

Peculiarities of clinical and anatomical manifestations of circovirus disease in pigs

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Abstract

The nature of pathomorphological changes caused by the circovirus infection in pigs shows that the main pathological process is concentrated in the kidneys, liver, lungs and lymphatic nodes. In all cases, venous hyperemia, granular, and sometimes fatty dystrophy of liver and kidneys, enlarged gallbladder and its overfilling with bile with the presence of mucus were detected.

Keywords: circovirus infection, pig, pathomorphological changes, dystrophy, necrosis, lymphadenitis.

INTRODUCTION

Circovirus disease is a common infectious disease of pigs caused by a circovirus. It is manifested in piglets by retarded growth and development, skin lesions, and development of the respiratory syndrome [1]. Currently, numerous works are devoted to the problem of pathogenesis of the circovirus infection in pigs [1, 2, 3]. As to the pathomorphology of the infection, the sources on this topic are very few [4]. In this respect, work [1] is of particular interest. Circovirus disease of pigs is a typical factor-based infectious disease [1, 5, 6] that causes the most sensible economic damage to pig farms [2].

This problem is particularly urgent at present in the Republic of Kazakhstan, due to the transition of agricultural enterprises to new forms of ownership, when the employees and the management are directly interested in increasing the volume of product and improving its quality.

The research is aimed at detecting the pathomorphological changes in case of pig circovirus infection in the conditions of pig-breeding farms in the Almaty region of Kazakhstan.

MATERIALS AND METHODS

The work was performed between 2015 and 2017 in the conditions of the Biological Safety Department of the Kazakh National Agrarian University, and at pig farms in the Almaty region. Previously the disease was diagnosed by the results of clinical and anatomico-pathological study. The final diagnosis was determined using PCR. The circovirus infection was diagnosed in the Virology Department of the regional veterinary laboratory with the use of the polymerase chain reaction (PCR) made by "Vetbiokhim". PCR was performed with a Terzic thermocycler in real time. The analysis results were accounted for using electrophoresis on agarose gel.

12 animals with various degrees of severity of the clinical symptoms of pig circovirus infection were forcedly killed for the diagnostic purpose. Pig autopsy was made by the Shore's method, followed by extraction and studying the internal organs. The obtained results were recorded in the minutes. During the autopsy, samples of muscle tissues and parenchymatous organs for preparation of histological preparations were taken. The sampled materials were fixed in a 10% aqueous formalin solution. For the study, samples with the thickness of 6-7 microns were stained with hematoxylin-eosin after deparaffination. The material was examined according to the recommendations of the author [7]. For objective confirmation of the obtained data, the most typical areas were photographed and shown in the work.

RESULTS AND DISCUSSION

From the anamnesis, it was known that infected piglets had been kept together. Clinically, the disease was manifested in all the piglets by the following symptoms: poor weight gain, retarded growth, anhelation, apathy, periodic diarrhea, depression, stiff gait; the appetite was mostly normal. The disease manifested itself sporadically; with that, the incidence rate was very low, and the mortality rate was always high.

The anatomico-pathological changes were determined after euthanasia. During the autopsy, it was found that in most cases pig circovirus infection affected kidneys, liver, lungs and lymph nodes.

In all cases, venous hyperemia, granular, and sometimes fatty dystrophy of liver and kidneys, enlarged gallbladder and its overfilling with bile with the presence of mucus were detected.

Macroscopic study of the heart revealed petechial and striate hemorrhages under the epicardium and endocardium. The myocardium was evenly colored, had soft texture; the fibrous structure was not clearly visible at the slice (Fig. 1).

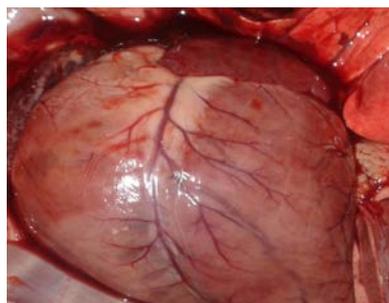


Figure 1. Granular dystrophy of the myocardium



Fig. 2. Granular dystrophy of the liver

The liver of all animals was somewhat enlarged, had flabby texture and uneven gray-yellowish-brown color (Fig. 2). Along the entire organ, there were gray-white indefinite striate areas that went down the entire thickness of the organ. Gallbladders of all examined animals were filled with thick, dark green bile. The hepatoportal lymph nodes were lumpy, with hyperplasia, filled with blood, and had yellow-red color. In some cases, walls of blood vessels of the lymph nodes were significantly thickened.

Kidneys were enlarged, swollen, the border between the cortical and the medullary areas was smoothed. Small hemorrhages were found on the surface of the kidneys of all dead animals; with that, the picture very much reminded classical swine fever, which required differential diagnostics. Numerous white nodules were found on the surface of the organ, which slightly protruded above the surface.

The pathomorphological changes in the lungs were characteristic of acute catarrhal bronchial pneumonia of the apical lobes of the lungs, accompanied by compaction of the organ texture. The bronchial lymph nodes were enlarged. The loose connective tissues of the mediastinum were swollen.

The spleen was filled with blood, increased in size, was dark-brown, had moderately dense texture, and protrusions in the form of separate papillae were located at the edges of the organ (Fig. 3). In the slice, the follicles were almost indistinguishable. Pulp scrape was absent.

All lymphatic nodes were enlarged, particularly the outside inguinal ones had lumpy shape, elastic texture, juicy at the incision, the parenchyma protruded above the surface of the incision; in the central part, they were lard-like and had pale pink color.

The walls of the stomach and individual bowel loops were thickened due to swelling of the connective tissues. Autopsy of prenatary pigs in most cases revealed enterocolitis, swelling of mesentary and intestine, lymphadenitis, and hyperplasia of regional lymph nodes (Fig. 4).



Fig. 3. The spleen was filled with blood and had increased size

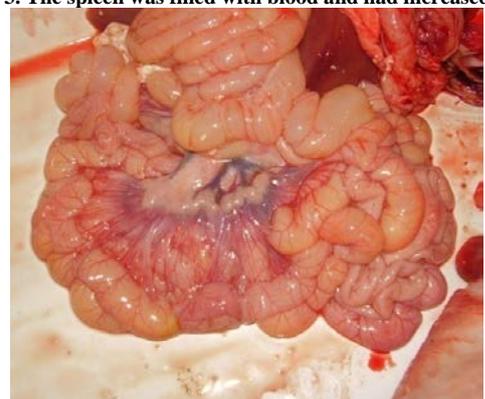


Fig. 4. Affection of the mesenteric lymph nodes in case of pig circovirus infection

The results of histological examination

The anatomico-pathological changes of the kidneys were represented by increased capillary bores both in glomerulus and in the straight tubules. In all cases, affection of the vascular glomerulus without expansion of the mesangial matrix and proliferation of the mesangium with moderate swelling and hemorrhagic exudate into the lumen of the vessel was noted. The same hemorrhagic exudate was noted in the lumen of dilated tubules. The capillaries contained sludged erythrocytes and perivascular infiltrates. In renal tubules, changes were characterized by dystrophic and necrotic processes, congestion and stasis in the capillaries. Expressed swelling of the interstitial tissue with focal infiltration of mononuclear cells was found. Granular and vacuolar degeneration, massive necrosis of the tubular epithelium were constant histological symptoms. In one case, sclerosis of many glomerules was noted.

The histological changes in the liver were characterized by lymphocytic infiltration of hepatoportal triads and liver acina. Focal necroses, local expansion of sinuses with infiltration of lymphocytes and mononuclear cells were observed. Hepatocytes were in the state of hydropic and fatty degeneration. Lymphocytic and monocytic infiltration of hepatoportal tracts ranging from moderate to severe, as well as single piecemeal necroses of hepatocytes, hepatocytes in the state of mild to moderate hydropic dystrophy were observed.

In the sinusoids, degeneration of endothelial cells, sometimes their desquamation and loss of hepatocytes, and proliferation of Kupffer cells were observed. In the hepatocytes in the central parts of lobules, hydropic or ballooning degeneration was observed. With that, hepatocytes in the state of intracellular hyalinosis that in some locations formed Councilman bodies, extreme intracellular hyalinosis with necrosis of hepatocytes were scattered across all liver lobules (Fig. 5).

The histological changes in the skeletal muscle tissues were similar in all cases of the study. Compared to the tissues of healthy animals, muscle fibers were swollen, unevenly thickened, with weakly expressed transverse striation; sarcoplasm contained finely granular eosinophilous mass. The nuclei of muscle fibers in some places had not been subjected to morphological changes, but in many areas they were veiled with granular dystrophy (Fig. 5).

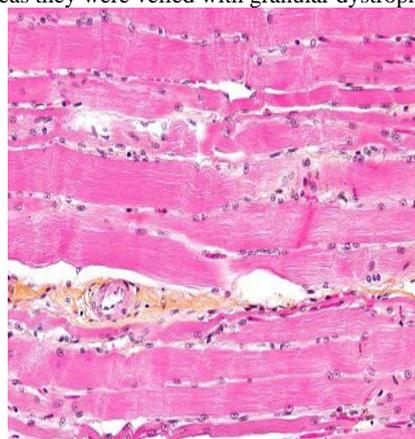


Fig. 5. Skeletal muscle tissue. Stained with hematoxylin-eosin. X200

In the heart, myocardiocytes had weakly expressed longitudinal-transverse striation of the sarcolemma. Uneven hypertrophy of individual bundles and layers of muscle fibers, combined with severe diffuse and focal interstitial inflammation, was observed.

Histologically, depletion of lymphocytes with the loss of follicular architecture was observed in the lymph nodes and spleens from all pigs. Under microscopy of histological slices of lymph nodes, hyperplasia of the cortical substance and of the

paracortical area was observed, with the manifestation of diffuse infiltration by cells of the lymphoid-macrophage series in the marginal and cortical sinuses.

In the lungs, the vessels were in the state of inflammatory hyperemia. Alveoles contained serous and cellular exudate with admixture of epithelial cells, leukocytes, and few erythrocytes. The epithelium in the alveoli was swollen, in the state of dystrophy. In other areas, violation of the alveolar and bronchial structure pattern was noted, the walls of individual alveoles had gaps resulting in large cavities filled with air. The lumen of the bronchi contained moderate amount of catarrhal exudate containing mostly mononuclear-leukocyte cells.

CONCLUSION

Thus, in case of clinically apparent pig circovirus infection, dystrophic and necrobiotic changes develop in the liver, accompanied with renal acute exudative glomerulonephritis and interstitial nephritis, and interstitial myocarditis in the heart.

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