INTERACTION OF PESTICIDES WITH MEMBRANE STRUCTURES OF HEPATOCYTES

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Annotation

Currently, the protection of public health is an urgent problem on a global scale. The predominant part of environmental pollutants are pesticides, without the use of which the promising development of agriculture is impossible. According to the World Health Organization (WHO), from 500 thousand to 2 million people are exposed to pesticide poisoning every year in the world, and 40 thousand cases end in death.

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Relevance. Among the various approaches used to decipher the mechanism of toxic action of pesticides, physiological and biochemical studies occupy an important place, which can be carried out at various levels of structural organization: organizational, tissue, cellular, subcellular and molecular. The last 2-3 approaches seem to be the most promising today, since they make it possible to study the effect of a particular pesticide isolated at a specific morpho-functional level or certain subcellular structures. This point is especially important for identifying the primary stages of interaction of a foreign substance with cell components [1,3,11].

The mechanism of action of various pesticides and, consequently, the correction of metabolic disorders caused by them is determined primarily by the compartmentalization of these compounds. This literature on this issue is very numerous, since the importance of the intracellular distribution of pesticides allows

not only to explain, but to a certain extent to predict possible biochemical shifts that occur in the body when pesticides are administered[5,10].

Numerous studies have established that pesticides penetrate into the cell, accumulate in it and have their effect by changing the action of certain enzymes [2,5,9,12].

Insecticides, fungicides and herbicides interact with biological membranes. In this case, the pesticide is adsorbed on the membrane surface. The nature of the interaction of the pesticide with the lipid part of the membranes depends on the size, shape, dipole moment and lipophilicity of the toxicant molecule. Pesticide molecules with lipophilic properties are embedded in the hydrocarbon part of the lipid bilayer[3,4,7].

Thus, the effect of pesticides can manifest itself at various levels of the organization of a living organism, and having as an initial stage the penetration of the pesticide into tissues and cells, interaction with intracellular organelles can be realized in changing various aspects of metabolism in the cell, in particular, disruption of the structure of intracellular components, regulation of metabolism, violation of the permeability of intracellular membranes. All this together leads to profound changes in cellular metabolism in general. [6,8].

Our study of the morphology of liver tissue after administration of cadmium salt to animals after 3 hours, its general structure is not subject to discomplexation.
The weight of rats ranges from 120g to 140.0g, on average -128.0± 3.54g.
The liver mass in laboratory animals of this group varies from 7.4 g to 9.7g, on average – 8.90 ±0.41g. The mass coefficient on average is -6.95 ± 0.27% The transverse size of hepatocytes (the distance from the center of one hepatocyte nucleus to the center of the nucleus of a nearby nucleus of another hepatocyte) varies from 19.0 to 29.0 microns, on average – 26.0 ±1.15 microns. Hepatocytes have a polygonal shape with well-defined boundaries. The cytoplasm is amphophilic, granular. In the perinuclear zone and from the side of the sinusoidal

pole, against the background of a relatively pale colored cytoplasm, there are clusters of fine-grained basophilic material corresponding to a granular endoplasmic network. Mononuclear hepatocytes are mainly found, along with them there are binuclear hepatocytes. The number of binuclear hepatocytes per 100 hepatocytes is in the range of 8-22, on average 16.1±0.87.

The average cross–sectional area of the cytoplasm of hepatocytes ranges from 440.0 mm2 to 750.0 mm2, on average - 620.5±19.2 mm2.

Hepatocyte nuclei are usually located in the center of liver cells, but can be displaced to their periphery. The cross–sectional area of hepatocyte nuclei of the control group of rats ranges from 100.0 mm2 to 148.0 mm2, on average - 120.4±2.98 mm2. In the center of the hepatic lobules are the central veins, which are the initial link of the hepatic veins. The diameter of the central veins ranges from 48.0 to 80.0 microns, with an average of 64.1±1.98 microns. Along the periphery of the hepatic lobes there is a portal triad, which includes an artery, a vein and a bile duct.

The interlobular veins have a diameter from 21.0 to 35.0 microns, on average - 28.5 ± 0.87 microns (Table 3.2). These veins branch into many smaller branches, which eventually pass to sinusoidal capillaries. The interlobular arteries devote most of their branches to the blood supply of the bile ducts, participating in the formation of peribiliary plexuses, the density of which increases as the diameter of the bile ducts increases.

When cadmium salt is administered to animals after 24 hours, the morphometric parameters of liver structures change as follows:

The weight of rats varies from 120g to 138.0g, on average -127.9± 3.19 g.

The liver mass in laboratory animals of this group ranges from 7.1 g to 9.4g, on average – 8.6 ± 0.41g. The mass coefficient on average is -6.72± 0.27%. The transverse size of hepatocytes varies from 19.0 to 28.0 microns, with an average of 25.4±0.56 microns. Hepatocytes have a polygonal shape with well-defined

boundaries. The cytoplasm is granular, clusters of fine-grained basophilic material corresponding to a granular endoplasmic network are visible. Mononuclear hepatocytes are mainly found, along with them there are binuclear hepatocytes. The number of binuclear hepatocytes per 100 hepatocytes is in the range of 10-22, on average 16.4 ± 0.74. Sinusoidal capillaries are oriented mainly in the radial direction to the center of the lobules, where they flow into the central veins. The sinusoidal capillaries are in a state of fullness. The diameter of these hemocapillaries in cross–section has a size from 8.0 to 16.0 microns, on average - 12.1 ± 0.49 km.

Thus, when cadmium salts are administered to animals, the liver responds with minor changes in the morphometric parameters of hepatocytes, their nuclei, as well as the diameter of intrahepatic vessels, especially sinusoidal hemocapillaries. In the early stages of the experiment (after 3 hours), the reaction of the morphometric parameters of the structural elements of the liver is more pronounced, compared with the later period (24 hours), except for an increase in the number of binuclear hepatocytes.

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