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Treatment of concurrent babesiosis and ehrlichiosis in a dog using imidocarb dipropionate and doxycycline

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ABSTRACT: *Rhipicephalus sanguineus* is a well-recognized vector of tick-borne diseases, including babesiosis and ehrlichiosis, in dogs. This case report describes the successful therapeutic management of concurrent babesiosis and ehrlichiosis using imidocarb dipropionate and doxycycline. A 10-month-old male domestic dog presented with anorexia, weakness, pyrexia, erythema on the medial aspect of the hind limb, and heavy tick infestation. Complete blood count analysis revealed leukopenia, granulocytopenia, increased mean corpuscular volume and mean corpuscular hemoglobin, and thrombocytopenia. Blood smear examination revealed the presence of intraerythrocytic parasites and *Ehrlichia morulae* within the monocytes. In addition, a rapid antibody test yielded positive results for *Babesia* spp. and *Ehrlichia* spp. The dog was treated with a comprehensive therapeutic regimen consisting of fluralaner, imidocarb dipropionate, doxycycline, and supportive supplementation with multi-vitamins and minerals. Twenty-eight days after initiation of therapy, the dog showed marked clinical improvement, as evidenced by the absence of blood-borne pathogens on smear examination and substantial recovery of hematological parameters.

Keywords:
babesiosis, domestic dog, doxycycline, ehrlichiosis, imidocarb dipropionate

■ INTRODUCTION

Rhipicephalus sanguineus transmits blood-borne parasitic diseases in dogs, mainly babesiosis and ehrlichiosis (Dantas & Otranto, 2015). Babesiosis is caused by Babesia parasites that multiply in red blood cells, causing mild-to-severe systemic disease (Grecu & Nastasa 2016). Ehrlichiosis is caused by Ehrlichia bacteria, which infect and replicate within leukocytes (Mylonakis & Theodorou 2017). In endemic regions, co-infection with both pathogens is common, complicating diagnosis and treatment of the disease.

Imidocarb dipropionate remains the primary therapy for canine babesiosis because of its antiparasitic efficacy (Uslu & Canbar 2022). Doxycycline is the preferred treatment for ehrlichiosis and tick-borne infections (Torbica *et al*. 2013). The combined use of imidocarb dipropionate and doxycycline improves outcomes in dogs with concurrent babesiosis and ehrlichiosis (Uslu & Canbar 2022), with studies showing enhanced recovery and hematological improvement (Grecu & Nastasa 2016).

Documentation gaps exist for the clinical signs and hematological changes of natural co-infections, as most reports cover single-pathogen infections. Data on blood smears and hematological recovery post-treatment remain limited in young dogs from endemic areas. This case report evaluated the response of a dog co-infected with *Babesia* spp. and *Ehrlichia* spp. to combined treatment, providing evidence for integrated tick-borne infection management.

■ CASE

Signalment and Anamnesis: A 10-month-old intact male domestic dog weighing 7 kg with light brown and white hair presented with anorexia, lethargy, and numerous ticks. It is kept indoors, but when it defecates outdoors, it is vaccinated and dewormed. **Physical Examination**: The vital signs were normal, except for the body temperature (39.6 °C), indicating inflammation. Tick infestation was observed in the ears, neck, and body of the animals. Erythema was observed on the medial hind leg (Figure 1).

Laboratory Examination: CBC revealed leukopenia, granulocytopenia, increased MCV and MCH, and thrombocytopenia. Blood smears revealed intra-erythrocytic parasites and morulae in monocytes. The rapid test kit antibodies were

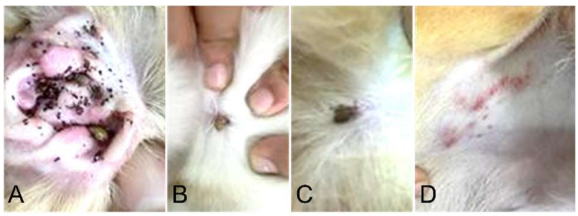

Figure 1. Tick infestation on (A) ear, (B) neck, dan (C) body. There was (D) erythema on the medial hind legs.

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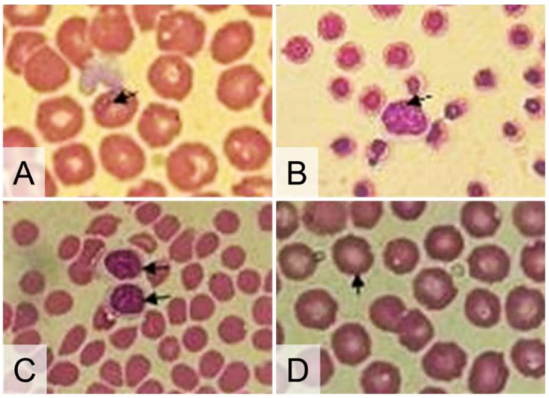

Figure 2. Blood smear showing Babesia in erythrocytes and Ehrlichia in monocytes. (A) Babesia (black arrow); (B) Ehrlichia in monocytes (black arrow); (C) no morulae in monocytes; (D) no intraerythrocytic parasites. 1000× magnification.

positive for Babesia and Ehrlichia. **Diagnosis**: Babesiosis and ehrlichiosis. **Prognosis**: Fausta. **Treatment**: Fluralaner 250 mg (Bravecto) and imidocarb dipropionate (Imidox) were administered subcutaneously at a dose of 6.6 mg/kg BW, given twice at a 14-day interval; doxycycline 10 mg/kg BW PO for 28 days; and multivitamins and minerals (Livron B-plex) 1 tab/day for 7 days

■ RESULTS AND DISCUSSION

Physical examination showed anorexia, lethargy, pyrexia, tick infestation, and erythema of hind limbs (Figure 1). Tick saliva induces inflammation through cytokines that activate B cells and cause fever (Kusuma *et al*. 2024). Hematological analysis revealed leukopenia, granulocytopenia, increased mean corpuscular volume (MCV) and mean corpuscular hemoglobin (MCH), and thrombocytopenia (Table 1). *Ehrlichia* spp. infect immune cells, causing leukopenia (Mylonakis & Theodorou 2017). Thrombocytopenia results from reduced platelet production and vitamin B12/B9 deficiency, while *Ehrlichia morulae* suppress megakaryocytes (Dharmawan *et al*. 2024). Babesiosis can occur without anemia when erythropoiesis remains intact, shown by elevated MCV and MCH (Torbica *et al*. 2013).

Fluralaner (250 mg; Bravecto) eliminated ticks within 24 h with 97.3% efficacy (Hadi *et al*. 2020). Imidocarb dipropionate reached optimal effectiveness after two administrations at a 14-day interval (Simoes *et al*. 2011). The combined use of imidocarb dipropionate and doxycycline showed successful outcomes in babesiosis and ehrlichiosis cases, with imidocarb reducing fever within 48 h (Torbica *et al*. 2013).

Doxycycline penetrates host cells via passive diffusion or active transport, inhibiting Ehrlichia protein synthesis. Doxycycline remains the first-line therapy for ehrlichiosis, with a recommended dosage of 10 mg/kg body weight daily for 28 days (Mylonakis & Theodorou, 2017). Supportive therapy with multivitamins and minerals (Livron B-plex) was administered to aid hematopoietic recovery. After 28 days of therapy, the dog showed clinical improvement, with no Babesia or Ehrlichia on blood smears and normalized hematological parameters (Figure 2).

Table 1. Result of complete blood count before and after treatment

Parameter		Day-0	Day-14	Day-28	Normal Range
WBC	**10^3/uL)**	**4.92** ↓	**4.4** ↓	**5.72** ↓	6 – 17
LYM#	(10^3/uL)	3.29	3.39	4.01	0.8 – 5.1
MID#	(10^3/uL)	0.47	0.44	0.47	0 – 1.8
GRA#	**(10^3/uL)**	**1.2** ↓	**0.57** ↓	**1.24** ↓	4 – 12.6
RBC	(10^6/uL)	6.93	5.93	7.1	5.5 – 8.5
HGB	(g/dL)	18.7	15.4	18.9	11 – 19
MCHC	(g/dL)	36.3	35.5	36	30 – 38
MCH	**(Pg)**	**27** ↑	**26** ↑	**26.7** ↑	20 – 25
MCV	**(fL)**	**74.4** ↑	**73.2** ↑	**74.2** ↑	62 – 72
RDWCV	(%)	12.2	12.3	12.4	11 – 15.5
RDWSD	(fL)	42.6	42.1	43	35 – 56
HCT	(%)	51.6	43.4	52.6	39 – 56
PLT	**(10^3/uL)**	**29.10** ↓	**87** ↓	**103** ↓	117– 460
MPV	**(fL)**	**6.5** ↓	8.1	8.1	7 – 12.9
PDW	**(fL)**	**23.8** ↑	**18.8** ↑	15.2	10 – 18
PCT	**(%)**	**0.019** ↓	**0.071** ↓	**0.083** ↓	0.1 – 0.5
P-LCR	**(%)**	**10.9** ↓	**19.7**	**7** ↓	13 – 43

Note: WBC=White Blood Cells, LYM=Lymphocyte, MID=Mid-Size Cell, GRA=Granulocyte, RBC=Red Blood Cell, HGB=Haemoglobin, MCHC=Mean Corpuscular Haemoglobin Concentration, MCH=Mean Corpuscular Haemoglobin, MCV=Mean Corpuscular Volume, RDWCV=Red Cell Distribution Width Coefficient Variation, RDWSD=Red Cell Distribution Width Standard Deviation, HCT=Haematocrit, PLT=Platelet, MPV=Mean Platelet Volume, PDW=PlateletDistributionWidth, PCT=Procalcitonin, P-LCR=Platelet-Large Cell Ratio.

■ CONCLUSION

Fluralaner, imidocarb dipropionate, doxycycline, and multivitamins and minerals showed significant recovery in babesiosis and ehrlichiosis after 28 days of therapy.

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