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Case Report: Severe Ticks Infestation with Ehrlichiosis in Mixed Dog

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Abstract. Canine ehrlichiosis is a disease caused by infection of *Ehrlichia* sp., which is a tick-borne disease. Transmission of ehrlichiosis in dogs can occur through the bite of *Rhipicephalus sanguines* as a transmission vector. A Shih Tzu-Terrier mixed dog named Mogli was examined with complaints of decreased appetite, weight loss, fever, and severe pruritus. Physical examination showed the presence of petechies, vulnus on the skin and *Rhipicephalus sanguineus* tick infestation, especially around the eyes and back. Complete hematological examination and blood smear showed leukocytosis, lymphocytosis, thrombocytopenia, increased granulocytes, hematocrit, and the presence of intracytoplasmic bodies in monocytes. The results of the examination with the test kit showed a positive result, which means had antibodies to *Ehrlichia* sp. Based on the examinations, the dog was diagnosed with severe tick infestation with accompanied ehrlichiosis. The dog was given doxycycline 5 mg/kg BW twice a day orally for 28 days and fluralaner 250 mg orally, tolfenamic acid 4 mg/kg BW intramuscularly (IM), chlorpheniramine maleat 2 mg once daily orally for 14 days, and vitamin B-complex once a day orally for 28 days. After 14 days of treatments showed changes in the dog's appetite that returned to normal, the dog looked active, the dog's body temperature was normal, the infestation of the *Rhipicephalus sanguineus* ticks significantly reduced, and the frequency of pruritus was reduced. The results of the hematological examination on the fourteenth day showed that all parameters were within the normal range.

Keywords: ehrlichiosis; *Rhipicephalus sanguineus*; thrombocytopenia; tick-borne disease

I. INTRODUCTION

A dog is a pet that is kept by people for various purposes, including to be used as a friend to play, hunt, as well as a reliable house guard. Dog health management is an important part of maintenance management that must be considered when raising a dog (Putra *et al.,* 2019). Problems that are often found related to the health and welfare of dogs are infections or parasitic infestations (Budiana, 2007). Flea and tick infestations cause the entry of protozoa, viruses, and rickettsiae, which can cause disease in dogs (Rumlaklak *et al.,* 2018).

The three most common types of external parasites found in dogs are ticks,

fleas, and mites. Canine ehrlichiosis is a disease caused by infection with *Ehrlichia* sp. and is a very important tick-borne disease in dogs (Beall *et al.,* 2012). The tick *Rhipicephalus sanguineus* acts as a vector in ehrlichiosis disease (Kurnia *et al.,* 2020). Ehrlichiosis is caused by Gram-negative intracellular bacteria of the genus *Ehrlichia* (Barman *et al.,* 2014). *Ehrlichia* primarily infects white blood cells and forms intracytoplasmic aggregates called morula (Mylonakis and Theodorou, 2017).

Ehrlichiosis in dogs is caused by various species of the genus *Ehrlichia*, including *E. canis, E. chaffeensis, E. ewingii*, and *E. ruminantium* (Vieira *et al.,* 2011). Ehrlichiosis in dogs has been reported to be distributed worldwide (Erawan *et al.,* 2017). *Ehrlichia canis* is a type of Ehrlichia which has the widest distribution and has been reported throughout the world, especially in countries with tropical and subtropical climates (Jayanegara, 2020).

Transmission of ehrlichiosis in dogs can occur through the bite of the tick *Rhipicephalus sanguineus*, as a transmission vector that moves from one dog to another (Nesti *et al.,* 2018). The pathogenesis of ehrlichiosis begins when the larval stage tick sucks the dog's blood, then the tick larvae will drop off and moult into nymphs. *Ehrlichia* will migrate to the salivary glands when tick nymphs are ready to suck blood (Putra *et al.,* 2015). *Ehrlichia* transferring in ticks occurs transtadially, namely when the tick sucks blood, the tick bites the dog's skin, and transfers the agent through saliva (Bowman *et al.,* 2009). The saliva plays a role in the anticoagulation of the host's blood. *Ehrlichia* that has entered the host's body will go to the target cell (monocyte) and replicate (Rikihisa, 2010).

The course of ehrlichiosis disease consists of 3 phases, namely acute, subclinical, and chronic (Harrus *et al.,* 1998). The acute stage begins 8-20 days after transmission through infected ticks and lasts 2-4 weeks, while the subclinical stage can last 40-120 days or even years (Skortaczak, 2003). In the acute phase, moderate to severe thrombocytopenia with mild anemia and a reduced white blood cell count are characteristic hematological findings (Harrus and Warner, 2011). Symptoms of high fever, depression, lethargy, anorexia, lymphadenopathy, splenomegaly, and the presence of skin petechiae, ecchymosis, and epistaxis also occur in the acute phase (Erawan *et al.,* 2017). In the subclinical phase, mild thrombocytopenia may occur in the absence of clear clinical findings. The chronic stage is characterized by the appearance of symptoms that are almost the same as the acute phase but with a higher degree of severity, namely the presence of

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bleeding, epitaxis, and edema (Skortaczak, 2003).

This case report describes a six-year-old mixed dog with ehrlichiosis. The purpose of writing this article is to provide information regarding methods of diagnosis, treatment, and therapeutic evaluation of ehrlichiosis in mixed dogs.

II. MEDICAL RECORD

Signalement

The case animal in this study was a Shih Tzu-Terrier cross dog named Mogli, a male, aged 6 years, weighing 10 kg, and having white hair.

Anamnesis

The dog had a decreased appetite for 3 weeks before being brought to the Veterinary Internal Medicine Laboratory, Faculty of Veterinary Medicine, Udayana University. Previously, dogs were given home food (chicken and rice) and dry food. According to the owner's statement, the dog had been infested with ticks since August 2022 and had been given an anti-ectoparasite drug once in August 2022. The dog has experienced weight loss and severe pruritus. The dog was fully vaccinated and given deworming medicine 3 months ago before examination. The owner only has one dog with a dog rearing system, released in the morning and put in the cage at night.

Physical Examination

The condition of the dog shows weakness and sensitivity during the examination. The hair looks dirty and dull. The dog experiences petechies, hyperpigmentation, vulnus on the skin and an infestation of *R. sanguineus* ticks almost all over its body, especially in the area around the eyes and back. On examination of the limbs, respiratory, digestive, nervous, urogenital, and lymph nodes were still in normal condition. Limb, respiratory, digestive, nervous, urogenital, and lymph nodes are normal. The dog's body temperature has increased.

Figure 1. Case dog named Mogli

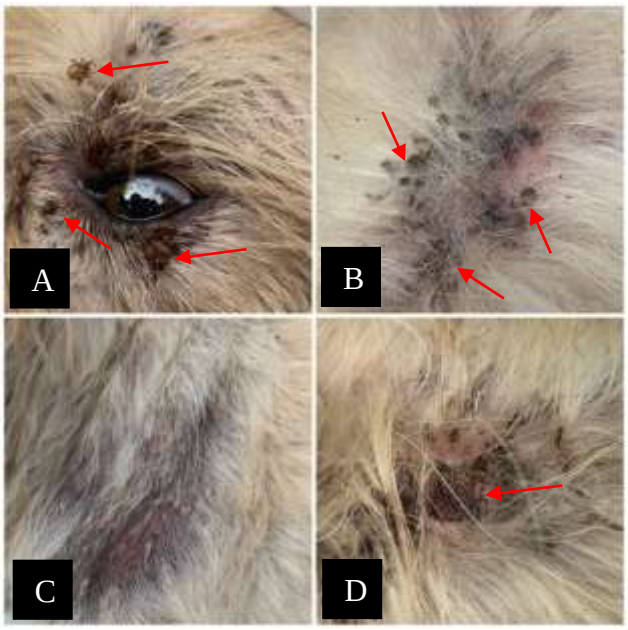

Figure 2. Severe tick infestation in the area around the eyes (A) and back (B), the skin is hyperpigmented (C), accompanied by vulnus (D).

Laboratory Examination

Hematology (Complete Blood Count/CBC)

A complete hematology examination is carried out using a Hematology Analyzer machine (Licare CC-3200, PT. Aerocom Global Sejahtera, West Jakarta, Indonesia). The results of a complete hematological examination showed that the dog had leukocytosis, lymphocytosis, thrombocytopenia, and increases in granulocytes and hematocrit (Table 1).

Table 1. Mogli Dog Complete Hematology Examination Results

Item	Result	Reference Range*	Category
WBC (10^3/µL)	23.3	6.0 – 17.0	Increased
Lymphocytes (10^3/µL)	6.4	0,8 – 5.1	Increased
Granulosit (10^3/µL)	15.4	4.0 – 12.6	Increased
RBC (10^6/µL)	7.20	5.5 – 8.5	Normal
Hemoglobin (g/dL)	173	110 – 190	Normal
Hematocrit (%)	56.5	37.0 – 55.0	Increased
MCH (pg)	24.0	14.0 – 25.0	Normal
MCV (fL)	78.5	60.0 – 77.0	Increased
MCHC (g/dL)	306	300 – 380	Normal
Platelet (10^3/µL)	70	117 – 460	Decreased

Notes:
WBC= *White Blood Cell*; RBC= *Red Blood Cell*; MCH= *Mean Corpuscular Hemoglobin*; MCV= *Mean Corpuscular Volume*; MCHC= *Mean Corpuscular Hemoglobin Concentration*.
*) Source: Weiss and Wadrop (2010).

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Blood Smear and Blood Parasite Test Kit

Examination of blood smears was carried out by staining using eosin and methylene blue solutions. The results of the blood smears of the case dogs showed the presence of intracytoplasmic bodies in monocytes (Figure 3). Examination of the test kit showed positive results for *Ehrlichia* sp. antibodies.

Diagnosis and Prognosis

Based on the anamnesis, results of physical examination and confirmed by the results of supporting examinations, the dog was diagnosed with severe tick infestation accompanied with ehrlichiosis with a fausta prognosis.

Therapy

The therapy given to case dogs is causative therapy with doxycycline antibiotics (Dohixat®, PT. IFARS Pharmaceutical Laboratories, Solo, Indonesia) 5 mg/kg BW twice a day orally for 28 days, and fluralaner (Bravecto®, Merck Sharp Dohme Pharma) 250 mg orally as an anti-tick to treat *R. sanguineus* infestations. As a symptomatic therapy given tolfenamic acid (Tolfedine®, Vetoquinol, France) 4 mg/kg BW intramuscularly (IM) as an antipyretic to reduce fever, and chlorpheniramine maleat (CTM®, PT. Ciubros Farma, Semarang, Indonesia) 2 mg once daily orally for 14 days as an antihistamine to treat pruritus in dog. Supportive therapy was given with vitamin B-complex (Livron B-Plex, PT. Phapros, Semarang, Indonesia) once a day orally for 28 days. Vitamin B-complex play a role in energy metabolism in the body and increase appetite. Vitamin B12 also plays a role in the formation of platelets in blood with thrombocytopenia, and improves skin hyperpigmentation (Lubis Zulhaida, 2010).

After 14 days of treatment, it showed significant changes. Appetite and drink have returned to normal, the dog is active again, the frequency of pruritus has decreased, and the body temperature is normal 38.2°C. The tick infestation was significantly reduced (Figure 4). WBC, lymphocyte, granulocyte, hematocrit, and platelet/platelet levels have reached the normal range.

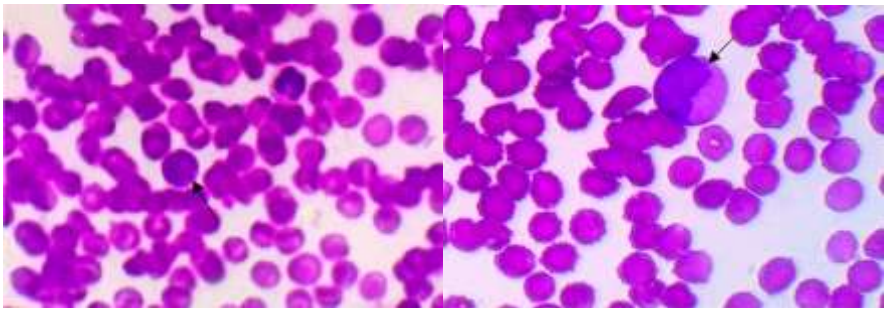

Figure 3. The results of the blood smear show the presence of intracytoplasmic bodies in monocytes (black arrows) (400X).

Figure 4. The condition of the case dog after being given treatment for 14 days. *R. sanguineus* tick infestation was significantly reduced in the area around the eyes (A) and back (B).

III. DISCUSSION

Rhipicephalus sanguineus ticks are blood-sucking ectoparasites that have an important role in the field of animal health. It is also called "the brown dog tick" and is the most common type of tick found on dogs. This tick infestation has the potential to spread disease to animals.

Ehrlichiosis in dogs is a vector-borne disease called canine vector-borne disease (CVBD) caused by the tick *R. sanguineus* (Guedes *et al.,* 2015). Ehrlichiosis can strike at all ages and types of dog breeds (Procajlo *et al.,* 2011). Transmission of ehrlichiosis occurs from one dog to another through tick bites when ticks start sucking the dog's blood as food (Nesti *et al.,* 2018).

The dog experienced petechies on the skin. This can be caused by damage to platelet cells resulting in extensive perivascular coagulation (Mutawadiah *et al.,* 2015). Petechiae are the most common clinical manifestation and are directly related to thrombocytopenia (Kearns and Ewing, 2006). The dog also experiences skin hyperpigmentation. Hyperpigmentation is generally found on parts of the skin that experience alopecia. Changes in skin color to darker are caused by increased activity of melanocytes (Wirawan *et al.,* 2019). Increased activity of melanocytes is stimulated by several factors including prostanoids, cytokines, chemokines, and other inflammatory mediators such as reactive oxygen species released during the inflammatory process (Wardhani and Rahmadewi, 2016).

The results of the hematological examination showed that the dog had leukocytosis, lymphocytosis, increased granulocytes, hematocrit, and thrombocytopenia. Leukocytosis can indicate that the animal is under stress or acute inflammation occurs (Paramita and Widyastuti, 2019). The increase and

decrease in total leukocytes in the blood is a mechanism for the body's response to invading pathogens (Sudira, 2018). An increase in the number of leukocytes indicates an increase in the body's defense ability. An increase in granulocytes is more indicative of an increase in neutrophils (neutrophilia). Generally, the increase occurs due to various factors, one of which is due to a bacterial infection (Simarmata *et al.,* 2021). Increased hematocrit values can occur in animals that are experiencing stress. When animals experience fear, epinephrine increases the contraction of the spleen, so that the red blood cells in the blood circulation become numerous and finally increase the hematocrit value (Swenson, 1984). A typical finding that occurs in cases of ehrlichiosis is that animals experience thrombocytopenia from the moderate to severe category (Harrus and Warner, 2011). Thrombocytopenia is a blood disorder that can occur in ehrlichiosis by all *Ehrlichia* agents (Straube, 2010). Thrombocytopenia begins to occur on the tenth day after infection and will reach its peak of severity in the third week (Jayanegara, 2020). According to Pantanowitz (2002) thrombocytopenia in cases of ehrlichiosis can occur due to decreased platelet production in the bone marrow. Morula and granuloma of *Ehrlichia* sp. can be in the bone marrow of animals with ehrlichiosis and will inhibit the bone marrow from producing megakaryocytes, which are the forerunners of the formation of platelets or platelets.

On blood smear examination, it found intracytoplasmic inclusions (morula) in monocyte cells. Ehrlichia primarily infects white blood cells, forming intracytoplasmic aggregates called morula (Mylonakis and Theodorou 2017). The presence of morula can indicate that the animal has ehrlichiosis (Putra *et al.,* 2019). An examination using a test kit was carried out to confirm the diagnosis and the case dog showed positive results for *Ehrlichia* sp. antibodies. Serological test is a test that supports the diagnosis of dogs suffering from ehrlichiosis (Nakaghi *et al.,* 2008).

The dog was treated with doxycycline, fluralaner, tolfenamic acid, and vitamin B-complex. Doxycycline is an antibiotic that has a broad spectrum, so it is good for treating infections from various types of bacteria. It is an oxytetracycline class of antibiotics that works by inhibiting bacterial protein synthesis and attaches to the 30S ribosome (Papich, 2011). Doxycycline has high lipophilic activity, so it is able to pass through the bacterial protein double layer (Petrov, 2018). According to Fourie *et al.* (2015), administration of doxycycline antibiotics for 28 days proved to be effective in eliminating morula that infects dogs. Fluralaner is given for the treatment of

ticks. Fluralaner is a systemic therapy. The dog was given Bravecto® in the form of chewable tablets. Fluralaner is a new molecule of isoxazoline which has acaricidal and insecticidal activities and is recommended as an anti-tick drug. In the body, fluralaner ticks will inhibit neurotransmitter junctions, namely g-aminobutyric acid (GABA) and gluta-mate-gated (Hadi *et al.,* 2020). Rohdich *et al.* (2014) reported that fluralaner was superior to three times the dose of fipronil for controlling ticks and fleas in dogs. Fluralaner is effective for up to 12 weeks (Walther *et al.,* 2014). William *et al.* (2014) stated that fluralaner can control egg dispersal, larval development and the reproductive system in ticks, even at sub-insecticideal concentrations. Furalaner is easily absorbed after administration of a single dose orally, the volume of distribution is relatively high, and has a long elimination time, so that the activity of fluralaner can last a long time (Kilp *et al.,* 2014). Giving Tolfedine® as symptomatic therapy is a non-steroidal anti-inflammatory drug (NSAID) and an analgesic drug that contains tolfamic acid (Plumb, 2008). Tolfedine® contains tolfenamic acid as an antipyretic, analgesic and anti-inflammatory drug. Tolfenamic acid works by binding to the prostaglandin synthetase receptors Cox-1 and Cox-2 and inhibiting the action of prostaglandin synthetase and thromboxane. CTM drugs work by blocking natural substances (histamine) that the body produces during allergic reactions (Wahyudi *et al.,* 2020). The vitamin B-complex functions to meet the needs of vitamins and minerals in the body.

Evaluation by clinical and hematological examination (Complete Blood Count (CBC)) was carried out on the dog after 14 days of treatment. The results of the clinical examination showed that the dog's appetite and drinking had returned to normal, the normal body temperature was 38.2°C, had started to become active, and significantly reduced *R. sangu*ineus tick infestation (Figure 4), but ticks were still found on the neck. Changes occurred in WBC, lymphocytes, granulocytes, and hematocrit which previously increased beyond the normal range, decreased until they reached the normal range. Platelets experienced a significant increase until they reached the normal range.

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