

1. Introduction

Skin diseases in dogs are quite common pathology, among which one of the leading places is atopic dermatitis.

Atopic dermatitis is a chronic and fairly common skin disease in dogs accompanied by severe itching. The development of atopic dermatitis is possible with complex interactions between environmental antigens, genetic predisposition and a number of different cell types [1].

Other researchers point out that in atopic dermatitis in dogs, the pathogenetic mechanisms of the disease have not been fully studied, noting the presence of numerous gene abnormalities and altered immunological processes [2].

According to [3], atopic dermatitis could affect both humans and animals. It has recently been established that atopic dermatitis is a multifaceted clinical syndrome with different pathways in different subgroups of patients, rather than a single disease.

Various phenotypes of it in dogs have been described in the available literature, and according to the authors, phenotypes may be related to breed and age, and may exist in other animals.

Other authors point out that canine atopic dermatitis has a hereditary basis modified by interaction with the environment, including diet. In addition, the authors found changes in lipid and keratinocyte metabolism, as well as angiogenesis in the skin of atopic dogs [4].

Atopic dermatitis, refers to inflammatory chronic diseases and ranks second in prevalence of the disease in dogs, after allergic dermatitis from fleas [5, 6].

The similarity of non-atopic dermatitis in dogs with atopic dermatitis complicates its diagnosis due to similar clinical features due to genetic factors, degree of lesion, stage of the disease and secondary infection [7].

The allergic nature of atopic dermatitis is pointed out by other researchers, noting that atopic dermatitis in dogs is not just a skin disease, it is a skin disease caused by allergies that can range from house mites to certain foods, i.e. symptoms can also be different [8, 9].

It is reported that atopic dermatitis having an allergic nature occurs when an animal inhales airborne substances (pollen, house dust) or swallows a substance to which it is sensitive. Due to an allergic reaction, the animal licks itself, bites or scratches [10].

BIOCHEMICAL STATUS OF BLOOD OF DOGS WITH ATOPIC DERMATITIS IN THE CONDITIONS OF PRIVATE VETERINARY CLINIC "ALFA VET" M. KONOTOP

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Abstract: Metabolic changes in the body of dogs with atopic dermatitis and the causes of its occurrence still remain poorly understood. This study confirms the need for biochemical blood tests for the differential diagnosis of skin diseases in animals.

The aim of the research. To identify metabolic changes in dogs with atopic dermatitis.

Methods. Serum samples from five ill animals and five intact animals were tested. The diagnosis of the nosological form of skin lesions was established based on the results of anamnesis and clinical manifestations of the disease. Additionally, biochemical studies of the serum of sick animals were performed. Blood of dogs ($n=5$) was taken from the anterior subcutaneous vein of the forearm or the lateral subcutaneous vein of the tibia into blood tubes.

Results. In the study of mineral metabolism, it was found that the concentration of inorganic phosphorus in the serum of sick animals is reduced by only 0.01 mmol/l, but the concentration of total calcium by 10.0 %. The concentration of cholesterol increases 1.3 times and exceeds the reference values by 0.16 mmol/l. In the blood of sick animals, the activity of alanine aminotransferase is significantly reduced by 21.0 % and aspartate aminotransferase – by 20.0 % compared to intact animals. The enzyme gamma-glutamyltransferase probably increases by 1.51 times ($P<0.05$) in sick dogs, but does not exceed the reference values.

Conclusions. It was found that in atopic dermatitis in the serum of dogs decreases the activity of alanine aminotransferase by 21.0 % and aspartate aminotransferase – by 20.0 %, while the activity of gamma-glutamyltransferase increases 1.51 times. The results show the toxic effect of an allergic agent on animals, especially on the liver, which confirms the previous diagnosis – atopic dermatitis.

Keywords: atopic dermatitis, dogs, biochemical analysis, blood serum.

Therefore, the main aim of the study was to determine metabolic changes in dogs with atopic dermatitis.

2. Materials and methods

The research was conducted in the conditions of the private veterinary clinic "Alfa vet" in Konotop, Ukraine and in the veterinary laboratory of LLC "Bald" in Kyiv, Ukraine.

Animal studies performed in the clinic were performed under Directive 2010/63/EU as amended by Regulation (EU) 2019/1010 and approved by the conclusion of the Commission on Ethics and Bioethics of the Faculty of Veterinary Medicine of Sumy National Agrarian University Protocol No. 3 from 18.09.2021.

The diagnosis of the nosological form of skin lesions was established based on the results of anamnesis, clinical manifestations of the disease. Additionally, laboratory tests of the blood of sick dogs were performed.

Blood in dogs ($n=5$) was taken from the anterior subcutaneous vein of the forearm or lateral subcutaneous vein of the leg in blood tubes and sent to the veterinary laboratory of LLC "Bald" in Kyiv. To determine the biochemical parameters of the blood used methods for total protein (SOP-BP-02-2017), albumin (SOP-BP-25-2018), urea (SOP-BP-03-2017), cholesterol (SOP-BP-07-2017), alanine aminotransferase (SOP-BP-09-2017), aspartate aminotransferase (SOP-BP-08-2017), alkaline phosphatase (SOP-BP-04-2017). An automatic biochemical analyzer and appropriate diagnostic systems were used. Glucose was determined by glucose oxidase method, for the study of creatinine used colorimeter-nephelometer photoelectric FEK – 56M.

The calculation of the obtained data was performed using Microsoft Excel for Windows 2010, using the Fisher-Student method, taking into account statistical errors and reliability of indicators.

3. Results

Studies of the serum of clinically healthy and sick dogs revealed changes in the studied indicators (Table 1).

Thus, alanine aminotransferase activity is likely to decrease by 21.0 % compared to clinically healthy animals, but the figure is almost twice lower than the reference values characteristic of dogs.

Another liver enzyme, aspartate aminotransferase, also has a decrease in activity of almost 20.0 % compared to intact animals, but in contrast to the previous figure, is within the reference values.

It should be noted that the activity of another hepatic enzyme gamma-glutamyltransferase (GGT) is likely to increase 1.51 times ($P < 0.05$) in sick dogs, but does not exceed the reference values.

Alkaline phosphatase activity is incredibly increased in sick dogs by 1.07 times compared with intact animals, but in both cases is within the physiological norm in dogs.

In the studied indicators of protein metabolism, the content of total protein increases incredibly by only 0.23 g/l, while the concentration of the albumin fraction is incredibly reduced by 5.41 g/l.

It should be noted that the concentration of total protein and albumin does not exceed the content of physiological norms.

The activity of α -amylase, calcium-dependent enzyme increases in comparison with intact animals by 1.18 times, but remains within the reference values.

The creatinine content is significantly reduced by 17.7 % ($p < 0.01$), and only almost 13.0 $\mu\text{mol/l}$ exceeds the reference values.

The concentration of urea increases incredibly in sick dogs 1.37 times, and also has an indicator within the physiological norm.

It should be noted that the concentration of bilirubin in atopic dermatitis changed. Thus, the concentration of total bilirubin in sick dogs increased unreliably 1.28 times, direct 1.11 times, indirect 1.47 times.

In the study of mineral metabolism, it was found that the concentration of inorganic phosphorus in the serum of sick animals is reduced by only 0.01 mmol/l, but the concentration of total calcium by 10.0 %.

In the studied indicator of lipid metabolism, cholesterol, it was found that its concentration increases almost 1.3 times and exceeds the reference values by only 0.16 mmol/l.

Thus, the course of atopic dermatitis is accompanied by certain changes in the biochemical parameters of the blood, as evidenced by the results of studies of the serum of sick dogs.

4. Discussion of research results

As a result of a biochemical study of blood serum, it was found that atopic dermatitis in dogs has an effect on the homeostasis of the internal environment [11].

Thus, the activity of liver enzymes changes, probably due to the impact of the liver and other organs that produce them. In addition, it was found that circulating enzymes in the blood can characterize the defeat of hepatocytes. An increase in the concentration of urea also indicates the condition of the liver.

Increased activity of α -amylase, a calcium-dependent enzyme, may indicate the development of an inflammatory process. The activity of alkaline phosphatase, a zinc-containing enzyme, increases due to its participation in mineral metabolism.

It should be noted that in the serum of patients with atopic dermatitis in dogs, the concentration of bilirubin changes due to the breakdown of hemoglobin and protein metabolism [12].

Such changes in the body of dogs can be associated with an allergic reaction to drugs [13] or to granular food [14]. Granulated feed is a mixture of processed grains and flour from animal by-products and enriched with chemical additives, including synthetic vitamins, minerals, trace elements, preservatives, dyes and flavor enhancers [15]. Such products could adversely affect the body of dogs and manifest themselves in diseases such as atopic dermatitis.

The obtained results give grounds to assert that biochemical studies of blood serum, which give an idea of possible metabolic changes in the body, should be applied to the existing methods of diagnosing skin diseases.

Study limitations. The limitation of the research is the small number of surveyed livestock.

Prospects for further research. Study of changes in blood biochemical parameters in other nosological skin diseases and the possibility of their use for differential diagnosis and control of treatment.

5. Conclusions

Studies have shown the presence of metabolic changes in dogs with atopic dermatitis. Thus, it was found that in atopic dermatitis in the serum of dogs decreases the activity of alanine aminotransferase by 21.0 % and aspartate aminotransferase – by 20.0 %, while the activity of gamma-glutamyltransferase increases 1.51 times. The results show the toxic effect of an allergic agent on animals, especially on the liver, which confirms the previous diagnosis – atopic dermatitis.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Table 1

Biochemical parameters of serum of intact dogs and atopic dermatitis, $M \pm m$, $n=5$

Indicator, units of measurement	Intact	Ill	Reference values
alanine aminotransferase (ALT), U/l	39.83±2.94	31.47±0.61*	60.0–70.0
aspartate aminotransferase (AST), U/l	35.12±1.14	28.2±2.88 n.d.	10.0–43.0
gamma–glutamyltransferase (GGT), U/l	4.01±0.83	6.07±0.10*	0.00–10.0
alkaline phosphatase, U/l	40.37±2.85	43.25±2.67 n.d.	8.00–76.00
albumin, g/l	35.11±2.25	29.70±1.73 n.d.	20.0–46.0
total protein, g/l	65.17±0.99	65.4±1.33 n.d.	50.0–78.0
α -amylase, U/l	731.00±13.26	861.00±64.17 n.d.	685.0–2155.0
glucose, mmol/l	3.92±0.11	4.21±0.04 n.d.	3.33–6.38
creatinine, $\mu\text{mol/l}$	69.33±2.50	57.03±1.38**	44.20–114.92
urea, mmol/l	5.02±0.21	6.88±1.24	3.50–9.20
total bilirubin, $\mu\text{mol/l}$	0.58±0.14	0.74±0.29 n.d.	0.00–10.00
bilirubin direct, $\mu\text{mol/l}$	0.28±0.03	0.31±0.06 n.d.	0.00–1.71
bilirubin indirect, $\mu\text{mol/l}$	0.30±0.11	0.44±0.27 n.d.	0.00–8.55
inorganic phosphorus, mmol/l	1.54±0.08	1.53±0.03 n.d.	0.74–1.77
total calcium, mmol/l	1.81±0.19	1.63±0.01 n.d.	2.29–2.76
cholesterol, mmol/l	5.21±0.79	6.76±0.10 n.d.	2.70–6.60

Note: * – $p < 0.05$, ** – $p < 0.01$

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