

EFFECT OF EXPERIMENTAL ALCOHOLISM ON STRUCTURE AND REGENERATIVE POWERS OF THE NEONATAL MYOCARDIUM AND LIVER OF THE NEXT GENERATION OF NEWBORN RATS

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Changes in the structure and a sharp decrease in regenerative activity of the parenchymatous cells of the myocardium and liver are found in adult chronic alcoholics, and are manifested at both cellular and intracellular levels [1]. The aim of this investigation was to study the effect of experimental alcoholism in rats on the structure and proliferative activity of parenchymatous cells of the myocardium and liver in newborn rats of the next generation.

EXPERIMENTAL METHOD

Experiments were carried out on mature noninbred rats, male and female, weighing 140-210 g, receiving a 15.5% solution of ethanol with the addition of 0.08% saccharine for taste [2]. After alcoholization of parent rats for 20 weeks, the newborn offspring were killed at the age of 1, 3, 5, 7, 11, 15, 20, and 30 days (three rats at each time). After birth of the offspring the mothers were separated from the remaining animals and returned to a normal diet not containing ethanol. These animals received four injections of ^3H -thymidine (specific activity 24 Ci/mmol, dose 1 mg/g) 2 h before sacrifice. Day-old young rats were given two injections of ^3H -thymidine.

The animals were killed by decapitation. The myocardium and liver were fixed in toto in 10% neutral formalin. After preparation of paraffin sections they were stained with hematoxylin and eosin and with Heidenhain's iron-hematoxylin. Sections cut on a freezing microtome were stained with Sudan III. To detect the thymidine label the sections were exposed in emulsion for 30 days and then stained with hematoxylin and eosin. Numbers of mitoses, of multinuclear cells, and of DNA-synthesizing cells were determined per 5000 parenchymatous cells. The results were subjected to statistical analysis by the Fisher-Student test, at a 0.05 level of significance. Equal numbers of rats of the same age and for each time, whose parents were kept on the same diet but with water to drink, served as the control.

EXPERIMENTAL RESULTS

The study of histological sections in the light microscope showed the absence of gross structural changes in the myocardium of the newborn rats of the experimental group. In all cases moderate changes of the cloudy-swelling degeneration type were present. In nine cases (at the ages of 1, 3, 5, 7, and 11 days) weak or moderately severe fatty degeneration, characterized by the presence of tiny droplets of fat, were observed in the cardiomyocytes.

In the early stages (1st-11th days after birth) marked morphological changes were found in the liver of most experimental animals, which we associated with the transplacental action of ethanol on the fetal liver. These changes consisted of the presence of foci of areactive coagulation necrosis (less frequently accompanied by a mild perinecrotic cellular reaction) of different sizes in the liver tissue, and mainly confined to the center of the lobule. The complex structure of the liver tissue was disturbed. Moderately severe degeneration changes of the cloudy swelling type were

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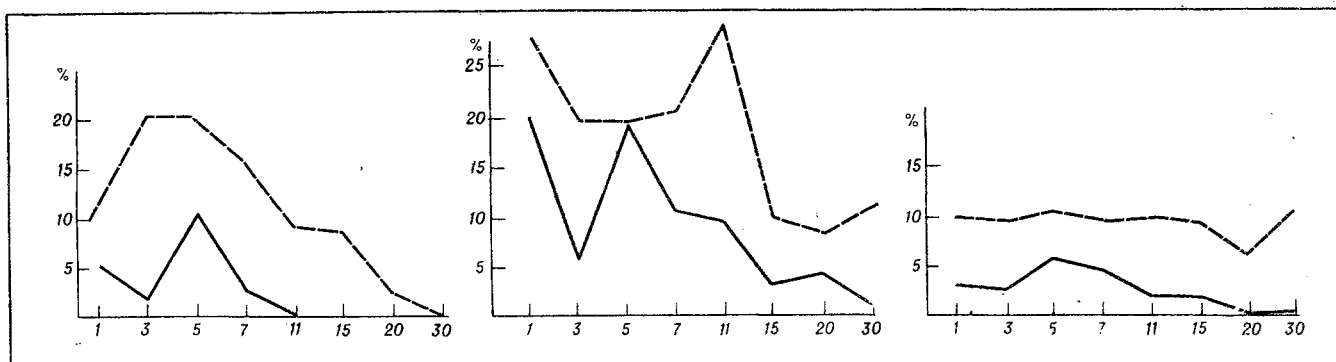


Fig. 1

Fig. 2

Fig. 3

Fig. 1. Content of mitoses in cardiomyocytes (in %) in myocardium of newborn rats. Here and in Figs. 2 and 3: abscissa, age of rats (in days); continuous line – experimental group of animals, broken line – control group.

Fig. 2. Number of binuclear and multinuclear cardiomyocytes (in %) in myocardium of newborn rats.

Fig. 3. Number of mitoses in hepatocytes (in %) in liver of newborn rats.

observed in the hepatocytes, accompanied in a high proportion of cases by fatty degeneration with the appearance of very small droplets of fat. In the overwhelming majority of cases proliferation of stellate reticuloendotheliocytes and round-cell infiltration of the portal tracts were identified. With increasing age of the animals (from the 7th through the 11th days after birth) the changes described above became less marked, and on the 15th, 20th, and 30th days we observed only some degree of loss of the complex structure of the liver tissue and evidence of mild cloudy swelling and fatty degeneration.

The study of proliferative activity of the myocardial and liver cells revealed a sharp decrease in the number of mitoses and of multinuclear cardiomyocytes (Figs. 1 and 2) and hepatocytes (Fig. 3), together with a decrease in the number of DNA-synthesizing parenchymatous cells of these two organs.

Thus parental alcoholism has a damaging effect on the myocardium and, more especially, the liver of the fetuses and has a significantly adverse effect on proliferative activity of the parenchyma of these organs.

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