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Case Report

A CASE OF CONTACT DERMATITIS WITH CONCURRENT INFECTION OF BABESIOSIS AND EHRLICHIOSIS IN A 5-YEAR-OLD GERMAN SHEPHERD BITCH

***AMBALI, H.M., AJAMU, F.S., AMBALI, R.T. & AMEEN, S. A.**
Department of Veterinary Medicine, Faculty of Veterinary Medicine, University of Ilorin, Kwara State, Nigeria

**Correspondence:* ambali.hm@unilorin.edu.ng

ABSTRACT
A 5-year-old female German shepherd was presented to the Small Animal Clinic of the Veterinary Teaching Hospital (VTH), University of Ilorin, Kwara State, Nigeria, on April 7, 2025, with complaints of lethargy and skin infection. The dog had a history of reduced activity, anorexia, and skin lesions, and had whelped six weeks and two days prior to presentation. It was reported that the dog was given a chemical bath and treated with 5% oxytetracycline and vitamin B complex by an unlicensed veterinarian prior to presentation, without improvement. On clinical examination, the vital signs were: temperature 39.0°C, pulse rate 140 beats per minute, and respiratory rate 30 cycles per minute. Clinical findings included weakness, emaciation with body weight loss from 31 kg to 29 kg, alopecia, and erythema localized to the ventral neck, dorsum, and limbs, accompanied by mild tick infestation. Diagnosis was established based on the patient's history, clinical presentation, and laboratory findings. The dog was treated parenterally for canine babesiosis and ehrlichiosis, combined with topical therapy for dermatitis and showed full recovery following therapy.

Keywords: Contact dermatitis, Babesiosis, Ehrlichiosis, German shepherd breed

INTRODUCTION
Tick-borne haemoprotozoans and haemorickettsiales are emerging diseases that pose significant global health challenges to animals (Ceylan *et al*., 2021). Ticks rank as the second most common hematophagous parasites, following mosquitoes (de la Fuente, 2018). In addition to inducing anaemia, they serve as vectors for transmitting a wide range of protozoan, bacterial, and viral diseases (Otranto *et al*., 2014). Among various parasitic infections, canine babesiosis and ehrlichiosis are the most prevalent in dogs (Birkenheuer *et al*., 2022). The occurrence of these complex infections, whether individually or concurrently, is largely influenced by vectors such as the brown dog tick (*Rhipicephalus sanguineus*), which is commonly found in tropical and subtropical regions (Shaw *et al*., 2001; Dantas-Torres, 2010; Azmi *et al*., 2013).

Canine ehrlichiosis affects multiple organs and systems, presenting in three clinical forms: subclinical, acute, and chronic (Harrus & Waner, 2011). During the acute phase, affected dogs typically exhibit high fever, anorexia, lethargy, lymphadenopathy, depression, epistaxis, splenomegaly, and both petechial and ecchymotic haemorrhages of the skin. Ocular manifestations are also common, including chorioretinitis, papilledema, anterior uveitis, retinal haemorrhages, and perivascular retinal infiltrates (Komnenou *et al*., 2007). The chronic form is characterized by more severe clinical signs such as anaemia, paralysis, profound weakness, and frequently results in mortality (Harrus & Waner, 2011). Similarly, Rojas *et al*. (2014) reported that all infections by Babesia species induce clinical signs including fever, anaemia, lymphadenopathy, splenomegaly, thrombocytopenia, jaundice, and pigmenturia. Consistent with these observations, Gallego-Solano *et al*. (2011) and Irwin *et al*. (2009) identified that the clinical features and diverse clinicopathological alterations commonly associated with Babesia infections in dogs likely reflect the host immune system's difficulty in effectively clearing the parasitic infection.

Concurrent infection between canine babesiosis and canine ehrlichiosis can occur in endemic regions (Rautenbach *et al*., 2018). Canine babesiosis and Canine ehrlichiosis are the major tick-borne diseases throughout the world (Karshima *et*

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al., 2021). Both babesiosis and ehrlichiosis can be spread from infected animals to healthy animals by infected ticks. Reports of co-infections in dogs are frequently documented worldwide. Examples include infections with *Babesia canis* (sub species vogeli), *Ehrlichia canis*, and *Anaplasma* platys in dogs from Canada (Al Izzi *et al*., 2013); *Ehrlichia canis* and Hepatozoon canis in Israel (Baneth *et al*., 2015). *Babesia canis* (sub species vogeli), *Babesia gibsoni*, and *Ehrlichia canis* in India (Jain *et al*., 2018); and *Babesia canis* and *Ehrlichia canis* in Thailand (Rawangchue & Sungpradit, 2020). Research on tick-borne parasites in Nigeria has been documented which include Kamani *et al*. (2010, 2013), Adamu *et al*. (2014), and Happi *et al*. (2018).

Dermatitis is a common skin condition in dogs characterized by excessive itching, redness, and sometimes hair loss (Bizikova *et al*., 2015). Different types of dermatitis in dogs include, atopic dermatitis (AD), flea allergy dermatitis (FAD), food allergy dermatitis, bacterial, fungal dermatitis and contact dermatitis (Telnov & Vovkotrub, 2021). Contact dermatitis is a localized, itchy skin rash that may result from a reaction to tick exposure (Thomsen & Kristensen, 1986). Although it is a less common cause of pruritus, it is characterized as an inflammatory, non-infectious skin condition triggered when specific substances come into contact with the skin (Haddad *et al*., 2018). While chronic lesions manifest as erythematous and/or atrophic plaques at the bite sites, acute lesions that arise shortly after the bites manifest as solid, extremely painful papules. These characteristic skin alterations can offer crucial diagnostic hints for viral and bacterial diseases (Haddad *et al*., 2018). Haemoparasite infections such as ehrlichiosis may lead to nonspecific erythematous or erythematous-purplish rashes. The disease is transmitted via a tick bite that injects the pathogen into the skin, from where it disseminates through the lymphatic system (Komnenou *et al*., 2007). In contrast, the sudden appearance of skin lesions typically indicates irritant contact dermatitis (Novak-Bilić *et al*., 2021), additionally, a seasonal flare-up of dermatitis often points to exposure to an outdoor environmental contact allergen. The initial cutaneous lesion, known as erythema migrans (EM), typically presents as erythematous macules or papules that progressively enlarge, forming single or multiple plaques with irregular borders and a lighter, purple, and/or scaly center (Ali *et al*., 2024). This lesion expands both centrifugally and concentrically, creating the characteristic "bull's eye" appearance, and can reach substantial size (Talhari *et al*., 2010). Although EM can develop on any skin area, it most commonly occurs on the lower and upper limbs and the face. It is usually asymptomatic, but patients may occasionally experience pruritus or a burning sensation (Talhari *et al*., 2010). Co-infections with canine babesiosis and ehrlichiosis in dogs are frequently reported worldwide, including in Nigeria, where mismanagement can result in severe immunosuppression, leading to increased morbidity, mortality, and a poor prognosis. (Rautenbach *et al*., 2018). This case highlights the hemato-biochemical changes and dermatological effects associated with such co-infections.

CASE PRESENTATION

A 5-year-old female German shepherd was brought to the Small Animal Clinic of the Veterinary Teaching Hospital (VTH), University of Ilorin, on April 7, 2025. The owner reported that the dog had reduced activity, anorexia, and skin lesions, and had whelped six weeks and two days prior to presentation. The dog was given a chemical bath and treated with 5% oxytetracycline and vitamin B complex by an unlicensed veterinarian, without improvement. On clinical examination, the weight was 29kg with normal respiratory rate (30 cycles per minute) and rectal temperature (39.0°C,) but had tachycardia (pulse rate 140 beats per minute). There was alopecia and erythema localized to the ventral neck, dorsum and limbs. Ticks were observed inside the pinnae and interdigital spaces of all the limbs, the dog was weak and emaciated. Arrow showing alopecic and erythematous areas on the neck, dorsum and limbs on the first day of presentation to the VTH of the University of Ilorin as shown in Figures I and II.

SAMPLE COLLECTION AND LABORATORY FINDINGS

About 5ml of Blood was collected from the cephalic vein into ethylenediaminetetraacetic acid (EDTA) tubes and plain tubes. About 3ml of blood in the EDTA was sent to clinical pathology and parasitology laboratories for full blood count and parasitological analysis (blood smear microscopy) while serum from 2ml of blood collected in plain tube was sent for biochemical analysis. Skin scrapings were sent to the Microbiology Laboratory for microbial culture. Results of the haematological parameters showed microcytic hypochromic anaemia, neutrophilic leukocytosis, and eosinophilia (Table I). Biochemical results revealed increased plasma levels of aspartate aminotransferase (AST), alkaline phosphatase (ALP) and hyperbilirubinemia and decreased level of albumin (hypoalbuminemia) (Table II). Microscopy examination of the blood smear revealed the co-infection of *Babesia canis* and *Ehrlichia canis* (Figures III and IV). There was no growth from the microbial culture.

Table I. Haematological parameters of the German Shepherd dog on the first day of its presentation to the VTH University of Ilorin

Parameters	Result	Normal range
PCV (%)	31	35-57
HGB (g/dL)	10.3	11.9-18.9
RBC ($\times10^{12}$/L)	5.50	4.95-7.87
MCV(Fl)	56.9	66-77
MCH(Pg)	18.7	21.0-26.2
MCHC(g/L)	32.9	32.0-36.3
WBC ($\times10^{9}$/L)	15.6	5.0-14.1
Neutrophils (%)	87	58-85
Lymphocytes (%)	05	8-21
Monocytes (%)	06	2-10
Eosinophil (%)	10	0-9
Basophil (%)	01	0-1
Platelet ($\times10^{9}$/L)	215	211-621
MPV (Fl)	8.8	6.1-10.1

HB)-Hemoglobin; PCV-Packed cell volume; RBC-Red blood cell;(Mean corpuscular volume; Mean corpuscular hemoglobin (MCH); Mean corpuscular hemoglobin concentration (MCHC); White blood cell (WBC); Neutrophil (NEUT); Lymphocyte (LYM); Monocytes (MON); Eosinophil (EOS)Platelet (PLT)

Table II. Biochemical parameters of the German Shepherd dog on the first day of its presentation to the VTH, University of Ilorin.

Parameters	Result	Normal range
Total Protein (g/dL)	5.6	5.4-7.5
Albumin (g/dL)	2.24	2.3-3.1
Alkaline Phosphatase ALP (IU/L)	122.0	1-114
Total Bilirubin (µmol/L)	14.5	1.12-10.43
Conjugated Bilirubin (µmol/L)	6.8	0.03-2.1
Unconjugated Bilirubin	7.7	1.09-8.33
Aspartate aminotransferase AST (IU/L)	30.1	13-15
Alanine transaminase ALT (IU/L)	27.2	10-109
Creatinine (µmol/L)	62.3	44-150
BUN (mmol/L)	5.8	2.9-10

ALT (alanine aminotransferase); AST (aspartate transferase); BUN; Blood Urea Nitrogen, ALP (IU/L)

FINAL DIAGNOSES AND CASE MANAGEMENT

Based on the history, clinical signs, and laboratory examinations, our diagnoses were contact dermatitis with concurrent infection of babesiosis and ehrlichiosis. The bitch was treated by administering diminazene aceturate (Ceva Animal Health (pty) Ltd) at 3.5mg/kg IM q 2weeks, doxycycline (Health Biotech Ltd) at 5 mg/kg PO bid 1/52. Sarolaner-80mg, PO q (4weeks) (Simparica®, Zoetis Inc), Vitamin B complex (Hebai yuanzheng, China) at 0.1ml/kg IM for 2 days. Ketoconazole cream (Teva Pharmaceuticals) (topical) was prescribed against secondary infection such as fungi dermatitis.

Table III. Haematological parameters of the German Shepherd dog (day 7 after treatment) at the VTH, University of Ilorin.

Parameters	Result	Normal range
PCV (%)	41	35-57
HGB (g/dL)	14	11.9-18.9
RBC ($\times10^{12}$/L)	6.50	4.95-7.87
MCV(Fl)	69	66-77
MCH(Pg)	22.7	21.0-26.2
MCHC(g/L)	34.6	32.0-36.3
WBC ($\times10^{9}$/L)	8.5	5.0-14.1
Neutrophils (%)	67	58-85
Lymphocytes (%)	12	8-21
Monocytes (%)	06	2-10
Eosinophil (%)	00	0-9
Basophil (%)	00	0-1
Platelet ($\times10^{9}$/L)	215	211-621
MPV (Fl)	8.8	6.1-10.1

HB)-Hemoglobin; PCV-Packed cell volume; RBC-Red blood cell;(Mean corpuscular volume; Mean corpuscular hemoglobin (MCH); Mean corpuscular hemoglobin concentration (MCHC); White blood cell (WBC); Neutrophil (NEUT); Lymphocyte (LYM); Monocytes (MON); Eosinophil (EOS)Platelet (PLT),

Table IV. Biochemical parameters of the German Shepherd dog (day 7 after treatment) at the VTH, University of Ilorin.

Parameters	Result	Normal range
Total Protein (g/dL)	5.6	5.4-7.5
Albumin (g/dL)	2.50	2.3-3.1
ALP (IU/L)	89.0	1-114
Total Bilirubin (µmol/L)	9.5	1.12-10.43
Conjugated Bilirubin (µmol/L)	5.0.	0.03-2.1
Unconjugated Bilirubin	7.7	1.09-8.33
Aspartate aminotransferase AST (IU/L)	14.4	13-15
Alanine transaminase ALT (IU/L)	27.2	10-109
Creatinine (µmol/L)	62.3	44-150
BUN (mmol/L)	5.8	2.9-10

ALT (alanine aminotransferase); AST (aspartate transferase); BUN; Blood Urea Nitrogen, ALP (IU/L

OUTCOME OF THERAPY

Blood samples were retaken and both blood and serum were sent to the Clinical Pathology and Parasitology Laboratories for biochemical, hematological and heamoparasites screening. The results from the Clinical Pathology Laboratory showed that all the biochemical and haematological parameters had improved considerably as shown in (Tables III and IV). No parasites were seen in the blood smear. The alopecic and erythematous areas had also improved when compared to the first day of its presentation to the VTH of the University of Ilorin as shown in Figure V after some weeks. The client was advised to continue with the cream.

Figure I: The dog on the first day of presentation showing alopecia and erythema at the ventral part of the neck.

Figure II: Arrow showing alopecia and erythema on the dorsum and the limbs of the dog on the first day of presentation to the VTH, University of Ilorin.

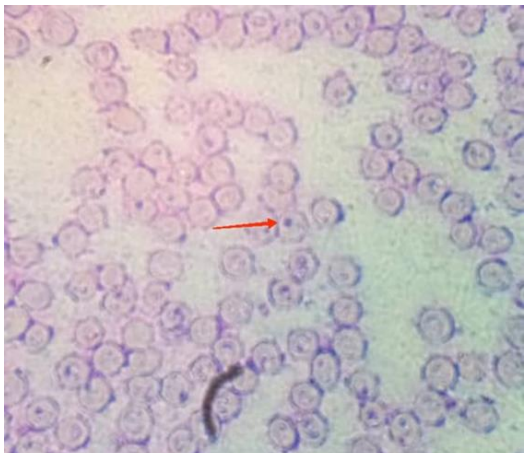

Figure III: Arrow showing the merozoite of *Babesia canis* within the RBC of the German Shepherd dog

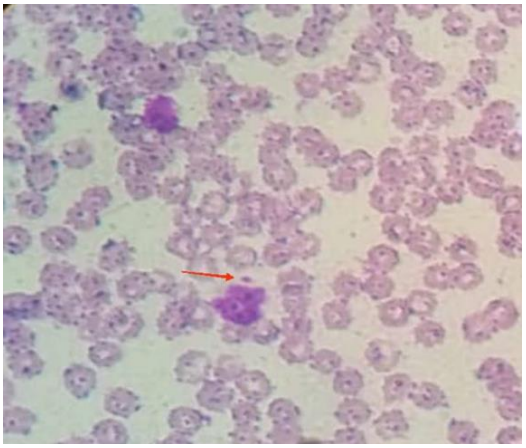

Figure IV: Arrow showing the morulae of *Ehrlichia canis* within the monocytes of the German shepherd dog

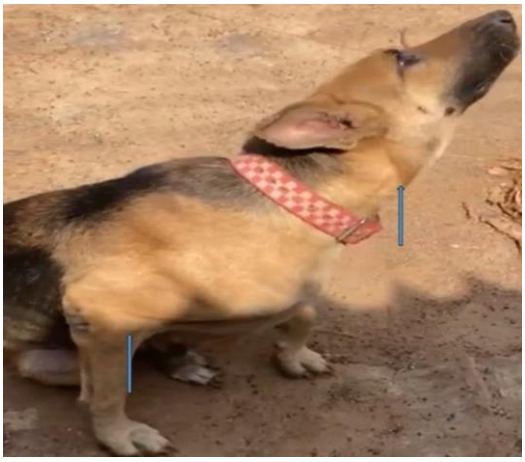

Figure V: Arrows showing the dorsum and the limb of the dog some weeks after treatment.

DISCUSSION

Vector borne diseases of canines are common all over the globe and its prevalence is high in Nigeria due to favourable hot and humid climatic conditions (Kamani, 2021). Canine babesiosis and ehrlichiosis are significant tick-borne infections frequently encountered in university of Ilorin veterinary teaching hospital and are generally considered common diseases in dogs, although they are often underreported.

The present study reported a case of simultaneous canine babesiosis and ehrlichiosis in a dog with a history of lethargy, anorexia, and skin infection, occurring six weeks and two days after whelping. Clinical observation revealed weakness, emaciation (loss of body weight from 31kg to 29kg), pale conjunctival mucus membrane and tachycardia, Prescapular and popliteal lymphadenopathy, alopecia and erythema at the ventral part of the neck, the dorsum and limbs similar to report by Kalaivanan *et al*. (2017). In subclinically affected dog, infection with B. canis and E. canis resulted in inappetence, lethargy, pyrexia, and lymphadenopathy, without involvement of the integument. Another report by Yabnez *et al*. (2018) included clinical findings such as inappetence, pale mucus membrane, pyrexia in *Ehrlichia* spp, *Anaplasma* spp., and Babesia spp. infections in 3-month-old puppy in the Philippines. Severe reduction of hemogram values were correlating to what was reported by Sainz *et al*. (2015) and Jeyabal *et al*. (2019), who observed the severe reduction of haemoglobin in canines infected with Babesia and *Ehrlichia* parasites.

High leucocytes and eosinophilia in this case could be as result of the contact dermatitis, which is similar to report by Ganesan *et al*. (2023) that contact dermatoses frequently affect both humans and domestic animals. The resulting skin lesions are commonly biopsied and examined histologically to confirm a diagnosis or exclude other diseases with similar or unusual clinical presentations. Most of the existing veterinary literature on allergic dermatoses primarily focuses on atopic dermatitis in dogs, with considerably less attention given to cats, horses, and other species (Marsella, 2021).

Elevated Serum glutamic-oxaloacetic transaminase (SGOT)/Aspartate aminotransferase (AST) in this case could be indicative of direct liver damage caused by the blood parasites, as reported by Torres-Velez *et al*. (2003). Hyperbilirubinemia in the present case may be due to intra- and extravascular hemolysis by Babesia canis. Similar to report by AlIzzi *et al*. (2013).

CONCLUSION

In summary, the treatment was favourable. Thus, it was determined that a good therapeutic regimen is necessary, along with laboratory findings, to prevent mismanagement that can lead to severe immunosuppression and secondary infections.

ETHICAL CONSIDERATIONS

The handling of the animal (dog) and the procedures adhered to the guidelines established by the ethics committee regarding the use of animals in experiments. It is important to note that the client provided verbal consent for this study.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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This research did not receive any financial support.

ABBREVIATION

AST	Aspartate aminotransferase
SGOT.	Serum glutamic-oxaloacetic transaminase
BUN	Blood Urea Nitrogen
K	Potassium
Na	Sodium
PCV	Packed cell Volume
RBC	Red Blood Cell

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