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Differential diagnosis of polyarthritic and cutaneous manifestations of chlamydiosis in dogs: A clinical and immunological approach

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Canine chlamydiosis is an infectious disease that has gained considerable relevance in contemporary veterinary medicine. The study was conducted at the Irpin City State Veterinary Medicine Hospital (Irpin, Ukraine) during 2024–2025. A total of 167 cases with suspected chlamydial infection were analysed in dogs of various breeds, ages and sexes, including mixed-breed companion animals. In 2024, 22 positive cases were recorded, while in 2025 this number increased to 31. It was established that canine chlamydiosis manifested in five clinical forms: polyarthritic, dermatological, respiratory, intestinal and genital. The article presents the results of a comprehensive study focused on the differential diagnosis of the polyarthritic and dermatological forms of canine chlamydiosis. The relevance of the study is determined by the polymorphism of clinical manifestations of chlamydial infection and the difficulty of distinguishing it from other infectious, inflammatory and non-infectious diseases affecting the joints and skin. Particular attention was paid to differentiating the polyarthritic and cutaneous forms of chlamydiosis from conditions such as Lyme disease, bacterial and viral arthritis, rheumatoid arthritis, degenerative joint diseases, traumatic arthritis, demodicosis, dermatophytosis, bacterial pyoderma, as well as endocrine and allergic dermatoses. Differential diagnosis was based on the analysis of clinical signs, the characteristics of synovial effusion, haematological parameters, and the results of radiographic, ultrasonographic and specific laboratory investigations. The final diagnosis of canine chlamydiosis was established on the basis of an integrated assessment of clinical findings and the results of haematological, serological, radiographic and immunological examinations (ELISA). The obtained results made it possible to systematise the main diagnostic criteria and to propose algorithms for the differential diagnosis of polyarthritic and dermatological manifestations of chlamydiosis in dogs. The proposed approaches may be applied in veterinary practice to improve the accuracy and timeliness of diagnosis.

Keywords: canine chlamydiosis; polyarthritis; cutaneous manifestations; *Chlamydia* infection; ELISA; dogs.

Introduction

Chlamydiosis in companion and food-producing animals is a serious disease that requires attention not only from veterinary professionals but also from the general public, particularly in densely populated urban and residential areas where close coexistence of humans and companion animals increases the risk of zoonotic transmission (Bommana & Polkinghorne, 2019; Miller, 2025). Human infection is possible and necessitates awareness and caution when handling and caring for infected animals (Nedosekov et al., 2021; Maggi et al., 2024). In recent years, canine chlamydiosis has increasingly manifested clinically in polyarthritic and cutaneous forms (Luis et al., 2023; Zhai et al., 2023; Wang et al., 2024), which are often characterised by nonspecific clinical signs and therefore require an extensive differential diagnostic approach. Moreover, in routine veterinary practice, chlamydiosis is frequently masked by other infectious, inflammatory or degenerative conditions, significantly complicating the establishment of a definitive diagnosis (Caspe & Hill, 2024; Eissa, 2024).

Polyarthritis associated with chlamydial infection may be accompanied by lameness, pain and restricted joint mobility, necessitating differentiation from bacterial, viral, immune-mediated inflammatory and degenerative disorders of the musculoskeletal system (Lambrechts et al., 1999). At the same time, cutaneous manifestations of the disease may mimic allergic dermatoses, pyoderma, fungal infections or parasitic diseases, which often leads to misdiagnosis or delayed initiation of appropriate therapy (Luis et al., 2023).

An additional diagnostic challenge arises from the fact that different clinical forms of chlamydiosis in dogs may occur concurrently or sequentially, resulting in a combined clinical presentation (Sykes, 2021; Caspe & Hill, 2024). Such a disease course requires a comprehensive diagnostic approach that integrates clinical findings with the results of laboratory, imaging and molecular-genetic investigations (Gu et al., 2020). In this context, the application of modern pathogen detection methods, including rapid antigen tests for chlamydial detection and polymerase chain reaction assays, plays a crucial role in improving diagnostic accuracy (Marti et al., 2024).

Thus, the problem of differential diagnosis of polyarthritic and cutaneous manifestations of canine chlamydiosis remains highly relevant and necessitates the synthesis of clinical experience, taking into account regional characteristics of disease distribution.

The aim of the study was to identify the key diagnostic criteria enabling differential diagnosis of the polyarthritic and dermatological forms of chlamydiosis in dogs.

Materials and methods

The study was conducted within the service area of the Irpin State District Veterinary Medicine Clinic (Irpin, Ukraine). A total of 167 cases with suspected chlamydial infection were analysed in dogs of various breeds, ages and sexes, including mixed-breed companion animals, during 2024–2025. In 2024, 22 positive cases of the disease were recorded, while in 2025 the number increased to 31. The disease manifested in five clinical forms: polyarthritic, dermatological, respiratory, intestinal and genital.

Radiographic examinations were performed using a Univet X-ray unit (Italy). The final diagnosis of canine chlamydiosis was established on the basis of clinical signs and the results of haematological, serological, radiographic and enzyme-linked immunosorbent assay (ELISA) investigations. ELISA testing for the definitive diagnosis of canine chlamydiosis was carried out at the «Balt» laboratory (Kyiv, Ukraine).

Results

According to the data obtained, during 2024–2025 a total of 53 dogs affected by chlamydiosis were registered within the service area

of the Irpin City State Veterinary Medicine Hospital. In 2025, the disease was most frequently diagnosed in the polyarthritic (32%) and dermatological (28%) clinical forms. Differential diagnosis of the polyarthritic form of canine chlamydiosis (chlamydial arthritis) should take into account that it is clinically manifested predominantly by lesions of the musculoskeletal system, including lameness, joint pain, swelling and, in some cases, increased body temperature. These clinical signs are non-specific and may resemble those observed in a range of other pathological conditions.

According to our findings, the main competing diseases to be considered in the differential diagnosis of the polyarthritic form of chlamydiosis in dogs include Lyme disease, bacterial and viral arthritis, rheumatoid arthritis, joint dysplasias, as well as degenerative and traumatic joint disorders (Fig. 1).

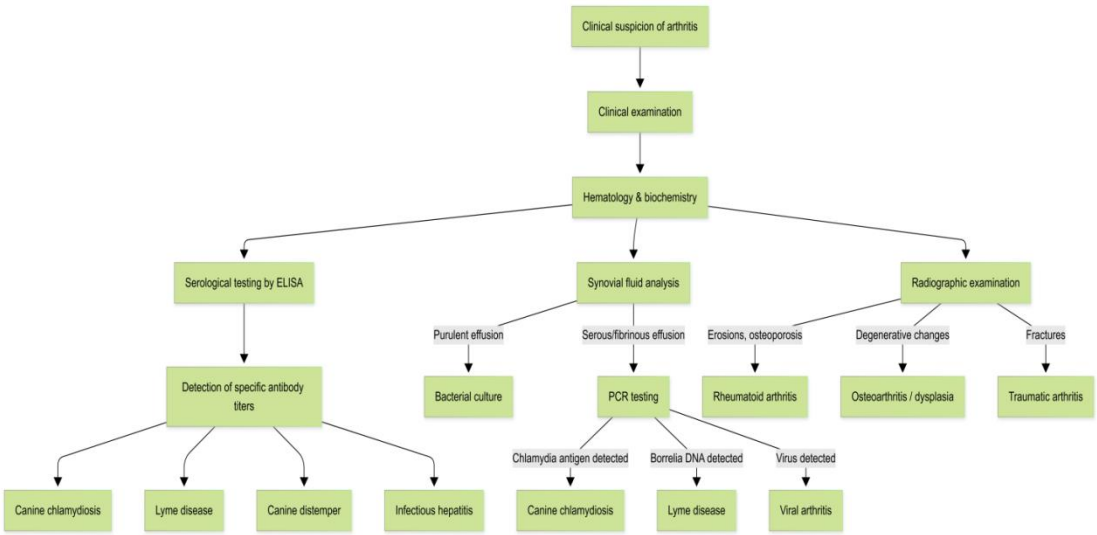

Fig. 1. Diagnostic algorithm for identification of canine chlamydiosis among arthritides of various aetiologies

It should be noted that bacterial arthritis caused by *Staphylococcus* spp., *Streptococcus* spp., *Mycoplasma spp.* and *Borrelia* spp. is characterised by clinical signs similar to those observed in chlamydial arthritis. The main clinical manifestations include joint swelling, lameness and pain. However, in cases of bacterial arthritis, purulent exudate is more frequently detected within the joint cavity, and bacteriological examination allows the identification of microbial growth, in contrast to chlamydial infection.

Viral arthritis is most commonly associated with viruses of the families Paramyxoviridae or Adenoviridae and is usually accompanied by other clinical signs of an infectious process, in which enteritis or respiratory symptoms predominate. Viral arthritis is typically secondary and develops following the onset of diarrhoea or upper respiratory tract involvement.

Fungal arthritis, which may be caused by aspergillosis or blastomycosis, is relatively rare. Its course is characterised by generalisation of the pathological process and is confirmed by mycological investigations demonstrating the presence of fungal mycelia.

In cases of rheumatoid arthritis and autoimmune polyarthropathy, symmetrical involvement of multiple joints, a chronic disease course, absence of an infectious agent in clinical samples and the detection of autoantibodies are commonly observed. In joint dysplasia and degenerative joint diseases (osteoarthritis, osteochondrosis, hip or elbow dysplasia), a gradual onset, absence of a systemic inflammatory response and radiographic changes typical of degenerative processes are noted. Traumatic joint lesions are diagnosed based on a history of trauma, with localised joint involvement and the absence of systemic signs of infection.

Diagnostic criteria supporting the polyarthritic form of canine chlamydiosis include anamnesis indicating contact with clinically affected birds, dogs or cats exhibiting conjunctivitis or respiratory signs, as well as exposure to asymptomatic carriers of chlamydiae, such as stray animals. Typical clinical features of the polyarthritic form of canine chlamydiosis include lameness, intermittent manifestation of symptoms, possible concurrent conjunctivitis, secondary pyodermic complications and respiratory signs (Fig. 2).

Radiographic examination revealed inflammatory changes of the periosteum, the development of discospondylitis, and, in some dogs, the presence of polyarthritis (Fig. 3).

The diagnostic algorithm for polyarthritis in dogs, integrating clinical, laboratory and specific diagnostic criteria for the differential assessment of chlamydiosis and other forms of arthritis, is presented in Fig. 4.

Fig. 2. Clinical signs of the polyarthritic form of chlamydiosis: *A* – pyodermic complications; *B* – conjunctivitis with purulent discharge

Fig. 3. Radiographic changes in the polyarthritic form of canine chlamydiosis (Univet X-ray unit): *A* – development of discospondylitis; *B* – polyarthritis

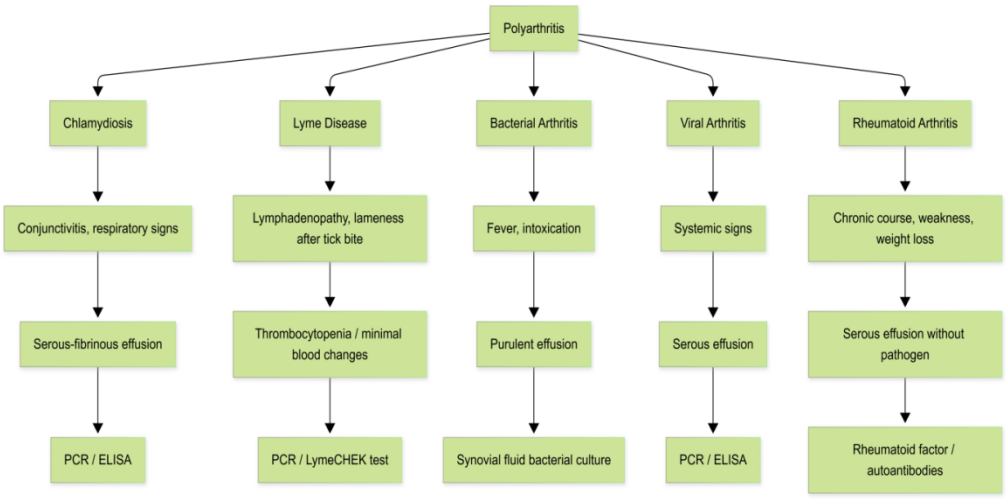

Fig. 4. Diagnostic algorithm for polyarthritis in dogs

The diagnostic algorithm is based on the initial identification of polyarthritis, followed by a detailed analysis of associated clinical signs, including conjunctivitis, fever, signs of intoxication and chronic asthenia. This sequential diagnostic approach determines the indication for targeted laboratory investigations, including specific serological tests (ELISA), polymerase chain reaction (PCR) and cytological analysis of synovial fluid. The proposed strategy increases the reliability of the differential diagnostic process, ensuring timely verification of chlamydial aetiology or allowing exclusion of other arthropathies.

The final diagnosis was established on the basis of laboratory investigations (Bisiuk et al., 2025). Giemsa staining of imprint smears does not always allow detection of chlamydial inclusions in epithelial cells. Given the need for reliable diagnosis, laboratory examination of synovial fluid samples, conjunctival swabs or mucosal scrapings is mandatory. Analysis of these biological materials by PCR enables detection of the specific Chlamydia spp. antigen, while ELISA testing of blood serum allows identification of high titres of specific immunoglobulin G antibodies to *Chlamydia* spp.

During 2025, we observed that the cutaneous form of canine chlamydiosis manifested as alopecia, erythema, seborrhoea and mild pruritus. Pigmentary changes of the skin were also noted. This form of chlamydiosis should be differentiated from demodicosis, dermatophytosis, bacterial pyoderma, allergic dermatitis (food-related, atopic or flea allergy), as well as endocrine dermatoses. The features of differential diagnosis of the dermatological form of chlamydiosis are presented in Figure 5 (*a*, *b*).

The diagnostic algorithm for the dermatological form of chlamydiosis included assessment of the animal's age, housing conditions and history of contact with other animals (dogs and cats). During clinical examination, particular attention was paid to the characteristics of alopecia and skin eruptions, as well as their localisation and symmetry (Fig. 6).

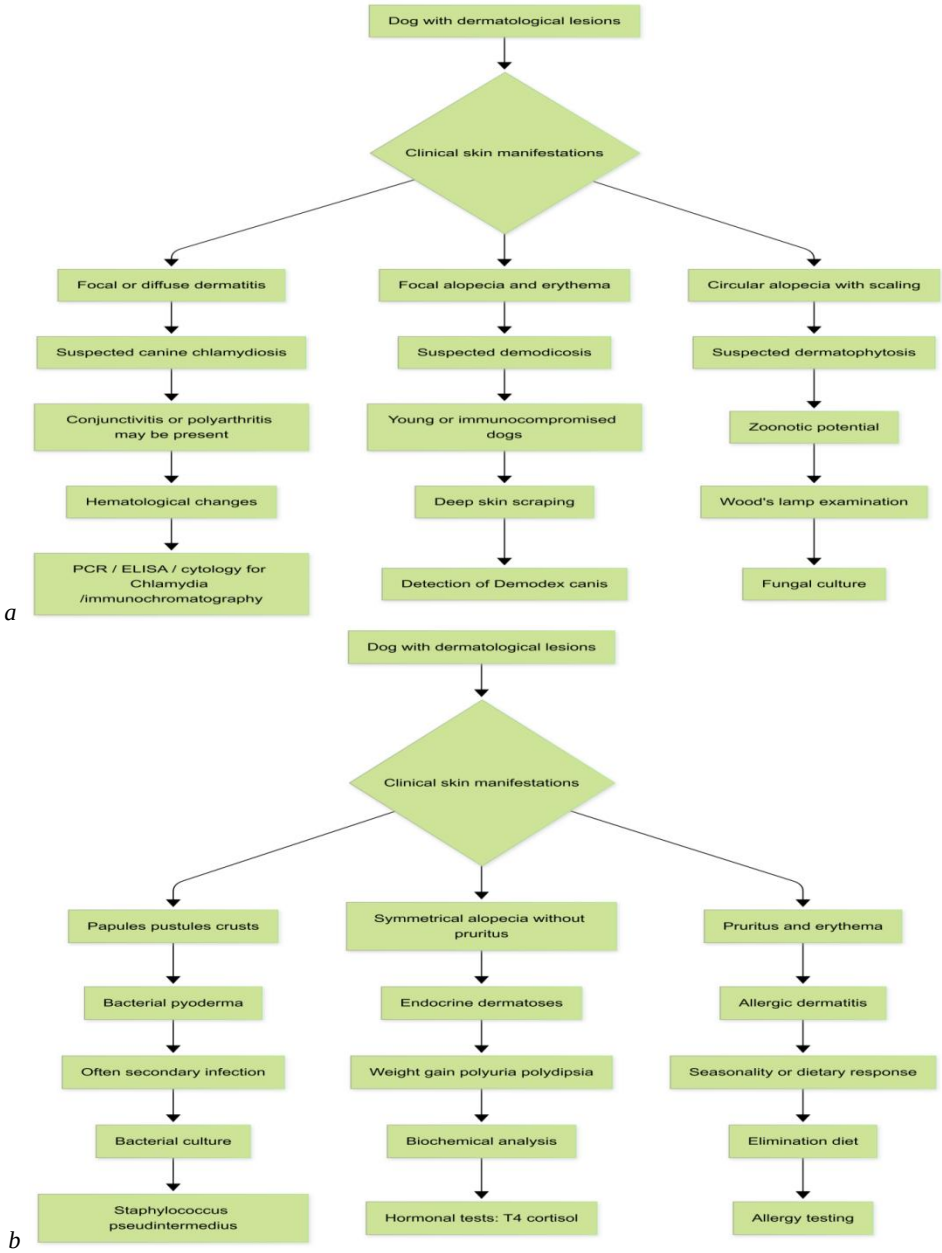

Fig. 5. Diagnostic algorithm for dermatological diseases in dogs:
infectious and parasitic conditions (*a*) and bacterial, endocrine and allergic dermatoses (*b*)

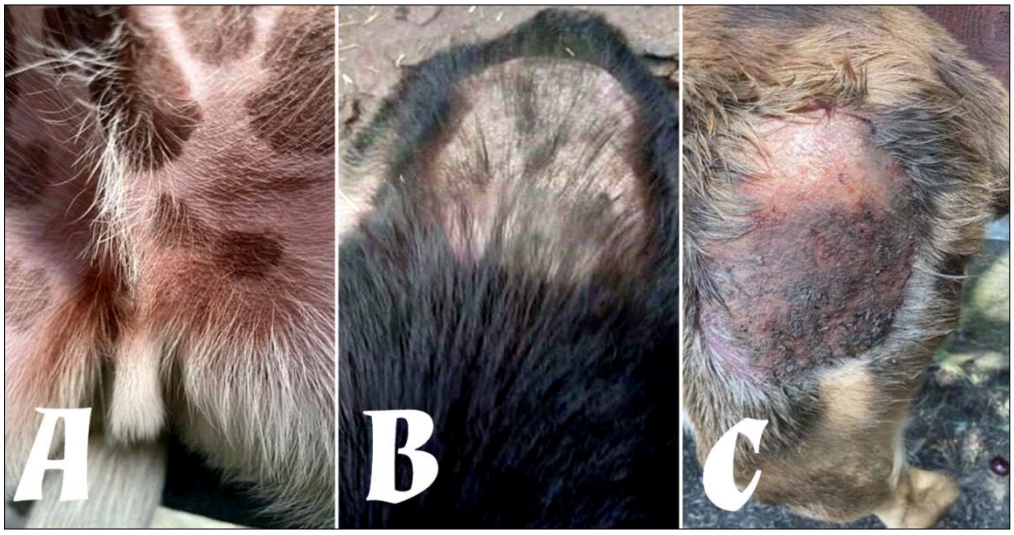

Fig. 6. Clinical manifestations of the dermatological form of chlamydiosis:
A – dermatitis; *B* – alopecia; *C* – complications associated with the development of eczema

Diagnostic work-up necessarily involved collection of skin scrapings for differential diagnosis with demodicosis and dermatophytosis, in addition to bacteriological culture to identify any concurrent bacterial infection.

When establishing the diagnosis, patient age should be carefully considered. According to our studies, 63,76% of dogs affected by chlamydiosis were aged between 1 and 4 years (Bisiuk, 2024). Adverse housing conditions – such as poor hygiene, chronic stress, inadequate or unbalanced nutrition, and excessive stocking density – are key factors that reduce non-specific host resistance. This increases susceptibility to infectious agents and may contribute to disease progression in already infected animals. The nature of cutaneous lesions, their symmetry and localisation must also be taken into account.

As part of the diagnostic protocol, impression smears from the conjunctiva and nasal discharge were prepared and stained using the Romanowsky–Giemsa method, while skin scrapings were collected to exclude demodicosis and dermatophytosis. In our opinion, routine haematological examination is also mandatory. Our investigations revealed characteristic haematological changes associated with the polyarthritic and dermatological forms of canine chlamydiosis. In the polyarthritic form, a significant ($P < 0.05$) decrease in the relative proportion of segmented neutrophils, along with a significant ($P < 0.05$) increase in the relative numbers of monocytes and lymphocytes, was observed (Bisiuk et al., 2025). These haematological alterations may serve as useful markers for establishing a preliminary diagnosis and enabling timely therapeutic intervention. In addition, radiographic examination is advisable, as it allows detection of acute inflammatory processes affecting the periosteum, including periostitis and arthritis (Bisiuk et al., 2025).

In the dermatological form of chlamydiosis, a significant ($P < 0.001$) increase in the relative number of segmented neutrophils and a decrease in lymphocyte counts were recorded (Bisiuk et al., 2025). The conducted differential diagnostic assessment enabled identification of a clinicopathological complex specific to systemic chlamydiosis in dogs. Its key components include polyarthritis, radiographically manifested by periostitis and structural changes in the articular bone tissue, accompanied by accumulation of serofi-brinous synovial effusion. A characteristic haematological marker is a distinctive leukogram featuring relative neutropenia with concurrent lymphocytosis and monocytosis. Cutaneous manifestations (vesicles, erythema and alopecia), predominantly localised on the ventral body surface and around joints, represent an important differential feature distinguishing this condition from idiopathic immune-mediated polyarthritis and infectious arthritis of other aetiologies.

Definitive diagnosis requires detection of the pathogen by polymerase chain reaction or serological confirmation by ELISA through identification of high titres of *Chlamydia* spp.-specific immunoglobulin G antibodies.

Discussion

Chlamydiae are considered epitheliotropic obligate intracellular microorganisms (Abdelrahman & Belland, 2005); therefore, chlamydial infection may be associated with a wide range of clinical manifestations, including abortions (Akpınar et al., 2024; Taheri et al., 2025), endometritis (Zaręba-Marchewka, 2021), pneumonia (Dai et al., 2022; Jonker & Michel, 2023), polyarthritis (Dear et al., 2024), conjunctivitis and keratitis (Cerrada et al., 2023), dermatitis (Lei et al., 2024), urethritis and atherosclerosis (Petrauskaitė et al., 2024), among others.

In veterinary clinical practice, diagnostic methods based on the detection of specific antibodies allow only identification of possible previous exposure to infection. However, in dogs affected by chlamydiosis, laboratory investigations remain essential, as clinical signs may vary considerably and often resemble those of many non-infectious diseases (Eissa, 2024; She & Zanfagnin, 2024; Darville, 2025).

The polymorphism of clinical manifestations of canine chlamydiosis, as well as their frequent combination, significantly complicates differential diagnosis with other diseases. Clinical signs of chlamydial infection in dogs are diverse and may include fever (up to 41 °C), bronchopneumonia, coughing, keratitis or keratoconjunctivitis, lethargy, anorexia, vomiting, diarrhoea and neurological signs (tonic–clonic seizures) (Gresham et al., 1996; Borel et al., 2018; Walker & Derré, 2024). In addition, chlamydia-induced septic polyarthritis and atherosclerotic lesions have been described (Walker et al., 2016).

Lambrechts et al. (1999) reported the first case of naturally occurring chlamydial polyarthritis in a dog, applying direct immunofluorescent staining of synovial fluid and polymerase chain reaction (PCR) testing (Lambrechts et al., 1999). Marti and Jelocnik (2022) emphasised that molecular diagnostics using PCR plays a leading role in the diagnosis of chlamydiosis in animals, including dogs and cats (Marti & Jelocnik, 2022). PCR-based molecular diagnostics enables detection of chlamydial antigen in dogs and cats with overt clinical signs, as well as in animals with subclinical or latent infection (Ulbert et al., 2024). The presence of dogs with latent infection indicates a potential public health risk, as companion animals may serve as a source of infection for humans. Petrauskaitė et al. (2024) demonstrated possible risks and transmission routes of brucellosis and chlamydiosis from infected dogs (Petrauskaitė et al., 2024).

The obtained results indicate that polyarthritis and dermatological lesions associated with systemic chlamydial infection in dogs constitute a characteristic clinical syndrome; however, this syndrome requires careful differentiation from a range of other pathological conditions (Phillips & Bleyaert, 2022).

In canine Lyme disease, blood analyses typically reveal thrombocytopenia, hepatomegaly, and increased serum hepatic enzyme activities (Kocaturk et al., 2021; Paz et al., 2021). In cases of bacterial arthritis, cytological examination of synovial fluid demonstrates an increased proportion of neutrophils, while mild leukocytosis or, less frequently, leukopenia may also be observed (Dubey et al., 2024). Viral arthritis is commonly associated with leukopenia, lymphopenia, and elevated serum enzyme levels (González-Domínguez et al., 2024). Rheumatoid arthritis is characterized by anemia and thrombocytosis (Mihevc et al., 2021). In osteoarthritis or joint dysplasia (degenerative joint diseases), synovial fluid analysis reveals an increased leukocyte count, whereas peripheral blood leukocyte levels typically remain within physiological reference ranges (Herr et al., 2021). Hemorrhagic arthritis is characterized by decreased erythrocyte and platelet counts, as well as reduced hemoglobin concentration and hematocrit values (Vanwielendaele et al., 2023). In serous arthritis, neutrophilia accompanied by lymphocytopenia predominates (He et al., 2023).

In cases of clinically manifest demodicosis, reductions in erythrocyte count and haemoglobin concentration are observed, along with an increase in total leukocyte count and eosinophilia (Satasiya et al., 2023). In dermatophytosis, a statistically significant decrease in erythrocyte count, haemoglobin concentration, and haematocrit is reported, accompanied by leukocytosis and increased activity of enzymes, including catalase and others (Koçkaya, 2022). The development of bacterial pyoderma is associated with decreased haemoglobin levels and elevated leukocyte counts (Khinchi et al., 2019; Eissa, 2024). In endocrine dermatoses, a significant reduction in erythrocyte count, haemoglobin concentration, and haematocrit is documented, together with increased malondialdehyde levels and a higher relative proportion of eosinophils (Oh et al., 2022; González-Arostegui et al., 2024; Zhu et al., 2025). In allergic dermatitis, a marked increase in total leukocytes, neutrophils, and eosinophils is typically detected (Sharma et al., 2015).

Therefore, the integration of clinical, haematological, and radiographic data, together with the results of specific laboratory tests, forms the basis for accurate diagnosis and the rational selection of comprehensive treatment strategies aimed both at eradication of the causative agent and at effective control of the inflammatory process.

Conclusion

The differential diagnostic algorithms developed for the polyarthritic and dermatological forms of canine chlamydiosis represent a scientifically grounded and practically valuable component of this research for veterinary professionals, facilitating more rapid establishment of a preliminary diagnosis. When formulating an initial

diagnosis of the polyarthritic form of chlamydiosis in dogs, it is advisable to differentiate the condition from Lyme disease, bacterial and viral arthritis, bacterial pyoderma, hip and joint dysplasia, degenerative joint disorders, and traumatic joint lesions. Pathognomonic features supporting a presumptive diagnosis of chlamydial polyarthritis in dogs include a constellation of findings, namely the presence of serofibrinous effusion, radiographic evidence of periostitis involving the periosteum with subsequent development of polyarthritis, as well as characteristic haematological alterations – specifically, relative neutropenia accompanied by monocytosis and lymphocytosis.

Differential diagnosis of the dermatological form of chlamydiosis requires exclusion of demodicosis, dermatophytosis, bacterial pyoderma, endocrine dermatoses, and allergic dermatitis based on clinical presentation, with consideration of haematological findings and pathology-specific laboratory test results. Key markers of the dermatological form of canine chlamydiosis include dermatitis or alopecia progressing to eczema, while haematological changes are characterized by an increased relative proportion of segmented neutrophils and a decreased lymphocyte count.

To verify the diagnosis and to differentiate it from other conditions with similar clinical manifestations, laboratory confirmation is essential. The optimal diagnostic approaches include antigen detection by polymerase chain reaction (PCR), which enables identification of the causative agent's antigen, or serological confirmation using enzyme-linked immunosorbent assay (ELISA), which allows detection of high titres of *Chlamydia* spp.–specific immunoglobulin G (IgG).

Further research will focus on improving therapeutic strategies for the various clinical manifestations of canine chlamydiosis.

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