

Molecular Detection of Blood-Borne Parasites in Ticks Infested Dogs in Wasit Province, Iraq

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Abstract

Haemoparasitic infections are frequently observed in dogs from tropical regions, including Iraq. Numerous dogs become infected with several blood parasites. This investigation was designed in Wasit Province, Iraq, to conduct a comprehensive molecular detection and characterization of haemoparasites in ticks that infested dogs. This cross-sectional study was performed from the beginning of May 2024 to the end of December 2024. Totally, 280 stray dogs were examined in different areas in Wasit, Iraq. All animals were systematically examined for tick infestation; for this, the collected ticks were preserved in ethanol and were identified using standard taxonomic keys. The sample was obtained from the ticks infested dogs and was used for both microscopic and molecular analysis to detect piroplasms (*Babesia*, *Theileria*), and *Anaplasma*. The total DNA was extracted followed by nested PCR using primer targeting 16S rRNA gene to detect the *Anaplasma* spp., and 18SrRNA for *Babesia* spp. and *Theileria* spp. The PCR products were confirmed by agarose gel electrophoresis. Morphological examination revealed that the adult ticks identified belonged to the Ixodid family, with four species classified under the genus *Rhipicephalus* (*Rhipicephalus turanicus*, *Rhipicephalus sanguineus*, *Rhipicephalus pravus*, and *Rhipicephalus camicasi*). Nested PCR analysis further demonstrated the presence of *Anaplasma* spp. in 16 tick samples (16%), *Babesia* spp. in 14 dogs (14%), and *Theileria* spp. in 11 dogs (11%). These results highlight the role of ticks as potential reservoirs for *Anaplasma*, *Babesia*, and *Theileria* species, emphasizing their importance in the transmission dynamics of these blood parasites and their possible impact on livestock health and productivity.

Keywords: Iraq, Blood-Borne Parasites, Dog, Tick, Nested PCR assay

Introduction

Ticks are obligate hematophagous ectoparasites belonging to the class Arachnida. They are temporary arthropods that infest both humans and animals. As vectors of multiple pathogens such as haemoprotozoa, bacteria, and viruses, ticks play a major role in the transmission of various diseases, leading to significant

health and economic consequences (Aziz and Al-Barwary, 2020). Their harmful effects on hosts include blood depletion and injection of toxic salivary secretions, which may cause anemia, skin lesions, inflammation, paralysis, and reduced productivity in terms of weight gain and milk yield (Wall and Shearer, 2008). These

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parasites are distributed globally, with their greatest diversity occurring in tropical and subtropical areas.

Globally, around 900 tick species have been identified, nearly 10% of which are responsible for transmitting pathogens. Most of these belong to two main families: Ixodidae and Argasidae (Huruma et al, 2015). Among tropical livestock, the most important genera of hard ticks include *Rhipicephalus*, *Boophilus*, *Hyalomma*, and *Amblyomma*, which are of high ecological and veterinary importance (Stafford et al, 2007). In many regions, *Rhipicephalus* (*Boophilus*) and *Hyalomma* species are predominant and contribute to considerable economic losses (Salih et al, 2015). Tick-borne diseases continue to pose serious challenges to animal health management worldwide, particularly in tropical and subtropical regions, where their veterinary and economic impacts are of major concern (Guglielmone et al, 2010).

Accurate identification of tick species is crucial for the control and treatment of tick-borne diseases, as these infections are usually transmitted by specific tick variants (Jongejan, 1998). Traditionally, phenotypic approaches have been regarded as the global standard for species determination and differentiation. However, these methods are often constrained by variations across tick developmental stages and require substantial expertise and training (Takano et al, 2014). To address these limitations, various genetic markers based on DNA sequence analysis have been employed for taxonomic and phylogenetic investigations in arthropods (Estrada-Peña et al, 2004). Nuclear ribosomal DNA regions (18S and 28S) along with mitochondrial ribosomal DNA regions (12S and 16S) are widely recognized as valuable tools in phylogenetic and genetic diversity studies of ticks (de Oliveira et al, 2005). Among these, the 16S rRNA gene is particularly significant, frequently utilized for molecular identification and phylogenetic analysis, and is well

established as a reliable barcoding marker (Latrofa et al, 2013). Molecular techniques therefore provide complementary and effective alternatives to overcome the limitations of morphological identification, facilitating more accurate differentiation of tick species (Nava et al, 2012).

Materials and methods

Study area

This investigation was carried out in Wasit Province, located in eastern Iraq, south-east of Baghdad (Figure 1).



Figure 1: Map of the tick's collection study sites in Wasit Province where dog blood samples were collected

It includes an area of about 17,153 km², with coordinates 32°30'N, 45°50'E. This province is surrounded by Baghdad and Diyala provinces to the north, Dhi Qar and Maysan provinces to the south, Missan to the east, and Babil and Qadisiyyah provinces to the west. The province has four distinct seasons: winter (December to February), spring (March to May), summer (June to August), and fall (September to November). Despite being located in the central-southern plains of Iraq, Wasit has very hot summers, with maximum temperatures often exceeding 45 °C, accompanied by dry weather and frequent dust storms. However, nights tend to be relatively cooler. During winter, the weather is mild to cool, though some nights can be cold, especially in rural areas near the rivers. Rainfall is limited and irregular,

with most precipitation occurring between December and March. The climate is strongly influenced by its proximity to the Tigris River, which supports agriculture despite the arid environment.

Description of the study sampling, period and location

A total of 280 stray dogs (137 male and 143 female) were collected randomly from the beginning of May 2024 to the end of December 2024 in different regions of Wasit (Al-kut, AL-sweara, Al- Aziziah, Al-Numaniyah, Al-Hay and Badra); then each dog was examined systemically, and the information about sex and age was also recorded.

Examination and identification of ticks infested stray dog

Each stray dog was thoroughly inspected for ticks. The examination covered the entire body—including the head, neck, back, abdomen, limbs, and ears—while the animals were under anesthesia (Figure 2). Ticks collected during the inspection were carefully detached using fine-tipped forceps and cotton, then were preserved in tubes containing 70% ethanol. All specimens were properly labeled and transferred to the Iraq Natural History Research Center and Museum at the University of Baghdad for species identification. The classification of tick specimens was carried out following established taxonomic keys (Walker, 2003).

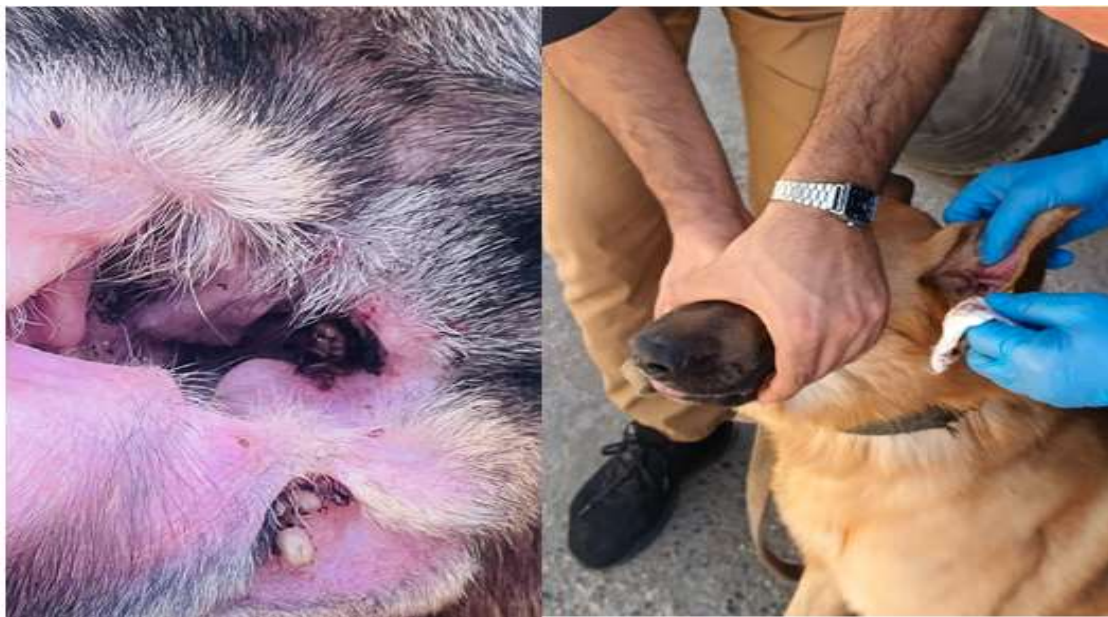


Figure 2: Collection of ticks from stray dog

Molecular Assays

DNA isolation and PCR amplification

Genomic DNA was extracted from tick samples collected from both adult male and female stray dogs using the gSYAN Genomic DNA Extraction Kit (Geneaid, USA), following the guidelines provided by the manufacturer. The DNA concentration (ng/ μ L) and purity (A260/A280 ratio) were measured using a NanoDrop® ND-2000 UV/Vis Spectrophotometer (Thermo Fisher Scientific Inc., Wilmington, DE, USA). To

minimize contamination, procedures such as DNA extraction, PCR preparation, nested PCR amplification and agarose gel electrophoresis were performed in separate laboratory facilities. All extracted DNA samples were analyzed by nested PCR with specific primers targeting blood parasites. The assays amplified the 18S rRNA gene for *Babesia* spp. or *Theileria* spp., and the 16S rRNA gene for *Anaplasma* spp., as summarized in Table 1.

Table 1: Nested PCR primers for *Babesia sp.*, *Theileria sp.* and *Anaplasma sp.* detection

Microorganism	gene	PCR	primer	Sequence 5'-3'	Product size
Babesia	18S rRNA	Normal	F	ATTGGAGGGCAAGTCTGGTG	697bp
			R	TCCACCAACTAAGAACGGCC	
		Nested	F	ATTGGTCGCGTCGCTTCTAA	429bp
			R	GACTTGCGACCATACTCCCC	
Theileria	18S rRNA	Normal	F	ATTGGAGGGCAAGTCTGGTG	740bp
			R	TCCACCAACTAAGAACGGCC	
		Nested	F	TTCCGGCCCATTTTTCCAGA	556bp
			R	TGCACCACCACCCAAAGAAT	
Anaplasma	16S rRNA	Normal	F	GGCAAGCGTTGTTTCGGAATT	861bp
			R	GCAGTGTGTACAAGACCCGA	
		Nested	F	AGGGCATGTAGGTGGTTTGG	583bp
			R	CCCTTAAAGTCCCCGGCATT	
			R	GACTTGCGACCATACTCCCC	

The PCR assay was prepared in a final volume of 25 μ L, consisting of 12.5 μ L of 2 \times Taq Master Mix (containing Taq DNA polymerase, dNTPs, MgCl₂, KCl, and stabilizers), 2 μ L each forward and reverse primers, 0.8 μ L of MgCl₂, 5 μ L of DNA template, and 3.5 μ L of nuclease-free water. Both positive and negative controls (master mix without template DNA) were included to verify the absence of false results. The amplification program involved an initial denaturation at 95 °C for 5 minutes, followed by 35 cycles consisting of denaturation at 95 °C for 30 seconds, annealing at 58 °C for 30 seconds, and extension at 72 °C for 2 minutes. A final elongation step was carried out at 72 °C for 5 minutes.

Gel Electrophoresis

Gel electrophoresis was done for all DNA sample amplicons including 100-3000 bp molecular ladder on first lanes on 2% agarose; then all the amplicons were stained with an ethidium bromide dye. The gel was run at 100V, 300MA for 45 minutes and viewed under UV light.

Statistical analysis

The collected data were organized and processed using Microsoft Excel, while statistical associations between variables were examined using chi-square or Fisher's exact tests through SPSS software (version 20.0). A probability value ($P < 0.05$) was adopted as the threshold for statistical significance.

Results

The prevalence rate of tick's infestations dogs

The result revealed that 46 stray dogs were infested with tick's out of 280 stray dogs examined in different areas in Wasit, Iraq (Figure 3). The percentage of infested dogs according to the region in Wasit Province showed that Al-Numaniyah has the highest infestation rate with 20%, while Al-Hay recorded the lowest percentage with 11.76% with no significant difference between the observed and expected frequencies of tick infestations across the Wasit Province (Table 2).

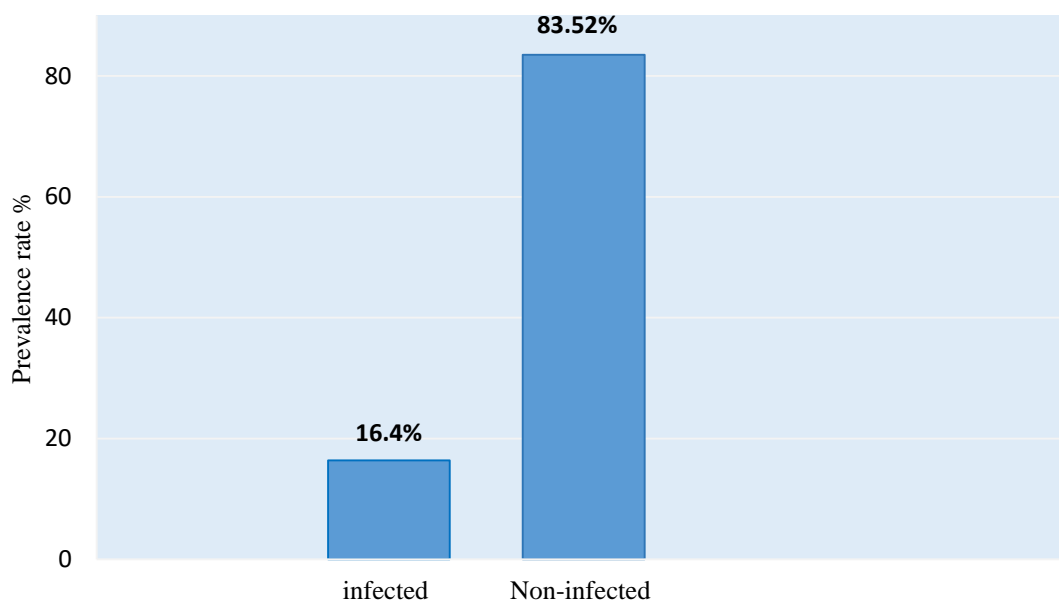


Figure 3: Prevalence rate of ticks among 280 stray dogs

Table 2: Number of infested dogs and the infestation percentage according to the region in Wasit province

Region	Total No. of examined dogs	No. of dog have tick infestation	Prevalence rate	p-value
Al-kut	98	17	17.34%	P ≥ 0.05
AL-sweara	32	4	12.5%	
Al- Aziziah	41	8	19.51%	
Al-Numaniyah	20	4	20%	
Al-Hay	51	6	11.76%	
Badra	38	7	18.42%	
Total	280	46	16.42%	

Tick identification

Morphological and Microscopic examinations detection of tick's infestation

In this study, all 280 stray dogs were examined for the presence of ixodid ticks. The majority of the ticks were obtained from the Hind limb area with the Ear being the second most common collection site. The result revealed that 381 adult ticks were collected from examined stray dogs. Based on its morphology, all tick samples were screened stereomicroscopically, indicating

that four species belonged to the genus of hard ticks *Rhipicephalus* (*Rhipicephalus turanicus*, *Rhipicephalus sanguineus*, *Rhipicephalus pravus*, and *Rhipicephalus camicasi*), commonly referred to as the brown dog tick. In summary, it exhibits a reddish-brown coloration without distinctive dorsal markings or patterns, with an elongated body, and hexagonally shaped mouthparts. This latter feature is considered a key morphological characteristic of the species, as illustrated in Figure. 4.



Figure 4: Classification of study ticks based on its morphology. (A) *R. pravus* dorsal and ventral view male; (B) *R. sanguineus* dorsal and ventral view male; (C) *R. camicasi* dorsal and ventral view male; and D) *Rhipicephalus turanicus* dorsal and ventral view male.

Ticks Distribution in different parts of the stray dogs' body

In the study, the survey of tick distribution in different parts of dogs' bodies was illustrated in Table (3). The results show

that the hind limb (60%) had the highest tick density, followed by the ear (25.45%) forelimb (5%). The neck however with 5.45% had the lowest tick density.

Table 3: Distribution of ticks in different parts of the the dogs' body

Body region	Number of ticks	Percentage rate %
Ear	14	25.45
Forelimb	5	9.09
Hind limb	33	60
Neck	3	5.45
<i>p</i> -value	p > 0.05	

Molecular screening (PCR amplification) of blood parasites in the tick's samples

Among the 100 ticks samples analyzed in this study, after a nested PCR assay, the highest prevalence rate was recorded as Anaplasmataceae family (16%) and followed by *Babesia spp.* (14%), while *Theileria sp.* was recorded the lowest prevalence rate (11%) ticks sample as illustrated in Table (4).

Table 4: Prevalence of Blood-Borne Parasites in tick's samples

No .of ticks	parasite species	Positive of parasites infestation	
		No.	%
100	<i>Anaplasma spp.</i>	16	16
	<i>Babesia spp.</i>	14	14
	<i>Theileria spp.</i>	11	11

From the results of specific and sensitivity primers, PCR amplified a monomorphic DNA fragment with product size about 583bp of 16S rRNA gene in case of *Anaplasma sp.*, 429 bp and 556 bp of 18S rRNA gene in case of *Babesia sp.* and *Theileria sp.* respectively, as shown in Figure (5).

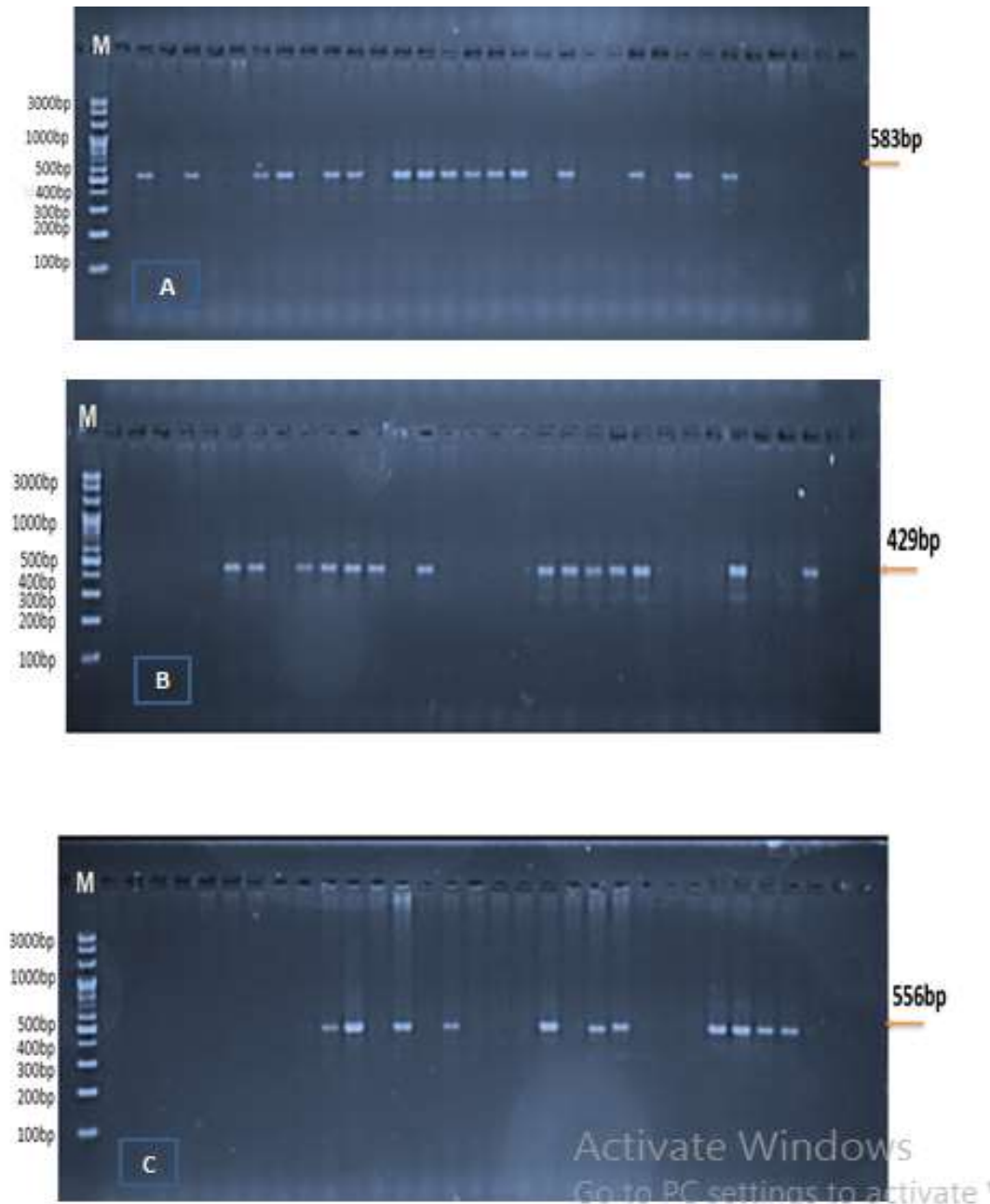


Figure 5: Nested PCR agarose gel electrophoresis products of some positive amplification small subunit ribosomal RNA gene in *Anaplasma spp.*, *Babesia spp.* and *Theileria spp.* from stray dog tick samples. Where M: marker (3000-100bp) and positive Nested PCR was show at A :(583bp) product size of *Anaplasma sp.* B: (429bp) product size of *Babesia sp.* C :(556bp) product size of *Theileria sp.*

Discussion

Ticks are widespread hematophagous arthropods that parasitize both humans and animals. In addition to causing direct blood loss, they act as reservoirs and vectors of various pathogens, including protozoa, bacteria, and viruses, which can spread across regions through host movement (Huggins et al, 2023). The persistence of these microorganisms relies on the

interaction between host, pathogen, and vector, with ticks recognized as among the most important arthropod vectors. In dogs, they are responsible for transmitting several infectious agents, and thus the distribution of these pathogens closely follows that of their tick vectors (Gong et al, 2025). In the present study, higher levels of infestation were observed in the ear, neck, forelimbs,

and hind limbs. This finding aligns with earlier reports where the hind legs, head, and tail were the preferred attachment sites (de la Fuente et al, 2023). A possible explanation for this site preference is that dogs have limited ability to groom or remove ticks from such areas using their claws (Robert et al, 2025). The occurrence of ticks across different body regions in this study also supports the previous observations showing that at least one tick is usually found on each infested animal (O'Neill et al, 2024). Considering the close association of dogs with humans, both the tick-borne diseases they acquire and the zoonotic pathogens they may carry represent significant public health concerns. (Vilas-Boas et al, 2024). According to previous studies, the conserved genes 18S rRNA and 16S rRNA, using the PCR test, are used as a sensitive diagnostic tool for the detection of *Babesia*, *Theileria*, and *Anaplasma*. (Alkathiri et al, 2024; Sri-In et al, 2024). To our knowledge, this work represents the first phylogenetic investigation of *Anaplasma*, *Babesia*, and *Theileria* in ticks infesting stray dogs in Wasit province, Iraq. It also provides the first molecular evidence of these pathogens in tick-infested dogs within the country.

All ticks were morphologically classified as brown dog ticks, *Rhipicephalus spp.*, which were examined stereomicroscopically and recognized as belonging to the genus of hard ticks. *Rhipicephalus* (*Rhipicephalus turanicus*, *Rhipicephalus sanguineus*, *Rhipicephalus pravus*, and *Rhipicephalus camicasi*). This tick was the sole species identified in our investigation of stray dogs in the waist area. The results aligned with research conducted in Pakistan (Khovand et

al, 2022), Nigeria (Opeyemi et al, 2019), Taiwan (Chao et al, 2019), and Algeria (Hassissen et al, 2019). *R. sanguineus* (s.l.) exhibits a global distribution and is regarded as a prevalent species in canines, although it may opportunistically feed on several other animals.

Globally, ticks are considered the second most important vectors after mosquitoes in transmitting a wide range of infections to both humans and animals. The current investigation revealed that 16.4% of stray dogs were contaminated with ticks. In Iraq, prevalence rates differ by region: 30.95%–40.47% in Mosul province (Arsalan et al, 2006), 16.7% in central provinces (Mohammad, 2015), 68.75% in Basra province (Hatem, 2020), and 10.3% in Erbil province (Aziz and AL-barwary, 2019). Such variation in infestation rates may be attributed to differences in ecological and climatic conditions, geographical factors, sample sizes, and the absence of organized monitoring and preventive programs for stray dogs. According to (Léger et al, 2013), shifts in tick abundance and distribution, along with the pathogens they transmit, are influenced by factors such as climate change, habitat alterations, and the globalization of human activities. Therefore, in this region, environmental factors including elevated temperature and humidity appear to play a major role in shaping tick distribution.

These results highlight the role of ticks as potential reservoirs for *Anaplasma*, *Babesia*, and *Theileria* species, emphasizing their importance in the transmission dynamics of these blood parasites and their possible impact on livestock health and productivity.

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Ethical approval

This study was approved by IR-UU-AEC-3.85

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Conflict of interest

The authors declare that they have no conflict of interest.

References

- Alkathiri, B., Lee, S., Ahn, K., Youn, S. Y., Yoo, M.-S., Lee, H.-S., Cho, Y. S., Jung, J., Seo, K., & Kim, S. (2024). DNA Barcoding Using 18S rRNA Gene Fragments for Identification of Tick-Borne Protists in Ticks in the Republic of Korea. *Pathogens*, 13(11), 941.
- Arsalan, S., Daham, E., Al-Obaidi, Q., & Sulaiman, E. (2006). Study on the percentage of infection with endo-and ectoparasites in dogs in Mosul/Iraq. *Iraqi Journal of Veterinary Sciences*, 20 (1), 125-137
- Aziz, K., & Al-Barwary, L. (2020). Molecular identification of Theileria equi and Babesia caballi from ixodid ticks infesting equids in Erbil province, northern of Iraq. *Advances in Animal and Veterinary Sciences*, 8(12), 1286-1293.
- Aziz, K. J., & AL-barwary, L. T. O. (2019). Prevalence rate of ixodid ticks in equids and some nearby farm animals in erbil governorate, north of Iraq. *Basrah Journal of Veterinary Research*, 18(1), 337-359.
- Chao, L.-L., Hsieh, C.-K., Ho, T.-Y., & Shih, C.-M. (2019). First zootiological survey of hard ticks (Acari: Ixodidae) infesting dogs in northern Taiwan. *Experimental and Applied Acarology*, 77(1), 105-115.
- de la Fuente, J., Estrada-Peña, A., Rafael, M., Almazán, C., Bermúdez, S., Abdelbaset, A. E., Kasajja, P. D., Kabi, F., Akande, F. A., & Ajagbe, D. O. (2023). Perception of ticks and tick-borne diseases worldwide. *Pathogens*, 12(10), 1258.
- de Oliveira, P. R., Bechara, G. H., Denardi, S. E., Nunes, É. T., & Mathias, M. I. C. (2005). Morphological characterization of the ovary and oocytes vitellogenesis of the tick Rhipicephalus sanguineus (Latreille, 1806) (Acari: Ixodidae). *Experimental parasitology*, 110(2), 146-156.
- Estrada-Peña, A., Bouattour, A., Camicas, J., & Walker, A. (2004). Ticks of domestic animals in the Mediterranean region. *University of Zaragoza, Spain*, 131(4).
- Gong, L., Diao, L., Lv, T., Liu, Y., Liu, J., Zhang, W., Xie, X., & Cao, Y. (2025). A comprehensive review of tick-borne disease epidemiology, clinical manifestations, pathogenesis, and prevention. *Animals and Zoonoses*. 1(3), 254-265.
- Guglielmone, A. A., Robbins, R. G., Apanaskevich, D. A., Petney, T. N., Estrada Peña, A., Horak, I. G., Shao, R., & Barker, S. C. (2010). The Argasidae, Ixodidae and Nuttalliellidae (Acari: Ixodida) of the world: a list of valid species names. *Zootaxa*, (1) 6 , 1-28.
- Hassissen, L., Kebbi, R., Ayad, A., & Nait-Mouloud, M. (2019). Seasonal activity of ticks infesting domestic dogs in Bejaia province, Northern Algeria. *Onderstepoort Journal of Veterinary Research*, 86(1), 1-6.
- Hatem, A. N. (2020). Prevalence and ecology of the brown dog tick Rhipicephalus sanguineus in domestic mammals in Basrah province, Iraq, with the acaricidal effect of Quercus brantii acorns extract in adults. *Iraqi Journal of Agricultural Sciences*, 51(6), 1670-1677.
- Huggins, L. G., Koehler, A. V., Gasser, R. B., & Traub, R. J. (2023). Advanced approaches for the diagnosis and chemoprevention of canine vector-borne pathogens and parasites—Implications for the Asia-Pacific region and beyond. *Advances in parasitology*, 120, 1-85.
- Huruma, G., Abdurhaman, M., Gebre, S., & Deresa, B. (2015). Identification of bovine tick species and their prevalence in and around Sebeta Town, Ethiopia. *Journal of parasitology and Vector Biology*, 7(1), 1-8.
- Jongejan, F. (1998). Integrated control of ticks and tick-borne diseases (ICTTD). *Parasitology today*, 14(5), 173-176.
- Khovand, H., FARD, S. R. N., Khalili, M., & Jajarmi, M. (2022). A survey of Ixodid ticks in stray dogs and molecular detection of Ehrlichia canis from ticks in central Iran. *Turkish Journal of Veterinary & Animal Sciences*, 46(2), 209-217.
- Latrofa, M. S., Dantas-Torres, F., Annoscia, G., Cantacessi, C., & Otranto, D. (2013). Comparative analyses of mitochondrial and nuclear genetic markers for the molecular identification of Rhipicephalus spp. *Infection, Genetics and Evolution*, 20, 422-427.

- Léger, E., Voure'h, G., Vial, L., Chevillon, C., & McCoy, K. D. (2013). Changing distributions of ticks: causes and consequences. *Experimental and Applied Acarology*, 59(1), 219-244.
- Mohammad, M. K. (2015). Distribution of ixodid ticks among domestic and wild animals in central Iraq. *Bulletin of the Iraq Natural History Museum*, 13(3), 23-30.
- Nava, S., Mastropaolo, M., Venzal, J. M., Mangold, A. J., & Guglielmo, A. A. (2012). Mitochondrial DNA analysis of *Rhipicephalus sanguineus sensu lato* (Acari: Ixodidae) in the Southern Cone of South America. *Veterinary Parasitology*, 190(3-4), 547-555.
- O'Neill, D., Komutrattananon, R., Church, D., Hartley, A., & Brodbelt, D. (2024). The epidemiology of tick infestation in dog breeds in the UK. *Journal of Small Animal Practice*, 65(7), 569-581.
- Opeyemi, O. A., Babamale, O. A., Shittu, O., Mohammad, M. U., & Ugbomoiko, U. S. (2019). Seasonal distribution and common management practices of ectoparasites of domestic dogs in Ilorin, Nigeria. *Animal Research International*, 16(1), 3265-3272.
- Robert, K., Van Gestel, M., Lathouwers, M., Fonville, M., Sprong, H., Matthysen, E., & Heylen, D. (2025). Abundance of ticks and tick-borne pathogens in domestic gardens in Belgium, 2020-2022: a citizen science approach. *BMC Public Health*, 25(1), 2031.
- Salih, D., El Hussein, A., & Singla, L. (2015). Diagnostic approaches for tick-borne haemoparasitic diseases in livestock. *Journal of veterinary medicine and animal health*, 7(2), 45-56.
- Sri-In, C., Thongmeesee, K., Wechtaisong, W., Yurayart, N., Rittisorntanoo, G., Akarapas, C., Bunphungbaramee, N., Sipraya, N., Riana, E., & Bui, T. T. H. (2024). Tick diversity and molecular detection of *Anaplasma*, *Babesia*, and *Theileria* from Khao Kheow open zoo, Chonburi Province, Thailand. *Frontiers in veterinary science*, 11, 1430892.
- Stafford, K.C. (2007). Tick Management Handbook. The Connecticut Agricultural Experiment Station. Bulletin. 10(10): p.79.
- Takano, A., Toyomane, K., Konnai, S., Ohashi, K., Nakao, M., Ito, T., Andoh, M., Maeda, K., Watarai, M., & Sato, K. (2014). Tick surveillance for relapsing fever spirochete *Borrelia miyamotoi* in Hokkaido, Japan. *PLoS One*, 9(8), e104532.
- Vilas-Boas, D. F., Nakasone, E. K. N., Gonçalves, A. A. M., Lair, D. F., Oliveira, D. S. d., Pereira, D. F. S., Silva, G. G., Conrado, I. d. S. S., Resende, L. A., & Zaldívar, M. F. (2024). Global distribution of canine visceral leishmaniasis and the role of the dog in the epidemiology of the disease. *Pathogens*, 13(6), 455.
- Walker, A. R. (2003). *Ticks of domestic animals in Africa: a guide to identification of species* (Vol. 74). Bioscience Reports Edinburgh.
- Wall, R., & Shearer, D. (2008). *Veterinary ectoparasites: biology, pathology and control*. John Wiley & Sons.

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تشخیص مولکولی انگل‌های خونی در کنه‌های آلوده کننده سگ‌ها در استان واسط عراق

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چکیده

آلودگی به انگل‌های خونی در سگ‌های مناطق گرمسیری، از جمله عراق، مشاهده می‌شوند. تعداد زیادی از سگ‌ها به چندین انگل خونی آلوده می‌شوند. این تحقیق در استان واسط، عراق طراحی شد تا شناسایی و توصیف مولکولی جامع هم‌پارازیت‌ها در کنه‌هایی که سگ‌ها را آلوده کرده‌اند، انجام شود. این مطالعه مقطعی از ابتدای ماه می ۲۰۲۴ تا پایان دسامبر ۲۰۲۴ انجام شد. در مجموع ۲۸۰ سگ ولگرد در مناطق مختلف واسط، عراق مورد بررسی قرار گرفتند. همه حیوانات به صورت سیستماتیک برای بررسی آلودگی به کنه معاینه شدند و کنه‌های جمع‌آوری شده در اتانول نگهداری شده و با استفاده از کلیدهای تاکسونومیک استاندارد شناسایی شدند. نمونه‌ها از سگ‌های آلوده به کنه‌ها گرفته شد و برای تحلیل‌های میکروسکوپی و مولکولی به منظور شناسایی پیروپلاسم‌ها (بابزیا، تیلریا) و آناپلازما استفاده شدند و DNA کلی استخراج شده و سپس PCR با پرایمرهای ژن ۱۶S rRNA برای شناسایی گونه‌های آناپلازما انجام شد، و ژن ۱۸ S rRNA برای شناسایی گونه‌های بابزیا و تیلریا استفاده شد. محصولات پی سی آر با استفاده از الکتروفورز ژل آگاروز تأیید شدند. بررسی ریخت‌شناسی نشان داد که کنه‌های بالغ شناسایی شده به خانواده Ixodid تعلق دارند و چهار گونه جنس *Rhipicephalus* شامل *Rhipicephalus camicasi*، *Rhipicephalus pravus*، *Rhipicephalus sanguineus turanicus* شناسایی شدند. Nested PCR همچنین وجود *Anaplasma spp.* را در ۱۶ نمونه کنه (۱۶ درصد)، *Babesia spp.* را در ۱۴ سگ (۱۴ درصد) و *Theileria spp.* را در ۱۱ سگ (۱۱ درصد) نشان داد. این نتایج نقش کنه‌ها را به عنوان مخازن بالقوه برای گونه‌های *Anaplasma*، *Babesia* و *Theileria* برجسته می‌کند و اهمیت آنها را در دینامیک انتقال این انگل‌های خونی و تاثیر احتمالی آنها بر سلامت و بهره‌وری دام‌ها را نشان می‌دهد.

کلمات کلیدی: عراق، انگل‌های خونی سگ، کنه، Nested PCR

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