

Pathomorphological Changes in Poultry Pasteurelliosis, Pullorosis and Colibacteriosis Diseases

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ABSTRACT

The organism of chicken infected with individual pathogens exhibits relatively simple patho-anatomical modifications in the presence of two or three separate bacterial pathogens. Because it is highly challenging to differentiate between mixed bacterial infections based just on clinical symptoms, pathologo-anatomical examination and distinction are preferred. These disorders will be accurately diagnosed promptly and without delay if the pathologo-anatomical investigations are properly examined, and preventive measures will be consistently applied.

KEYWORDS: *Dystrophy, fibroblast, pathomorphology, colibacteriosis, pasteurellosis, pullorosis, atelectatic, adventitial, paratyphoid, hyperemia.*

Relevance of the topic. Recent years have seen an increase in the number of chicken deaths due to bacterial infectious illnesses caused by *Pasteurella*, *S. pullorum*, and *E. coli* on small farms and poultry factories. These illnesses cause young chicks to grow more slowly, to be fewer in number, and to produce fewer meat and egg products, which has a significant negative economic impact on the poultry business.

Numerous bacterial illnesses occur among poultry, particularly young chicks, and they are mixed together, leading to the loss of many chicks, according to some literature and research findings.

40 two-and-a-half-month-old chicks were divided into four groups of 10 heads by S.A. Artemiev and M. Babaeva in 1970. The first, second, and third groups were then combined with five *Pasteurella* strains, three *S. pullorum* strains, and five *E. coli* strains. The commanding group was the fourth one. Patho-anatomical exams revealed that fibrin fiber threads, inflammation, and turbid fluids were all present in the beard and mouth cavity of all experimental chicks. The organs did not, however, exhibit any distinct disease-specific alterations. When pathologo-anatomical samples collected from the internal organs were planted in various nutrient medium and microbiologically tested, it was discovered that *Pasteurella*, *S. pullorum*, and *E. coli* were present.

Our study looked closely at the clinical symptoms, pathologo-anatomical changes, and histological changes of three infectious mixed bacterial infections that affect poultry: pasteurellosis, pullorosis, and colibacteriosis.

Materials and methods. According to G.A. Merkulov's method, studies were conducted in the order listed below. Skin tissue samples were dissected, and internal parenchymatous organs (liver, lungs, spleen, lymph nodes, heart, and kidney) from birds infected with colibacteriosis, pullorosis, and pasteurellosis were examined histologically for pathologo-anatomical changes. To accomplish this,

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pathological samples (slices) collected from internal organs and tissues were examined histologically using a histopreparation that was made and kept in 50-100 ml black glass vials.

I. Fixation

1. Pathological samples (fragments) taken from birds infected with Pasteurellosis pullorosis and colibacteriosis were kept in 10-12 percent formalin solution for 24 hours;
2. It was kept for 24 hours in a solution of equal proportions of 96° ethyl alcohol and formalin;
3. Kept in Carnoia liquid for 2-4 hours;
4. Kept in 96°-100° alcohol for 12-24 hours.

II. Dehydration

1. To dehydrate the obtained pathological samples (pieces), they are kept in 96° absolute alcohol for 24 hours;
2. On the next day of the experiment, it was kept in 96° absolute alcohol for another 24 hours.

III. Paraffin injection

1. Placed in a solution of alcohol and chloroform in equal proportions at 96° for 6-12 hours;
2. Kept in pure chloroform solution for 6-12 hours. At the end of storage, it was observed that the color of the flakes became clear;
3. For uniform and better absorption of paraffin, pieces were placed in an equal ratio solution of melted paraffin and chloroform and left for 2-3 hours in a thermostat with a temperature of +35-40 °C. Sometimes such solutions were stored frozen when not in use;
4. Then the slices were placed in melted paraffin kept in a thermostat with +54 - +55 0C. In this case, the slices were first placed in part I, i.e., in melted paraffin in the first container for 1.5-2.5 hours, and then with heated tweezers, they were kept in the position of paying attention to the size and thickness of the slices for 0.5-1.5 hours.;
5. The pieces were placed in a jar with glycerin applied to the bottom and heated to +60+70 0C using a gas burner, and melted clean paraffin was poured over it until it was covered with a thickness of 0.5 cm. The pieces were placed at free distances that were easy to separate from each other;
6. The paraffin container containing the slices was cooled in a large container filled with cold water. It was based on the melting of paraffin moving from the bottom to the top;
7. After hardening, the paraffin was cut off from the edges, a new portion of it was re-poured in order to have limited flow areas in the paraffin;
8. Blocks were cut from solidified paraffin leaving at least 2 mm of paraffin layer around the pieces. In this case, the organs present in each part were taken separately;
9. The resulting blocks were glued to the boards with paraffin on most sides using a heated spatula.

With the use of a microtome, sections were cut from the blocks, and then a micropreparation was made on a glass slide, stained with hematoxylin and eosin, and examined under a microscope. Microscopy allowed researchers to examine the pathogistological alterations in the internal organs of birds infected with the Pasteurella, *S. pollorum*, and *E. coli* pathogens.

Gram and Romanovsky-Giemza stains were used to view smears made from pathological samples under a microscope. The discovered bacteria's morphology and staining were noted. The varieties of bacteria and the most prevalent ones were identified; the findings were then documented in

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publications.

Bacteriological cultures from diseased materials were cultivated in a thermostat using artificial nutritional media. The type, variety, color, and size of colonies were identified while growing bacterial cultures seeded in nutritional media. Simple GPQ, GPA, Kitt-Tarotssi, selected Endo, Salmon Shigella, and blood agar nutrient media were used to cultivate these characteristics. Based on the features of their colonies, bacteria were divided.

Result and Discussion.

The pathologo-anatomical investigations focused on the following changes: the health of experimental control birds, alterations in the mucous membranes that could be seen, the state of the body and blood, its color, the condition of the skin, etc.

The external appearance of the subcutaneous tissue, lymph nodes, blood vessels, parenchymatous organs, liver, kidneys, lungs, heart, spleen, reproductive organs, internal excretory glands, head, and spinal cord were given consideration when examining the internal organs.

The size, density, color, and surface changes of the organs, as well as the state, fullness, and swelling of the tissues, were the primary factors considered while examining changes in the body. The status of the small and large intestines, hemorrhagic inflammations, the serous and mucous membranes of the digestive tract, dystrophy, atrophy, and necrotic foci.

On each study, histological exams were carried out. In this instance, parts of parenchymatous organs that were anywhere between wounded and healthy tissues of the liver, kidneys, spleen, heart, lungs, and pancreas were sliced into pieces that were 2-3 cm long and thick. Based on pathologoanatomical changes, a determination was made following the completion of all examinations.

Result and discussion. The clinical symptoms of mixed infectious diseases of birds, such as pasteurellosis, pullorosis, and colibacteriosis, varied according to the severity of the pathogens and the disease's progression. Acute disorders complicate the pathologo-anatomical process and severely harm the bird's body. Additionally, the type and number of infections in the body affect clinical symptoms in different ways. For instance, when *Pasteurella S.pullora* and *E.coli* causative agents are discovered in the same organism, the clinical symptoms change as follows: in the first days, chickens and chicks are weak, shivering, and refuse to eat; from the second day, wheezing, lying down a lot, redness of the mucous membranes, body temperatures of 42, an increase to 0-42.5°C, and bloody diarrhea were observed.

Chickens and chicks developed weakness, bowed heads, lost appetite, and on the second day of the illness, they refused to eat owing to loss of desire, raised body temperature, and increased breathing when the causative agents of pasteurellosis and pullorosis were encountered together. Along with the paralysis of the legs, their diarrhea was liquid blue.

It was shown that hens' clinical symptoms were a bit convoluted when pasteurellosis, colibacteriosis, and pullorosis coexisted. They developed swellings in the chest and abdomen, exuded purulent exudates from their nasal cavities, experienced bloody and purulent diarrhea, as well as leg paralysis and an increase in body temperature of 43.5–44.0°C.

In contrast to hens infected with separate diseases, poultry infected with two (pasteurellosis and colibacteriosis), three (pasteurellosis, pullorosis, and colibacteriosis), or more infections simultaneously displayed complicated and profound patho-anatomical alterations. However, it can be challenging to differentiate between these illnesses based solely on clinical symptoms, hence it is advised to conduct pathologoanatomical and histological testing at the first diagnosis.

Pathologoanatomical changes. The pathologoanatomical changes in the body were different when pasteurellosis and colibacteriosis co-occurred in chicken because they were more subtle and

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consistent. The bodies were observed to be extremely thin and unhardened, to have foamy liquid flowing from the mouth and nose, sometimes mixed with blood, to have hyperemia in the mucous membranes, particularly in the conjunctiva, to have liquid yellow waste contaminating the area around the cloaca, and to have discolored feathers. Blood vessel fullness was primarily seen in the gastrointestinal tract and subcutaneous cells. All infected chickens displayed spotted and dot hemorrhages on the serous membranes as well as blood vessels packed with blood.

The heart muscle was enlarged, there were more punctate blood deposits, there was an accumulation of foamy mucus material in the bronchi and alveoli of the lungs, and there were multiple foci of atelectasis.

The spleen saw the most significant and long-lasting modifications; its size rose, and patchy and spotted hemorrhages were identified on its surface. The gastrointestinal system also underwent significant changes. That instance, an essential differentiating indicator is the existence of 2–3 wounds that are 0.5 cm in size in the muscular and glandular stomach.

Swellings appear in the subcutaneous cells around the head, neck, wings, and cloaca in chickens with pasteurellosis and pullorosis, and frothy fluid mixed with blood leaks from the oral cavity.

All chickens and chicks' lungs and digestive tracts were filled with blood vessels, and the serous membranes had spot and spot hemorrhages. The liver was noticeably enlarged, with point and spot hemorrhages on the surface, and hyperemia and hemorrhagic processes were seen in the kidneys. The lungs were enlarged, pale red in color, and had point hemorrhages on the surface.

It showed up as little dot hemorrhages, erosions, and ulcers in the muscular stomach's mucous membranes. Small surface hemorrhages were seen, the spleen's size was somewhat increased, and the pulp was dark crimson when sliced.

There were numerous ulcers of 1-2 cm in size, patchy hemorrhages, and catarrhal-hemorrhagic irritation of the mucous membranes of the intestines.

Birds with pasteurellosis, pullorosis, and colibacteriosis have a slender body, hyperemic external mucous membranes, liquid feces-contaminated cloaca area, and swollen lymph nodes under the wings. Blood stasis in the blood vessels, multiple surface hemorrhages, paratyphoid nodules diagnostic of pullorosis were developed in the liver, and there were spotty hemorrhages on the surface of the enlarged kidneys throughout the acute course of the disease.

The lungs' diphtheritic inflammation, thickening, liver and spleen size reduction, spotty and spotty hemorrhages in the mucous membranes of the stomach and intestines, a significant buildup of mucus in the rennet, dystrophic-necrotic changes, hemorrhagic inflammations, and numerous ulcers were all characteristics of the disease's chronic course.

Small hemorrhages were present in a few areas of the spleen, intestinal mesenteric lymph nodes were inflamed, the kidneys' umbilical layer hemodynamic and dystrophic changes were well-developed, and the capsule was also swollen and filled with fibrinous fluid.

Thus, compared to other bacterial infections, the clinical symptoms and pathologoanatomical alterations of mixed pasteurellosis, pullorosis, and colibacteriosis in chicken are extremely complex. However, if it is carefully examined from a patho-anatomical perspective, many disorders can be accurately recognized and preventative steps can be taken.

Pathohistological changes. Blood arteries widened, filled with blood, and different hemorrhages around muscle fibers were seen in the myocardium of birds with pasteurellosis and colibacteriosis. The vein gaps are significantly expanded and bulging. The pulmonary capillaries are also dilated and filled with shaped blood components, and in some areas, there is blood stagnation and focal hemorrhages. The cavities of most alveoli are filled with erythrocytes. There are loose, partially

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homogenized connective tissues. Fibroblasts, leukocytes, and in rare cases bacterial collections are present in the interstitial tissue. The specific histological abnormalities in the liver are defined by vascular wall inflammation, dystrophy, and blood circulation issues. The spleen's vascular walls have an adventitial layer that thickens them, and their fibers have become homogenized. Additionally, little bleeding foci were seen. The lymph nodes have well developed hyperplastic processes. It develops perivascular malignancies. Diapause hemorrhages, which frequently result in the growth and filling of blood vessels, are typical histological abnormalities in the kidneys. As the primary changes in the gastrointestinal tract, vascular expansion, fullness, localized extravasates, and perivascular serous swellings were investigated. The mucosal membranes of the intestines quickly developed catarrhal inflammatory processes, and numerous areas showed focal erosion and necrosis.

It was discovered that chickens with mixed infections of pasteurellosis and pullorosis had enlarged heart blood vessels, repositioned endothelium, and significantly more cell clusters of histiocytes, lymphocytes, and leukocytes around some vessels than chickens with mixed infections of pasteurellosis and colibacteriosis. The liver underwent histological changes that were comparable to pasteurellosis and colibacteriosis, but they weren't the same as the necrotic nodules that developed in the liver parenchyma. There were small hemorrhages and lymphoid aggregates in certain splenic regions. It was discovered that the trabeculae are enlarged, the fibers' appearance is ambiguous, the kidneys' hemodynamic and dystrophic alterations are well-developed, the capsule has expanded, the nephrons in the medulla have started to necrotize, and they are filled with fibrinous fluid.

In the gastrointestinal tract, there were significant and intricate pathohistological alterations. Because it was discovered during the studies that these organs were mostly affected more by both stimuli. The glandular stomach and intestines' mucous membranes were found to have serous-catarrhal, catarrhal-hemorrhagic inflammations, dystrophic, and necrotic processes.

Conclusions:

1. Poultry colibacteriosis is characterized by chronic and acute flow in the early life, swollen lungs, blood vessel stagnation, point hemorrhage under the kidney capsule, enlarged liver and necrotic foci at its edges, spotty hemorrhage in the spleen, accumulation of significant amounts of pus in the pulp, and hyperemia. Mortality is $y=92.040.84\%$, and morbidity is $y=88.10.73\%$.
2. The internal organs of the birds who died from colibacteriosis were examined histologically, and it was discovered that the cardiac muscle fibers had developed granular dystrophy and that the lungs' alveoli were in a state of dyslectase and atelectasis. The adventitial layers of the liver and spleen thickened, the trabeculae and capsules of the liver grew larger, and lymphoreticular hyperplasia formed in the spleen.
3. Chicks with poultry pullorosis, which typically begins between two and four weeks of age and frequently expresses itself in an acute form, exhibit hyperplasia of the spleen, dystrophy of the liver, catarrhal enteritis, and dot hemorrhages in the mucous membranes of the gastrointestinal tract.
4. A drop of blood is occasionally used in poultry farms to conduct an indirect hemagglutination response, which can reveal the health of the flock in terms of pasteurellosis, pullorosis, and colibacteriosis disorders. Paying attention to zoohygienic standards will help prevent these diseases.
5. There is a mixture of pasteurellosis and pullorosis in poultry, as well as lymphoid collections in the spleen, serous-catarrhal, catarrhal-hemorrhagic inflammations of the glandular mucous membranes of the stomach and intestine, and increased necrotic and dystrophic processes in the lungs and kidneys.

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