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РЕЗЮМЕ

Изучены применяющиеся в ветеринарной практике, методы лабораторной диагностики туберкулеза животных, являющегося одним из зооантропонозных заболеваний. Обнаружение микобактерий туберкулеза в исследуемых образцах является одним из основных признаков в диагностике туберкулеза животных.

Чувствительность и специфичность, активность метода иммунофлуоресцентной реакции для диагностики туберкулеза животных установлена постановкой опытов на лабораторных животных и исследованием патматериала, полученного от животных из благополучных и неблагополучных по туберкулезу хозяйств. Проведены исследования по изучению возможности применения прямого метода ИФР для диагностики туберкулеза животных и как экспресс – метод для идентификации микобактерий бычьего вида. Изучена активность и специфичность ИФР в мазках из патматериалов, полученных от зараженных вирулентными и атипичными видами микобактерий животных в сравнении с другими лабораторными методами исследования. В результате установлено, что метод ИФР по своей активности, чувствительности и диагностической ценности не уступает известным методам, применяемым в ветеринарной практике. Высокая специфичность этого метода обусловлена моноклональными антителами, полученными к микобактериям бычьего типа.

Разработан способ постановки прямого метода иммунофлюоресцентной реакции с применением моноклональных антител для обнаружения возбудителя туберкулеза бычьего вида в патологическом материале.

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CLINICAL AND PATHOMORPHOLOGICAL ASPECTS OF EIMERIOSIS IN CHICKENS IN THE WEST KAZAKHSTAN REGION

ANNOTATION

This study presents clinical and pathomorphological findings that confirm the presence of eimeriosis in the animal. Clinically, depression, feather-ruffling, weakness, lack of appetite, diarrhoea with blood, and decreased physical activity are observed. These signs, characteristic of parasitic diseases, indicate acute inflammation in the intestine.

Studies have shown the presence of anaemia, manifested by a decrease in haemoglobin and hematocrit. The processes occurring in the chickens' body indicate haemorrhages caused by intestinal lesions, which are characteristic of meiosis. Physiologic abnormalities in blood cells include increased basophils, which may indicate inflammation and decreased eosinophils, which may be due to depletion of the immune system in response to chronic inflammation. Quantitative lymphocyte counts are slightly elevated, reflecting an activated immune response.

Biochemical blood analysis showed hypoproteinemia, decreased urea levels, and increased creatinine, indicating metabolic disturbance, liver and kidney damage, and destruction of muscle tissue, probably due to exposure to toxins produced by parasites.

Microscopic and histopathologic examination of tissues confirmed the diagnosis of eimeriosis of chickens. Oocysts of Eimeria spp. were detected in intestinal samples, indicating parasitic infection. Pathanatomical autopsy results showed significant mucosal damage, loss of villi and tissue necrosis, and infiltration with lymphocytes and macrophages. Release of merozoites from the oocysts resulted in cell destruction and intestinal tissue damage.

Thus, all data indicate a severe organismal lesion caused by eimeriosis, with pronounced metabolic disorders and tissue inflammatory changes.

Key words: *clinical signs, pathology, morphology, eimeriosis, chicken.*

Intoduction. Eimeriosis, a parasitic disease caused by protozoa of the genus Eimeria, is a significant concern in poultry production worldwide. It is recognized as one of the most economically impactful diseases affecting the poultry industry, leading to substantial productivity losses, increased mortality rates, and heightened costs associated with treatment and prevention strategies. This literature review synthesizes current research on the prevalence, risk factors, and control measures for eimeriosis in poultry, mainly focusing on the implications for both commercial and small-scale farming operations.

The prevalence of eimeriosis varies significantly across different geographical regions and production systems. Eimeriosis is a major cause of economic losses in poultry farming in Nigeria, affecting both local and exotic chicken breeds [1]. The disease is a common enteric parasitic infection that poses a major constraint to poultry farming in Osun State, Nigeria [2]. Study in Ethiopia corroborated these findings, noting that eimeriosis is the most prevalent disease in free-range chicken production systems [3]. These studies collectively underscore the widespread nature of eimeriosis and its economic implications across diverse poultry farming contexts.

The economic burden of eimeriosis is substantial, with estimates suggesting that the annual global cost to the poultry industry ranges from $7 to $13 billion [4]. This financial impact is primarily due to reduced performance, including weight gain and feed conversion efficiency, as well as increased mortality rates associated with severe infections. The disease is particularly detrimental in high-density farming systems, where the risk of transmission is heightened due to the close proximity of birds [5].

Moreover, the presence of multiple Eimeria species, such as E. acervulina, E. maxima, and E. tenella, complicates the management of eimeriosis, as each species can affect different segments of the intestinal tract and elicit varying immune responses [6, 7].

Control measures for eimeriosis have traditionally relied on the use of anticoccidial drugs and vaccines. Recent studies have explored the efficacy of various vaccines, the effectiveness of a specific vaccine in broilers [4]. Additionally, the use of coccidiostats in feed has been a common practice to mitigate the impact of the disease [8]. However, the increasing concern over antibiotic resistance and the push for more sustainable farming practices have prompted researchers to investigate alternative strategies, including the use of herbal remedies and immunization approaches [9, 10]. For instance, the relationship between fecal shedding of oocysts and body weight gain during Eimeria infections, emphasizing the need for effective management practices that consider both health and productivity [11].

Furthermore, the development of host immunity plays a crucial role in the management of eimeriosis. Recent advancements in understanding the immune response to eimeriosis and the potential for developing more effective vaccines [12]. The complexity of the immune response, which varies depending on the Eimeria species involved, highlights the necessity for tailored vaccination strategies that can enhance resistance to coccidial infections [10].

In conclusion, eimeriosis remains a critical challenge in poultry production, with significant implications for animal health and economic viability. Ongoing research into the prevalence, risk factors, and control strategies is essential for developing effective management practices that can mitigate the impact of this disease.

This article aims to study the clinical and pathomorphological aspects of chicken eimeriosis in the western region of Kazakhstan.

Materials and methods of research. The Fülleborn method is the most common flotation method of diagnosis. For the study, it is necessary to have a saturated solution of table salt, tea or chemical beakers of two hundred millilitres (or half-litre glass jars, as well as other dishes of the specified capacity), beakers of smaller capacity (75-100 ml), gauze or wire sieves, absorbent cotton, wire loops with a diameter of 0.8-1 cm, glass or wooden sticks, slides and coverslips, microscope. Wire loops are made of thin, flexible wire. To prepare a saturated solution in 1 litre of hot water, dissolve about 350 g of table salt. The resulting solution is filtered through a funnel with gauze or absorbent cotton into a clean dish. The precipitation of salt crystals indicates the saturation of the solution. The specific gravity of such a solution is 1.18. A saturated solution of table salt can be prepared in advance and stored indefinitely. 5-10 g of faeces in a glass of larger capacity is thoroughly stirred in the 20-fold volume of a saturated solution of table salt, which is added gradually. The obtained uniform suspension after removal of floating large particles with a paper scoop or a stick is filtered through metal sieves or gauze into glasses of smaller capacity, which are filled to the top and left alone for 40-60 min. During this time, the eggs float to the top. The sample is taken from the surface of the suspension by touching it with a wire loop. The film of liquid adhering to the loop is shaken off onto a slide and examined under a microscope (with or without a slide, depending on the magnification). For each sample, take a separate loop or burn it on a burner flame so that in subsequent samples, do not bring helminth eggs. Glass sticks are washed thoroughly after each sample, and wooden sticks are discarded. Floating helminth eggs are kept on the solution's surface for several hours and then settle to the bottom. The eggs of some helminths are heavier than the solution and do not float to the surface at all. Therefore, as a complement to the method of Fülleborn sometimes carries out a sample from the bottom: the liquid, after examination of the sample and a long-standing carefully drained, and part of the contents of the sediment is transferred with a wire loop on a slide and viewed under a microscope [13].

Pathologic autopsy was performed according to Shore's method [14].

All material samples were fixed in a 10% neutral formalin solution. Then, the material was dehydrated in alcohols (70° to 100°), impregnated with a sealing mixture and embedded in paraffin. Histologic sections 5-7 μm thick were prepared on a sledge microtome. The sections were stained with hematoxylin and eosin [15].

Results. Clinical signs in chicken eimeriosis are manifested as depression, ruffled feathers, weakness, lack of appetite, diarrhoea, blood in feces and decreased physical activity.

Table 1 – Haematological parameters of chicken's blood in eimeriosis, n=10

Indicators	Unit of measurement	Reference indicators	Average values for the control group	Average values for the experimental group
Haemoglobin	g/l	80-120	95,3±3,20	75,2±2,04
Hematocrit	%	38-42	39,0±1,56	22,5±1,23
Erythrocytes	10^{12}/l	3-4	3,5±0,30	3,8±0,35
Leukocytes	10^{9}/l	20-40	30,0±2,00	23,2±1,57
Тромбоциты	thou./ml	32-100	50,0±3,10	46,7±2,02
Erythrocyte sedimentation rate	mm/hour	4,0-6,5	5,2±0,45	1,9±0,05

The results of the tests show the following abnormalities:

Haemoglobin is below average by 5.9%, indicating the presence of anaemia typical of meiosis caused by intestinal bleeding.

Hematocrit is lower than usual by 40.8%, confirming a decrease in the volume of blood cell mass typical of anaemia.

Erythrocytes, leukocytes, and platelets are within normal limits.

The erythrocyte sedimentation rate is 52.5% below average, which may indicate abnormalities in blood protein metabolism.

These data indicate the presence of anaemia with signs of blood loss and may also indicate abnormalities in protein metabolism (Table 1).

Table 2 – Leukogram, n=10

Indicators	Unit of measurement	Reference indicators	Average values for the control group	Average values for the experimental group
Basophils	%	1-3	2,5±0,18	3,5±0,23
Eosinophils	%	6-10	7,0±0,90	4,3±1,27
Lymphocytes	%	52-60	56,0±2,10	60,8±2,35
Monocytes	%	4-10	6,0±0,80	5,1±1,02

The results of the analysis show the following changes in blood cells:

Basophils are higher than usual by 16.7%, which may indicate an inflammatory process in the body.

Eosinophils are 28.3% below average, which may indicate a decrease in their activity or depletion, possibly due to chronic inflammation or other pathologic conditions.

Lymphocytes are 1.3% above average, which may indicate immune system activation, for example, in response to infection or inflammation.

Monocytes are within the normal range, indicating the absence of pathologic changes in the body.

These changes may indicate an active inflammation and immune response, with possible depletion of some immune system components, such as eosinophils (Table 2).

Table 3 – Biochemical analysis of blood, n=10

Indicators	Unit of measurement	Reference indicators	Average values for the control group	Average values for the experimental group
Total protein	g/l	43-59	51,5±2,00	31,7±1,23
Urea	mmol/l	0,23-0,47	0,35±0,05	0,15±0,09
Uric acid	mmol/l	119-654	450,0±25,00	447,2±19,35
Creatinine	μmol/l	13,9-14,0	13,9±0,30	19,0±3,01

The results of the biochemical analysis show the following abnormalities:

Total protein is below average by 26.3%, indicating hypoproteinemia - a decrease in the total protein level in the blood, which may be due to impaired protein synthesis in the liver or excessive protein loss (e.g., through the kidneys or intestines).

Urea is 34.8% below average, possibly due to decreased protein breakdown, which may indicate general exhaustion, impaired liver function, or reduced urea synthesis.

Uric acid is within normal limits, not indicating pathologies associated with purine metabolism disorders.

Creatinine is higher than average by 36.1%, which may indicate increased destruction of muscle tissue, possibly due to exposure to toxins released by parasites, resulting in excessive release of creatinine into the blood.

These changes may indicate the presence of severe metabolic abnormalities, particularly hypoproteinemia, possible liver or kidney damage, and destruction of muscle tissue, which is probably related to parasitic invasion (Table 3).

Figure 1 – Oocysts of Eimeria spp

Eimeria spp. multiplies in the intestinal tract and causes small intestine and rectum lesions, causing pathologic changes in the affected area. Examination of intestinal samples by flotation and wet smear methods revealed oocysts.

Necropsy showed an enlarged and dilated appendage filled with blood [Figure 1].

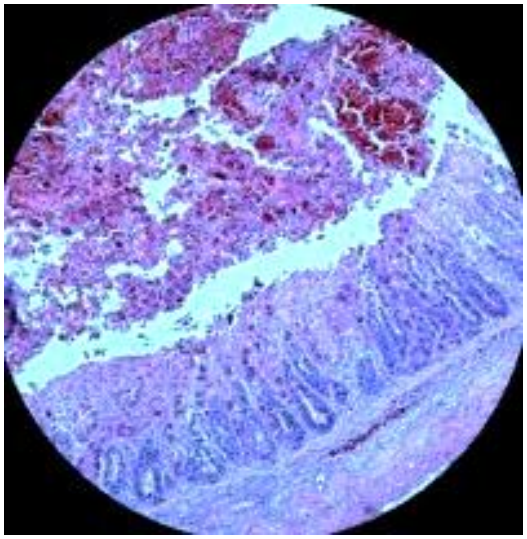

Figure 2 – Degeneration of intestinal tissue and villi with haemorrhages

Microscopic examination showed severe tissue damage, villi loss, and intestinal mucosa necrosis (Figure 2).

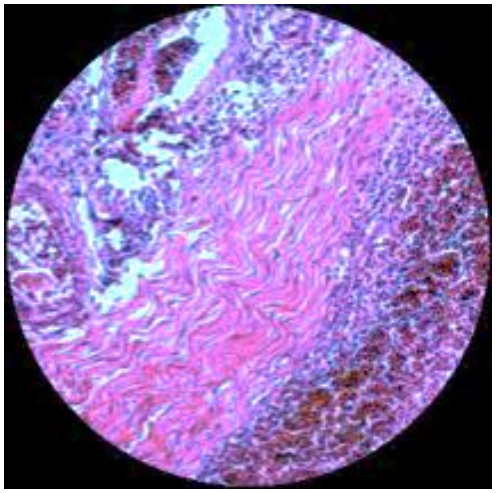

Figure 3 – Haemorrhage in the intestinal epithelium and tissue necrosis

Histopathologic examination showed different stages of development of Eimeria oocysts in both epithelial and mucosal tissues (Figure 3). Infiltration of the epithelium with lymphocytes and macrophages was also observed. The release of merozoites resulted in severe tissue destruction, sloughing, and denudation of villi, as observed in tissue sections.

Discussion. Eimeriosis, an enteric disease caused by protozoan parasites of Eimeria, poses significant clinical and pathomorphological challenges in poultry. The disease is primarily characterised by its impact on the intestinal tract, leading to a range of pathological changes that can severely affect the health and productivity of infected birds. This discussion synthesises current knowledge on the clinical manifestations and pathomorphological alterations associated with eimeriosis in poultry, mainly focusing on the most pathogenic species, Eimeria tenella.

Clinically, meiosis manifests through a variety of symptoms, including diarrhoea, weight loss, dehydration, and, in severe cases, mortality. Eimeria tenella is particularly notorious for causing hemorrhagic enteritis, which is characterised by bloody diarrhoea and significant morbidity [13, 14]. Infected birds often exhibit signs of distress, such as ruffled feathers, lethargy, and reduced feed intake, which can lead to poor growth performance and increased susceptibility to secondary infections [14]. The onset of clinical signs typically occurs within 5 to 6 days post-infection, following the ingestion of sporulated oocysts [15]. This rapid progression underscores the importance of early detection and intervention in managing outbreaks.

Pathomorphologically, eimeriosis is characterized by distinct lesions in the intestinal tract, particularly in the ceca and intestines. Eimeria species invade the epithelial cells of the intestinal lining, leading to cellular destruction and inflammation. Histopathological examinations often reveal intestinal epithelium necrosis, inflammatory cell infiltration, and oocysts within the intestinal lumen [16]. In the case of Eimeria tenella, the lesions are particularly severe, with extensive haemorrhage and necrosis observed in the cecal mucosa, which can lead to significant blood loss and shock in affected birds [13, 16]. The severity of these lesions correlates with the pathogenicity of the infecting Eimeria species, with E. tenella being among the most virulent.

The economic implications of eimeriosis are profound, as the disease can lead to substantial losses in poultry production. The pathological changes induced by Eimeria infections result in reduced nutrient absorption, impaired feed conversion efficiency, and increased mortality rates, all contributing to economic losses estimated to exceed $3 billion annually in the poultry industry [17]. Furthermore, the presence of eimeriosis can complicate the management of poultry health, necessitating the use of anticoccidial drugs and vaccines, which can further increase production costs [18].

In conclusion, eimeriosis remains a critical challenge in poultry health management, characterized by significant clinical symptoms and pathomorphological changes that adversely affect bird welfare and productivity. Understanding the clinical manifestations and pathological alterations associated with

Eimeria infections is essential for developing effective prevention and control strategies. Continued research into the mechanisms of Eimeria pathogenesis and the host immune response will be crucial for improving management practices and reducing the economic burden of this disease in the poultry industry.

Conclusion. The study revealed signs of eimeriosis caused by the parasite *Eimeria spp.*, which were confirmed by clinical and pathomorphological data. Clinically, the animal showed depression, weakness, ruffled feathers, lack of appetite, diarrhoea with blood, and decreased physical activity. Blood haematology analysis showed anaemia, possible blood loss in the intestine, and abnormalities in the metabolism of proteins and cellular components of the blood. Biochemical values indicate hypoproteinemia, possible liver or kidney damage, and destruction of muscle tissue.

Microscopic examination of intestinal tissues showed the presence of *Eimeria spp.* oocysts and pronounced pathologic changes in the intestinal wall: necrosis of the mucosa, loss of villi, and infiltration by inflammatory cells. These data confirm active inflammation and destruction of intestinal tissues caused by parasitic infection.

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ТҮЙІН

Бұл зерттеу жануарда эймериоздың болуын растайтын клиникалық және патоморфологиялық өзгерістердің нәтижелерін ұсынады. Клиникалық белгілерге депрессия, қауырсындардың әлсіздігі, тәбеттің болмауы, қанды диарея, физикалық белсенділіктің төмендеуі жатады. Паразиттік ауруларға тән бұл белгілер ішекте жедел қабынудың дамуын көрсетеді.

Зерттеулер көрсеткендей, гемоглобин мен гематокрит деңгейінің төмендеуімен көрінетін анемияның болуы. Тауықтардың денесінде болатын процестер, өз кезегінде, эймериозға тән ішектің зақымдануынан туындаған қан кетулерді көрсетеді. Қан жасушаларындағы физиологиялық ауытқуларға базофилдердің жоғарылауы жатады, бұл қабынуды және эозинофилдердің төмендеуін көрсетуі мүмкін, бұл созылмалы қабынуға жауап ретінде иммундық жүйенің сарқылуына байланысты болуы мүмкін. Лимфоциттердің сандық көрсеткіштері аздап жоғарылайды, бұл иммундық жауаптың белсендірілуін көрсетеді.

Биохимиялық қан анализі гипопротеинемияны, несепнәр деңгейінің төмендеуін және креатининнің жоғарылауын көрсетті, бұл метаболикалық дисфункцияны, бауыр мен бүйректің зақымдануын және паразиттер бөлетін токсиндердің әсерінен бұлшықет тінінің бұзылуын көрсетеді.

Тіндердің гистологиялық зерттеулері тауық эймериозының диагнозын растады. Паразиттік инвазия көрсететін ішек үлгілерінде Eimeria spp. аутопсия нәтижелері шырышты қабықтың айтарлықтай зақымдалуын, виллалардың жоғалуын және тіндердің некрозын, сондай-ақ лимфоциттер мен макрофагтардың инфильтрациясын көрсетті. Ооцисталардан мерозоиттердің бөлінуі жасушалардың жойылуына және ішек тіндерінің зақымдалуына әкелді.

Осылайша, барлық деректер метаболизмнің айқын бұзылуларымен және тіндердегі қабыну өзгерістерімен эймериоздан туындаған дененің ауыр зақымдануын көрсетеді.

РЕЗЮМЕ

В данном исследовании представлены результаты клинических и патоморфологических изменениях, подтверждающие наличие эймериоза у животного. Клинически наблюдается депрессия, взъерошеннось перьев, слабость, отсутствие аппетита, диарея с примесью крови и снижение физической активности. Эти признаки, характерные для паразитарных заболеваний, указывают на развитие острого воспаления в кишечнике.

Исследования показали, наличие анемии, которая проявляется снижением уровня гемоглобина и гематокрита. Процессы происходящие в организме кур, в свою очередь, свидетельствует о кровоизлияниях, вызванных поражением кишечника, что характерно для эймериоза. Физиологические отклонения в клетках крови включают повышение базофилов, что может указывать на воспаление и снижение уровня эозинофилов, что может быть связано с истощением иммунной системы в ответ на хроническое воспаление. Количественные показатели лимфоцитов слегка повышены, что отражает активизацию иммунного ответа.

Биохимический анализ крови показал гипопротеинемию, снижение уровня мочевины и повышение креатинина, что свидетельствует о нарушении обмена веществ, повреждении печени и почек, а также разрушении мышечной ткани, вероятно, из-за воздействия токсинов, выделяемых паразитами.

Микроскопические и гистопатологические исследования тканей подтвердили диагноз эймериоза кур. В образцах кишечника были выявлены ооцисты Eimeria spp., что указывает на паразитарную инвазию. Результаты патанатомического вскрытия показала, что значительное повреждение слизистой оболочки, потерю ворсинок и некроз тканей, а также инфильтрацию лимфоцитами и макрофагами. Освобождение мерозоитов из ооцист привело к разрушению клеток и повреждению кишечной ткани.

Таким образом, все данные указывают на тяжелое поражение организма, вызванное эймериозом, с выраженными нарушениями обмена веществ и воспалительными изменениями в тканях.

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EPIZOOTIC MAP OF HELMINTH INFESTATION OF SAIGAS OF URAL POPULATION IN THE WEST KAZAKHSTAN REGION

ANNOTATION

The study focuses on the analysis of the epizootic situation related to saiga helminth infestations in West Kazakhstan region, especially in the context of migration routes crossing farm territories. In the context of increasing saiga populations and farm animal densities, close monitoring is required to prevent the spread of infestations that may affect both wild and domestic fauna. The study covers the period from 2021 to 2024, and the aim is to identify the most common helminth infestations and assess the epizootic process using modern analytical methods, including geographic information systems (GIS).

The main focus was on saiga migration routes in the Kaztalov and Zhanibek districts of West Kazakhstan region, where data on helminth infestations were collected and unfavorable points were