameter of the reticular zone was $(234.68 \pm 1.06) \mu\text{m}$ – increased by 78.38%. On the 4th week, the indicators of the diameter of the glomerular zone were

$(60.51 \pm 0.51) \mu\text{m}$, which is 36.68% more than the control value; indicators of the diameter of the fasciculate zone were $(390.85 \pm 3.09) \mu\text{m}$, which is 2.74% less than the control values; the diameter of the fasciculate zone was $(93.32 \pm 1.11) \mu\text{m}$, which is 29.26% less than the control values. In the 8th week of the study, the indicator of the total diameter of the glomerular zone was $(68.49 \pm 0.63) \mu\text{m}$ – more than the control value by 54.71%; the average values of the total diameter of the fasciculate zone were $(336.31 \pm 3.09) \mu\text{m}$ – 16.31% less than the control value; the average diameter of the reticular zone was $(146.66 \pm 1.86) \mu\text{m}$ – 11.48% more than the control values. On the 12th week of observation, the indicator of the diameter of the glomerular zone was $(59.39 \pm 0.46) \mu\text{m}$ – more than the control value by 34.15%; the diameter of the fasciculate zone was $(458.68 \pm 2.51) \mu\text{m}$, which is 14.14% more than the control value; the average diameter of the reticular zone was $(125.06 \pm 1.87) \mu\text{m}$ – 4.94% less than the control values. On the 16th week of the study, the average indicators of the diameter of the glomerular zone were $(61.85 \pm 0.63) \mu\text{m}$ – 39.71% more than the control value; the average indicators of the diameter of the fasciculate zone were $(334.23 \pm 1.55) \mu\text{m}$ – 16.83% less than the initial values; the average diameter of the reticular zone indicators was $(133.99 \pm 0.84) \mu\text{m}$, which is 1.85% more than the control value.

As a result of the morphometric study of the control group of animals, it was established that the average values of the total diameter of the medulla were $(382.22 \pm 3.61) \mu\text{m}$. After 1 week of taking a complex of nutritional supplements, the diameter of the medulla was $(598.06 \pm 12.58) \mu\text{m}$, increasing by 56.47%. This phenomenon may be caused by cell hypertrophy and perivascular edema of the adrenal glands medulla. At the 4th week of observation, the indicator was $(515.64 \pm 4.79) \mu\text{m}$, 34.91% more than the control value. On the 8th week of the study, the indicator of the total diameter of the medulla was $(416.83 \pm 1.92) \mu\text{m}$, increased by 9.05% from the control value. At 12 and 16 weeks, the indicators corresponded to the values of $(585.29 \pm 8.43) \mu\text{m}$ and $(512.81 \pm 5.55) \mu\text{m}$, 53.15% and 34.17% more than the control values, respectively.

Conclusions.

It was established that the use of food additives (monosodium glutamate, sodium nitrite and Ponceau 4R) directly affects the cortex and medulla of the adrenal glands, causing hypertrophy and perivascular edema in the early stages of the experimental study, the reversibility of the processes within 8-10 weeks of taking food additives and irreversibility with alteration of cells and destructive changes of endocrinocytes starting from the 16th week of experimental studies.

References

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