

Peculiarities of clinical and laboratory manifestations of hepatopathy: the path to medical consensus

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Abstract. The article analyzes the information available in the scientific literature on the clinical and laboratory manifestations of liver pathologies of various origins, mainly in productive animals, in order to achieve a medical consensus on the most relevant methods for diagnosing such pathologies. Hepatopathy is a universal term to refer to various liver diseases. The incidence of hepatosis in cattle can reach up to 50%, in swine up to 90%, and in canines up to 68%. At the moment, a large amount of material on this topic has been accumulated for each animal species separately. The goal is to systematize the available material on all types of animals to identify the characteristics of the clinical and laboratory manifestations of hepatopathy in animals with different types of nutrition. For pigs, a more characteristic type of hepatopathy is hepatodystrophy of toxic etiology, with vacuolar degeneration and necrosis of hepatocytes. For cows, especially highly productive ones, a more common type of hepatopathy is fatty liver degeneration. For dogs, a more characteristic type of hepatopathy is acute hepatitis, which occurs in response to infectious and non-infectious diseases. The study established that, despite various etiological factors and species predispositions to them, hepatopathy in different animal species manifests itself in the same way. It is not clinically expressed but has a significant effect on reproductive function; laboratory: three syndromes: cytolysis, hepatodepression, and cholestasis.

1 Introduction

Hepatopathy is a universal term to refer to various liver diseases. Hepatopathies represent a wide range of conditions and diseases associated with liver dysfunction and damage. Understanding this term and its causes aids in the veterinary diagnosis and prevention of hepatopathy, which is of significant importance for maintaining liver health and overall body well-being. These include acute conditions such as hepatitis, liver failure, liver abscess, and acute poisoning with hepatotropic poisons, as well as chronic diseases including hepatosis, dystrophy, neoplasms, and cirrhosis. The conditions listed above, especially chronic ones, are widespread among animals with different types of digestive

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systems. The incidence of hepatitis in cattle can reach up to 50% [1], in swine up to 90% [2], and in canines up to 68% [3]. Despite the fact that hepatopathies are represented by various diseases that affect different animals, their pathogenesis is mostly common, namely excessive stimulation of lipid peroxidation. Moreover, any biotic or abiotic factor can serve as a stimulating agent. After enhanced stimulation, a large number of peroxidation products contribute to damage to hepatocyte membranes, which leads to the launch of cascade reactions similar to an autoimmune process. Then, depending on the etiological factor and the individual characteristics of the organism, the liver parenchyma undergoes necrosis, protein or fatty degeneration, and atrophy. [4] Thus, hepatopathies are common diseases among animals that are based on the same process and, consequently, the same clinical and laboratory picture. However, we should not forget about the specific features that will inevitably overlap with the variants of the disease manifestation. At the moment, a large amount of material on this topic has been accumulated for each animal species separately. But there are few studies systematizing all available material. Therefore, the goal is to systematize the available material on all types of animals to identify the characteristics of the clinical and laboratory manifestations of hepatopathy in animals with different types of nutrition.

2 Materials and methods

To accomplish this goal, we used a retrospective analysis of national and foreign sources devoted to the clinical and laboratory manifestations of hepatopathies, presented in specialized databases: eLibrary, PubMed, and dslib. The most relevant and cited sources were used. The obtained data were statistically processed to average values, which were then analyzed according to the purpose of the article.

3 Results

For pigs, a more characteristic type of hepatopathy is hepatodystrophy of toxic etiology, with vacuolar degeneration and necrosis of hepatocytes. [5] Pregnant sows, especially in a state of gestosis, and piglets are most susceptible to this disease. Precedents of diseases arise when feeding and maintenance regimes are violated. Clinically, hepatitis in pregnant sows often occurs without obvious clinical signs. It manifests itself in the form of a decrease in the weight of both the sow and the offspring, and the number of stillborn and hypotrophic piglets also increases. [6] The disease manifests itself more clearly in the laboratory. There is a decrease in the concentration of albumin up to 50%, urea up to 73%, cholesterol up to 114%, serum cholinesterase activity up to 113%, glucose up to 60%, calcium up to 59%, and an increase in the concentration of bilirubin up to 174%, phosphorus up to 56%, and iron up to 110%. The activity of alanine aminotransferase increases to 119%, and that of aspartate aminotransferase increases to 89%. Lactate dehydrogenase increases up to 44%, glutamyl transpeptidase up to 80%, and alkaline phosphatase up to 171% in comparison with healthy animals. [7] Urobilinogen appears in urine. [8] Hepatopathy in piglets often manifests itself acutely and is accompanied by nonspecific symptoms: general depression, diarrhea, vomiting, anorexia, muscle weakness, and pain in the liver area. [9] Blood tests show an increase in the content of hemoglobin, RBC, and WBC with a regenerative shift to the left. Bilirubin increases; AST, ALT, cholesterol, and albumin decrease. [10]

For cows, especially highly productive ones, a more common type of hepatopathy is fatty liver degeneration. The etiological factor is the pathology of fat metabolism, provoked by an unbalanced diet and a violation of maintenance technology. Pregnant, high-yielding

cows and their calves are susceptible to this disease. [11] Clinically, hepatopathy manifests itself in the form of increased respiratory and heart rate, hypotension of the proventriculus, anorexia, diarrhea, constipation, increased hepatic dullness, and painful percussion of the liver. [12] The blood picture is also indicative. Signs of depression of the erythrocyte hematopoiesis in the form of hyperchromic anemia are revealed. The concentration of albumin and the albumin-globulin ratio, cholesterol, urea, glucose, and calcium also decrease. Also, the bilirubin content, the activity of AST and ALT, alkaline phosphatase, and GGT increase. [13] In calves, hepatopathy is manifested by a weak sucking reflex, lethargy, an unsteady gait, diarrhea with sour-smelling feces, a painful liver, and impaired skin elasticity. In the blood, there is erythropenia and leukocytopenia, or hyperchromic anemia. Biochemically, increased activity of AST, ALT, hypoproteinemia, and antibodies to the liver are detected. [14]

For dogs, a more characteristic type of hepatopathy is acute hepatitis, which occurs in response to infectious and non-infectious diseases. Puppies are most susceptible to infectious hepatitis, while adult animals are most susceptible to secondary, non-infectious hepatitis. [15] Clinically, the disease is expressed through the primary disorder. Hepatopathy, in turn, is manifested by increased temperature, diarrhea, vomiting, anorexia, icterus of the mucous membranes, itching and rash, increased hepatic dullness and soreness, and dark-colored urine. Laboratory tests show an increase in ALT, AST, ALP, GGT, cholesterol, and bilirubin. [16] Normochromic anemia, erythropenia, leukocytosis, a decrease in albumin, and a decrease in urea concentration are also noted, with a further increase when kidney pathology is associated. [16, 17]

It should also be noted that bile acids are an important tool in the diagnosis of liver pathologies. These unique organic compounds, synthesized in the liver and playing a key role in the process of bile formation, can serve not only as an indicator of its functioning, but also to signal the presence of any diseases. One of the most common methods for diagnosing the liver using bile acids is the laboratory analysis of the level of these compounds in the blood plasma. This makes it possible to assess the functional state of the liver and identify possible abnormalities. An increased bile acids levels may indicate the presence of liver pathologies such as chronic hepatitis, cholestasis, gallstone disease and cirrhosis. This diagnostic method is not only effective, but also relatively simple to implement and inexpensive compared to other methods. However, to improve diagnostic accuracy, other approaches may be used, including diagnostic samples with bile acid metabolites. These samples make it possible to determine specific types of disorders and identify possible causes of liver pathologies. The value of bile acids as a way to diagnose liver pathologies lies in their specificity and uniqueness. It is also worth noting their potential for use in monitoring the therapy of liver diseases [17-24].

4 Discussion

From the data presented above, it is clear that hepatopathy in all animal species manifests itself as pathological syndromes of the same type. Cytolysis syndrome, which occurs as a result of the destruction of hepatocyte membranes and the release of cell contents into the intercellular space, manifests itself biochemically as an increase in the enzymes contained in the cytoplasm and mitochondria of liver cells (AST, ALT, and LDH) and an increase in the concentration of bilirubin (urobilinuria)[17-24]. Cholestasis syndrome, which occurs due to disorders in the biliary system of the liver, manifests itself in the form of increased alkaline phosphatase and an increase in bilirubin in the blood. Hepatodepression syndrome is manifested by shifts in glucose levels and decreases in albumin, urea, cholesterol, and cholinesterase activity. And also suppression of hematopoiesis. The listed syndromes characteristic of hepatopathy occur in all studied animals to varying degrees. The severity

of these syndromes depends on the etiological factor and the characteristics of the disease. For swines with toxic hepatodystrophy, the cytolysis syndrome is most clearly manifested. In cattle, hepatodepression syndrome is more pronounced due to the replacement of liver tissue with adipose tissue. In canines, the primary disease and inflammatory markers of the disease come to the fore.

Clinically, hepatopathy manifests itself nonspecifically in all animal species. This is due to the high metabolic activity of the liver, which allows in the early stages of the disease to compensate for the pathological process and the involvement of the liver in all types of metabolism, which is manifested by a violation of all metabolism when the stage of organ decompensation occurs.

It should also be noted that clearance tests are one of the most efficient methods for diagnosing liver pathologies. These tests allow assessing the functional state of this important organ and identifying possible disorders. The main objective of clearance tests is to determine the rate at which the liver is able to clear the blood of certain metabolites or medicines. To do this, special markers are used that provide a quantitative assessment of the functional state of the liver.

Another recognized diagnostic method is liver biopsy. However, this method is more invasive and comes with certain risks. Unlike a biopsy, clearance tests do not require surgery and can be performed without lengthy hospitalization and rehabilitation of the animal.

Clearance tests are an important tool in diagnosing liver pathologies, such as cirrhosis, hepatitis, fatty degeneration and other diseases. They allow veterinarians to obtain objective information about the state of the liver and take appropriate measures to prescribe treatment.

Hepatitis in both cows and pigs greatly affects reproductive function and impairs the quality of offspring and their survival.

5 Conclusion

Medical consensus is generally accepted standards and recommendations developed collectively by leading experts in the field of hepatology and gastroenterology. These consensus act as guidelines for physicians of various specialties when diagnosing liver diseases. They not only provide a set of rules for accurate and consistent patient assessment, but also set standards for the use of modern diagnostic methods.

One of the key aspects of medical consensus is the standardization of the diagnostic process. This implies unification of the methods used, tests and criteria for assessing liver condition. Only in this way can avoid the lack of unambiguity in assessing the results and minimize diagnostic errors. In addition, physician consensus suggests algorithms for sequentially examining a patient, starting with noninvasive methods and moving to potentially more complex and invasive methods if necessary.

The study established that, despite various etiological factors and species predispositions to them, hepatopathy in different animal species manifests itself in the same way. It is not clinically expressed but has a significant effect on reproductive function; laboratory: three syndromes: cytolysis, hepatodepression, and cholestasis.

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