

Conference Paper

Structural Organization of the Liver in the Presence of Pig Hepatosis

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Abstract

The structural organization of the liver in hepatosis and its clinical and morphological manifestation in pigs were studied. In animals with reduced vitality, the liver underwent deep microscopic and ultrastructural changes. At hepatic steatosis, the liver had a cellular structure, many lipid vacuoles and the damage of mitochondrial membranes of a granular endoplasmic reticulum appeared in hepatocytes. Proteinosis was characterized by impaired of lobular structure, with protein swelling of the cytoplasm of hepatocytes and Disse's spaces expansion, significant decrease of glycogen; mitochondrial swelling and the appearance of lysosomal vacuoles in the hepatocyte. In massive hepatic necrosis, hepatocyte dystrophy was noted, significant histochemical decrease of glycogen, lysis of the hepatocyte granule endoplasmic reticulum, pycnosis of the hepatocyte nucleus, and in general necrobiotic changes in the liver cells.

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1. Introduction

In swine husbandry, the body of pigs is adversely affected by various stress factors that lead to a decrease in resistance and productivity of animals, as well as to metabolic disorders and hepatopathy [1–3, 5]. The liver is directly or indirectly involved in all vital processes occurring in the body because it occupies a central place in the metabolism regulation and it is a link between the portal and the general circulation. It takes an active part in the elimination of diseases being at the same time the most important organ in the dynamics of homeostasis -- the ability of an animal's body to maintain a dynamic constancy of the internal environment [2, 4, 5]. Therefore, in order to clarify the pathogenetic nature of the pathological processes occurring in the body, for early prediction and adequate treatment and prevention, deep knowledge of the clinical, functional and structural features of disorders occurring in the liver is required [4].

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Consequently, in modern conditions of swine breeding, the study of liver morphology using morphological, histochemical and ultrastructural research methods conditioned by the need for the treatment and prevention of hepatodystrophy in pigs. Despite the numerous works devoted to the diagnosis, treatment and prevention of hepatitis, the problem of their solution remains relevant.

2. Methods and Equipment

2.1. Methods

The samples of liver from 23 hepatodystrophy pigs were used for morphological studies. The material for histological and histochemical studies were fixed in 10,0--12,0 % neutral formalin fluid, and for electron microscopy -- in 2,5 % glutaraldehyde with post-fixation in 1,0 % osmium tetroxide fluid.

3. Results

Clinically, pig hepatitis was manifested by a decrease in vitality, general weakness, convulsive twitching of individual muscles of the body and a lying posture, swelling of the subcutaneous tissue of the lower abdomen and around the eyes. At the same time, the dystrophic processes were observed in the form of hepatic steatosis, proteinosis and massive hepatic necrosis in the liver of pigs.

Macroscopically, with hepatic steatosis, the liver of the sick pigs was enlarged, its edges were blunt, it had an elastic consistency and a brownish yellow color, and fat droplets protruded from the cut surface, which stuck to the knife.

Under a microscope, the hepatic parenchyma looked like a honeycomb, had a cellular structure. At the same time, in the ultrastructure of hepatocytes, many lipid vacuoles with an electronically bright and dense matrix appeared. Single glycogen granules remained in the form of black dusty granularity. There was also noticeable damage to the mitochondrial membranes and the hepatocyte granule endoplasmic reticulum (Figure 1).

Small grayish spots were visible on the surface of liver capsule in proteinosis.

Microscopically, a disruption of the architectonics of the beam and lobular structure was observed, protein swelling of the cytoplasm of numerous hepatocytes was observed, which was accompanied by expansion of the microvasculature of the lobules with filling it with serous fluid. At the same time, Disse's spaces with swollen Kupffer

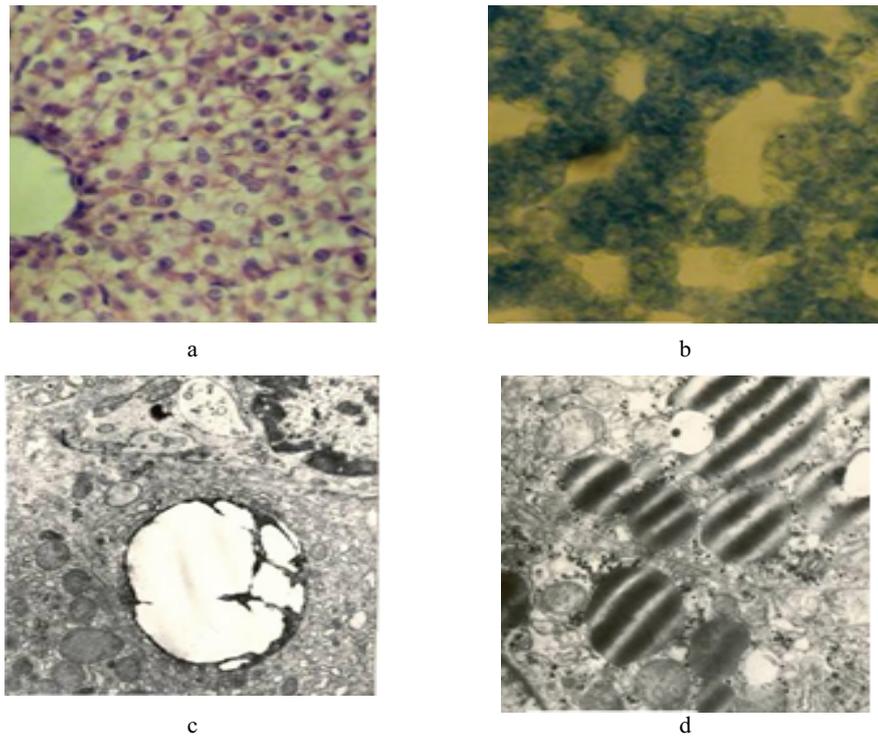


Figure 1: Liver structure of pigs with hepatic steatosis (a), fatty liver infiltration (b), histochemical detection of fat (c), ultrastructural detection of fatty inclusions (d).

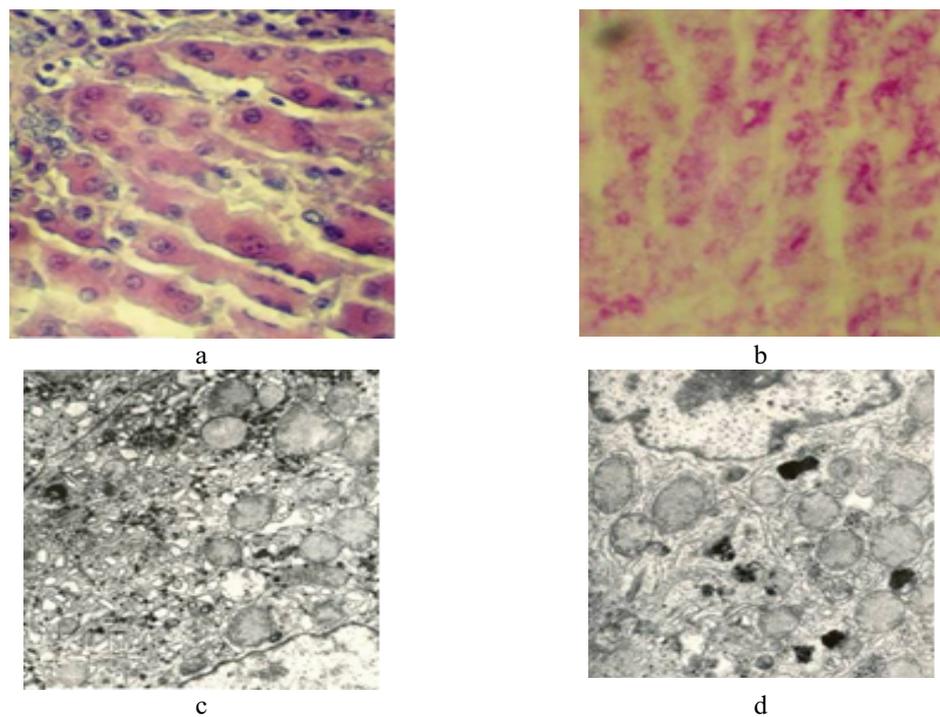


Figure 2: Liver structure of pigs with proteinosis: protein swelling of hepatocytes and expansion of the Disse's space (a); a significant decrease of glycogen (b), the ultrastructure of swollen hepatocyte cytoplasm (c), mitochondrial swelling and the appearance of lysosomal vacuoles in the hepatocyte (d).

cells expanded considerably. In hepatocytes, the cytoplasm was vacuolated, the matrix

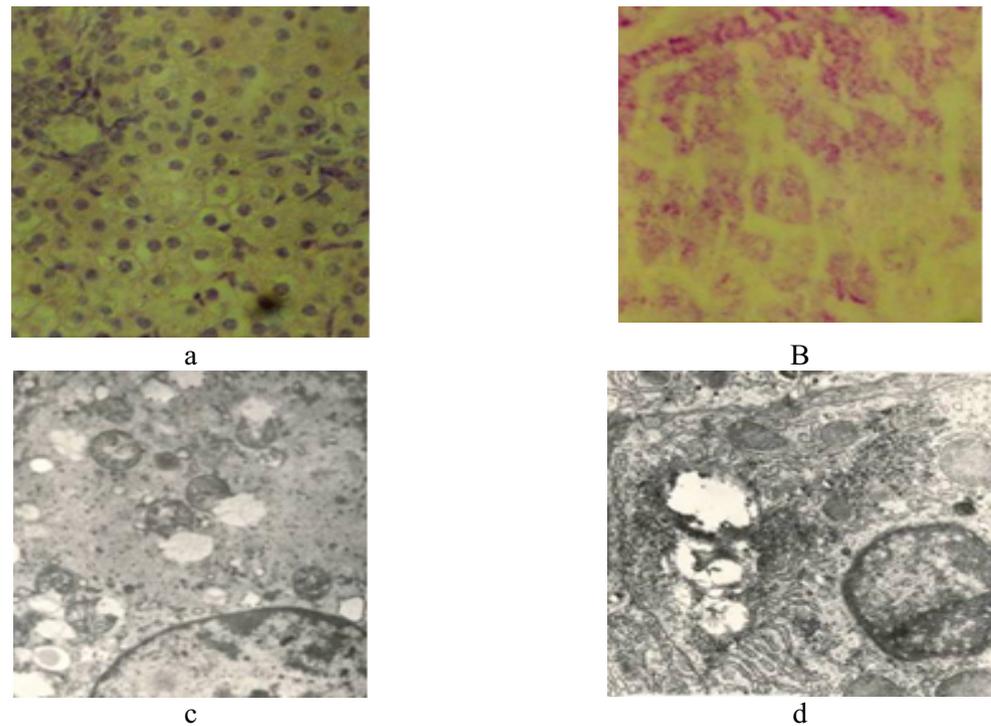


Figure 3: Liver structure of pigs with massive hepatic necrosis: hepatocyte dystrophy (a), a significant histochemical decrease of glycogen (b), lysis of the hepatocyte granular endoplasmic reticulum (c), pycnosis of the hepatocyte nucleus (d).

of mitochondria and the karyoplasm of individual nuclei were clarified. And in some hepatocytes with proteinosis of the liver, the nucleus became electron-dense, and the granular endoplasmic reticulum swelled in the cytoplasm, multiple focal accumulations of small lysosomal vacuoles appeared (Figure 2).

In massive hepatic necrosis, the liver became brittle had a dark brown color, and did not increase in volume.

Microscopically, necrobiotic hepatocyte fields were found among the normal cells which were affectless. The destruction of organelles, vacuolization, myelin and lysosomal vacuoles, swelling of nuclear membranes and euchromatin consolidation appeared in the ultrastructural organization of hepatocytes (Figure 3).

4. Conclusion

Therefore, it was established that in pig hepatitis, the liver undergoes deep microscopic and ultrastructural changes in the form of hepatic steatosis, proteinosis and massive hepatic necrosis, which have the corresponding structural characteristic.

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Conflict of Interest

The authors have no conflict of interest to declare.

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