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Pathologoanatomic Changes in Birds with Associated Infections (Infectious Bronchitis and Esherichiosis)

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Abstract

Infectious diseases tend to be widespread in large poultry complexes containing a large number of birds in limited areas. It is an actual problem for industrial poultry farming. The presence of infectious diseases of viral and bacterial etiology in poultry farms has a negative effect not only on the exacerbation of the epizootic situation, but also it leads to a sharp decline of economic indicators. These infectious diseases are often associated and considered as a medical and environmental problem, due to the risk of spread among people. Experimental infection of chickens causes a slowdown in the growth and loss of cilia of epithelial cells, dilatation of tubular glands, infiltration of lymphocytes, mononuclear cells, plasma cells, as well as edema and fibroplasia of the proper layer of all parts of the oviduct. So, the clinical signs of IBC and its mixed course with escherichiosis, pathological changes and histological examination allow us to establish a preliminary diagnosis.

Introduction

Infectious bronchitis of chickens (IBC), the causative agent of which is the coronavirus, is one of the frequently recorded diseases in poultry complexes. The problem associated with this disease has become more actual and urgent because of the pandemic caused by this group of coronaviruses. Coronaviruses, the causative agents of human respiratory diseases, differ from the infectious bronchitis virus (IBV) in birds by the sequence of proteins in RNA and antigenicity (Cavanagh, 1995).

It has been established that there is a low titre of neutralizing antibodies against IBV (Brown et al., 1987; Cook & Huggins, 1986; Cowen et al., 1987) in the blood serum of people caring for chickens. This fact still requires further thorough investigation.

The high contagiousness of the disease and the multiplicity of serotypes of the causative agent of infectious bronchitis in chickens complicate significantly the

whole process of immunization and increase the cost of attempts to prevent this illness in this way.

IBC is a highly contagious respiratory disease characterized by symptoms of respiratory tract and nervous system damage, nephrotic, nephritic and reproductive syndromes (Brown et al., 1987; Cook & Huggins, 1986; Cowen et al., 1987).

IBC often occurs in association with other viral and bacterial infections.

Their timely diagnosis is essential for maintaining the health of people and bird populations as well as for boosting the country's economy.

The main economic losses occur due mainly to three factors including the costs of drug treatment, a slowdown in the growth rate of birds and high mortality.

Nowadays, there is also another risk because of the possibility of migration of disease to the human population due to hypermutability of the pathogen.

Diagnosis of IBC is carried out taking into account the clinical signs of the disease, pathological changes that are inherent in this pathology and laboratory studies necessary for the complete identification of the causative agents of the disease.

The diagnosis of associated infections in poultry farms becomes even more complicated and requires further research.

Materials and methods

The material for our research was 125 sick chickens of ROSS 308 breed of 3-20 days of age, which were bred from chicken embryos obtained from specific pathogen free (SPF) farms.

The birds were placed in cages with feeders and drinkers and kept according to zoo sanitary standards.

Sick and dead birds were examined by clinical, pathological and histological methods. The mucous membrane of the nasal cavity, nasal septum, larynx, trachea, lungs, and reproductive organs were taken for histological examination.

The material was fixed in 10% neutral formalin, and cryosection has been done. Thin sections of kidney and trachea tissue with a thickness of 2-3 mm were cut, placed in cassettes, closed and embedded in paraffin after fixation. Then, the cassettes were fixed in a microtome, 5 μm thick slices were cut and placed on glass slides. They

were stained with hematoxylin-eosin, for fibrin according to Shueninov, for collagen fibres and fibrin according to Slinchenko, and for mucus with Meyer's mucicarmine.

After staining, the sections were dried at room temperature and a drop of Canadian balsam was applied to them. Then, they were covered with a cover glass, and examined under a microscope.

Pathological and histological changes in the structure of the trachea were assessed using a 4-point scale (Alvarado et al., 2002):

1 point - complete absence of pathological and histological signs;

2 points - indication of slight hyperplasia of the epithelium and mild subepithelial lymphoid infiltration, with a slight thickening of the mucous membrane as a result of edema;

3 points - the presence of moderate hyperplasia of the epithelium with loss of cilia and moderate subepithelial lymphoid infiltration with moderate thickening of the mucous membrane;

4 points - the presence of severe hyperplasia of epithelial and subepithelial tissue, the presence of lymphoid infiltration with moderate thickening of the mucous membrane, all cilia disappear from the surface of the epithelium and desquamation of epithelial and secreting cells of the mucous membrane occurs.

Research results

We registered the associated course of IBC with escherichiosis in the poultry farms of the republic.

We observed the associated infection of IBC with escherichiosis in young animals from one day to 10 months of age, is often less in older birds.

The contamination of chickens with IBC and escherichiosis was recorded in farms in case of violation of the manning of production groups of birds, as well as in violation of the technology of keeping and feeding.

At the same time, a reduction in the incubation period from several hours to 10-24 hours was observed.

The clinical course of the infectious process is acute or septic.

The acute course was accompanied by a respiratory syndrome: coughing, sneezing, tracheal wheezing and nasal discharge (Figure 1).

Figure1. Acute course of IBC

Wet eyes and swollen sinuses were common. Mortality in the 80% of cases was recorded mostly in an associated course with escherichiosis. The duration of the disease was 8-12 days in this case. Profuse diarrhea leading to the death of the bird was noted. In some cases, shortness of breath, paresis, paralysis, exhaustion (with a mixed course with escherichiosis) were noted.

The main pathological changes were noted in the respiratory organs. There was a sharp congestive hyperemia of the mucous membrane in the nasal cavity. Focal necrotic overlays, often localized on the vestibule and the lateral or ventral nasal passages, less often on the mucous membrane of the nasal septum, were a grayish or grayish-yellow color. There are accumulations of grayish foamy fluid on the surface of the mucous membrane in the larynx and trachea. The membrane is hyperemic. Pneumatocysts darken or may contain yellow curd exudate. (Figure 2)

Caseous plugs can be found in the lower part of the trachea or bronchi of dead chickens. Pneumonia was recorded. The lobes of the lung were increased in volume and firm consistency. Serous-fibrinous edema and fibrinous deposits were observed. The coligranulomatosis, characterized by the development of specific granulomas on the internal organs and skin, was additionally noted in some chickens. Young

animals are affected from the moment of birth, sometimes later up to 2-5 months of age or maturity. Knotty formations were found in the liver and in the intestines (with a joint course with escherichiosis) during palpation of birds.

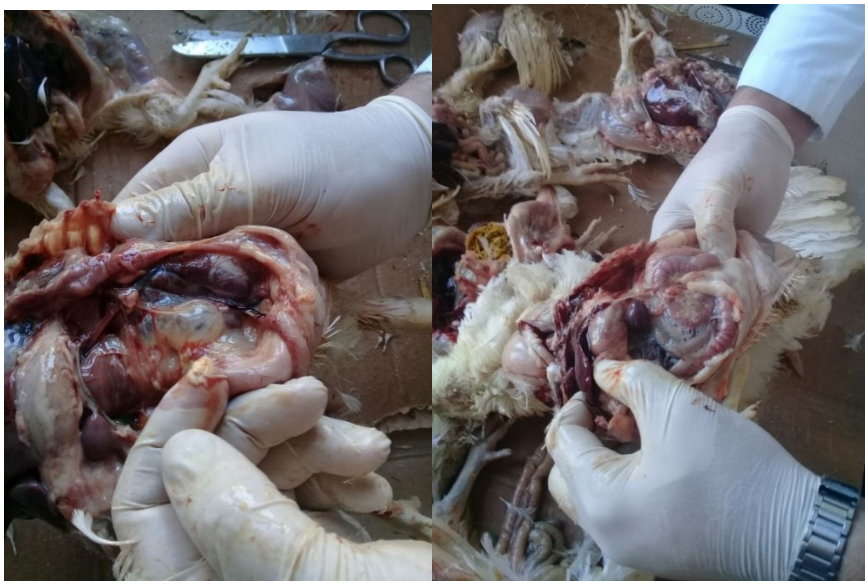

Figure 2. Pneumatocysts containing yellow curd exudate

Reproductive syndrome and a sharp decline in productivity were observed in the adult parent-flock. A sharp decrease in productivity was observed after reaching 35-50% of egg production (Figure 3).

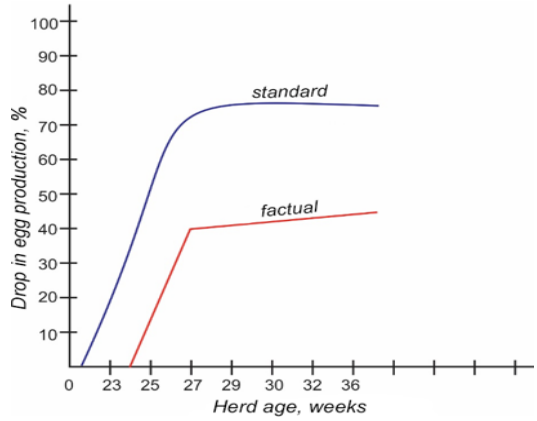

Figure 3. Curve of egg production in a population of chickens infected with IB virus and *E. coli.* No peak in productivity after reaching 50%.

The appearance and quality of eggs change: eggs are small, pale in color, almost white, sometimes the shell is soft, deformed or with lime deposits on the surface (Figure 4).

Figure 4. Curve of egg production in a population of chickens infected with IB virus and *E. coli*. No peak in productivity after reaching 50%.

An increase in the number of eggs not suitable for incubation and a decrease in the number of hatched chickens should be taken into consideration. Also, less damage to the oviduct in adult chickens was observed.

The nephrotic and nephritic syndrome was characterized by structural changes in the epithelial cells of the renal tubules, which was accompanied by a deterioration in water-salt transport and led to acute renal failure (anemia and nephritic-nephrosis syndrome were registered). We observed regeneration of the epithelium of the collecting ducts and ureters in nephritis on the 6-12th day after infection. Focal sites of uric acid deposition were recorded in swollen and pale kidneys and ureters.

Tissue regeneration was observed on the 15th day after an illness in adults.

Histological examination revealed changes 4-5 days after infection.

IB virus of R5 strain caused degeneration, vacuolization and desquamation of epithelial cells of the renal tubules. The lesion of the tubules was more established in the medulla of the kidneys. Foci of necrosis were observed in some parts. As the condition of the birds improved, the tubule epithelium is regenerated. Degenerative changes were observed when isolating the Masas strain. As a result of these degenerative changes, severe atrophy of one or two or three kidney sites happens at once.

Experimental infection of chickens causes a slowdown in the growth and loss of cilia of epithelial cells, dilatation of tubular glands, infiltration of lymphocytes, mononuclear cells, plasma cells, as well as edema and fibroplasia of the proper layer of all parts of the oviduct.

So, the clinical signs of IBC and its mixed course with escherichiosis, pathological changes and histological examination allow us to establish a preliminary diagnosis.

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