

EXPERIMENTALLY INDUCED CHANGES IN THE HISTOLOGICAL STRUCTURE OF THE ADRENAL GLANDS UNDER THE ACTION OF METHYLVINYLPYRIDINE

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Abstract. The experiment investigated the effect of methylvinylpyridine on the histological structure of the adrenal glands of white rats. This substance is colorless, has a sharp odor, and is used in the chemical production of polymers and rubber materials. Examination of histological sections revealed lymphocytic infiltration of adrenal tissue, a pronounced vascular reaction in the connective tissue capsule, as well as in the vessels of all zones of the cortex and the sinuses of the medulla.

Keywords: experiment, methylvinylpyridine, rat, adrenal gland, glomerular zone, hematoxylin-eosin, Van Gieson method.

ЭКСПЕРИМЕНТАЛЬНО ВЫЗВАННЫЕ ИЗМЕНЕНИЯ ГИСТОЛОГИЧЕСКОГО СТРОЕНИЯ НАДПОЧЕЧНИКОВ ПОД ДЕЙСТВИЕМ МЕТИЛВИНИЛПИРИДИНА

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Аннотация. В ходе эксперимента изучено влияние метилвинилпиридина на гистологическую структуру надпочечников белых крыс. Данное вещество бесцветно, имеет резкий запах и используется в химическом производстве полимеров и резиновых материалов. При исследовании гистологических срезов проявляется лимфоцитарной инфильтрацией ткани надпочечников,

выраженной реакцией со стороны сосудов соединительнотканной капсулы, а также сосудов всех зон коркового вещества и синусов мозгового вещества.

Ключевые слова: эксперимент, метилвинилпиридин, крыса, надпочечник, клубочковая зона, гематоксилин-эозин, по методу Ван-Гизона.

Introduction. In modern conditions, due to the widespread use of antibiotics in medicine, veterinary medicine, and agriculture, as well as a number of other unfavorable factors (environmental pollution with industrial waste, including radioactive substances), a shift in the microbial ecology of humans and animals has been observed [1]. Traditional approaches in recent decades to the etiopathogenesis of many common diseases in humans and animals do not provide new constructive ideas that would allow the development of highly effective means and methods for the prevention and treatment of various pathological conditions and syndromes [2]. Currently, the problem of therapy and especially the restoration of the normal structure and function of organs and tissues in farm animals remains far from resolved; therefore, the search for new, more effective methods and means of targeted influence on the development of restorative processes in them seems justified [3]. Methylvinylpyridine (MVP), as a pyridine derivative, is a colorless liquid with an unpleasant odor and is widely used in the chemical industry for the synthesis of various polymers and synthetic rubber. For the prevention of occupational poisonings, it is of interest to study the degree of toxicity of this substance. This substance primarily affects the central nervous system and causes dystrophic changes in a number of parenchymal organs [4]. This work is a morphological study conducted on experimental animals and presents the results obtained from studying the effect of MVP on the histostructure of the organs of the neurohumoral system — the adrenal glands.

Objective of the study. To study the histological changes in the adrenal glands under the action of methylvinylpyridine.

Materials and methods. The experiments were carried out on 12 white rats weighing 180–240 g. The test animals were administered a solution of MVP

perorally into the esophagus using a syringe with a needle fitted with a chloroprene tip. Control animals were administered tap water in the same manner. The test substance was used by us in various doses. In the first series, 12 white rats received MVP at a dose of 0.01 mg/kg; in the second, 12 animals received up to 0.1 mg/kg; and in the third, 27 rats received 1.0 mg/kg of their body weight. For histological processing, the adrenal glands were taken and fixed in calcium-formalin. Sections obtained on a freezing microtome were stained with hematoxylin-eosin and by the Van Gieson method.

Results of the study. When studying histological sections taken from the adrenal glands of the experimental animals, we note that the effect on the body of white rats at doses of 0.01, 0.1, and 1.0 mg/kg for 20 and 40 days caused changes in the histostructure of these organs. This was expressed in lymphocytic infiltration of the adrenal tissue, a significant reaction from the vessels of the connective tissue capsule, as well as the vessels of all zones of the cortex and the sinuses of the medulla. In this case, the vessels were dilated and filled mainly with lymphocytes and a small number of erythrocytes; marginal standing of the latter was often observed. It should be noted that the walls of small vessels were more thickened, and the connective tissue capsule covering the adrenal glands was more expanded and rich in cells of the fibroblastic series under the action of MVP at doses of 0.1 and 1.0 mg/kg. From the capsule, connective tissue strands descended in coarse layers into the fascicular zone. When stained with hematoxylin-eosin, the glomerular, fascicular, and reticular zones were clearly defined in the adrenal cortex. Under the connective tissue capsule, groups of smaller dark cells were visible. In the glomerular zone, among the not very large cells with lighter cytoplasm and a dark nucleus, mitoses were often encountered. The cells of the fascicular zone varied in size, had a polygonal shape and a reticular cytoplasm; however, the reticularity was unclear under the action of MVP at a dose of 1.0 mg/kg. Many cells contained large light nuclei with a well-visible nucleolus, while at the same time, on significant areas, cells with a darker, structureless, smaller

nucleus and dark cytoplasm were visible. The reticular zone, when stained with hematoxylin-eosin, appeared as a darker background; its small cells in the form of strands intertwined into a network. In this area, scattered and focal lymphocytic infiltration was most pronounced. Some sinusoidal capillaries of this zone were overfilled with erythrocytes. The chromaffin cells of the medulla were located densely next to each other, in nests, between which there were rather wide sinuses with single lymphocytes at their inner edge, lying in foci at their outer wall and scattered against the background of the chromaffin cells themselves. Some smaller sinuses were filled with erythrocytes, which were also observed outside their walls; this was especially pronounced under the action of MVP at doses of 0.1 and 1.0 mg/kg. It should be noted that the action of MVP on the body of white rats at doses from 0.01 to 1.0 mg/kg by the end of the 20th day caused a significant decrease in lipid substance in the interrenal cells of all zones of the adrenal cortex; however, after 40 days, on the contrary, an accumulation of sudanophilic inclusions was observed in the cells of all zones except the glomerular one. When studying the histostructure of the adrenal glands exposed to MVP at doses from 0.1 to 1.0 mg/kg for 40 days followed by a one-month recovery period in the animals, we found pronounced signs of edema from the adrenal capsule and interepithelial connective tissue layers of the cortex, areas of hemorrhages (especially at the border of the reticular zone and the medulla), signs of vascular stasis, more intense scattered and perivascular infiltration (mainly lymphocytic), and diapedesis of erythrocytes into the tissue of the fascicular and reticular zones.

In cases of MVP exposure to the adrenal glands for 70 and 90 days at doses from 0.01 to 1.0 mg/kg, the above-described phenomena in the tissues were more pronounced, especially in the reticular zone and the medulla (edema, scattered and focal lymphocytic infiltration, dilation and blood filling of vessels, diapedesis of erythrocytes). In the fascicular zone, a gross disruption of the radial course of the interrenal strands predominated, among the cells of which dividing and groups of dystrophically altered cells were found. At the same time, hypertrophy of the

fascicular zone and its interrenal cells was determined, along with the presence of dystrophic forms, disruption of the radially of the epithelial strands, and weak accumulation of acid mucopolysaccharides in the glomerular and reticular zones.

Conclusion. Analysis of the obtained data allows us to note that prolonged exposure to methylvinylpyridine (for 20, 40, 70, and 90 days) on the animal body at doses of 0.01–1.0 mg/kg causes adverse changes in the histostructure of the adrenal glands, namely: scattered and focal lymphocytic infiltration in all zones and the medulla; dilation and blood filling of vessels up to their stasis, especially in the reticular and medullary substance; gross disruption of the radial arrangement of epithelial strands in the fascicular zone; reactive and dystrophic cellular shifts; a decrease in the content of acid mucopolysaccharide granules in the cortex.

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