

Case Report: Helminths Infestation with Bronchopneumonia and Tick Infestation in Mixed Dog

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Abstract. A mixed-breed dog named Vino, male, golden brown, two years old, weighing 10 kg was brought to the Veterinary Internal Medicine Laboratory, Faculty of Veterinary Medicine, Udayana University with a non-productive cough four months before the examination. Two weeks after the onset of the cough, the dog showed signs of itching. There were blood spots in the feces and the consistency is very soft but still has shape. Respiratory examination revealed that the case dog had a non-productive cough. Auscultation of the lungs revealed deep breathing and slight crackles. Skin examination revealed *Rhipicephalus* sp. Infestation with ulcerative lesions, erythema, papules, hyperpigmentation, lichenification, and alopecia. On radiography, there was a bronchial pattern and radiopaque spots in the lungs. The results of the complete blood count showed leukocytosis, mild neutrophilia, eosinophilia, and mild hypochromia. Stool examination revealed the presence of *Ancylostoma* spp. and *Strongyloides* spp. eggs. Examination of the impression smear and tape acetate preparation test with cytologic staining revealed some neutrophils. The case dog was diagnosed with *Ancylostoma* spp. and *Strongyloides* spp. infestation accompanied by bronchopneumonia and tick infestation. Treatment was administered with Caniverm[®], Advocate[®], and methylprednisolone. After 14 days of treatment, the dog's condition improved, as evidenced by no worm eggs found in the feces and the case dog was no coughing or scratching by the case dog, and no ticks found on the case dog's body.

Keywords: bronchopneumonia; dog; tick infestation; helminth infestation

I. INTRODUCTION

Helminthiasis is a disease caused by worm infestation of the animal's digestive, respiratory, and other body systems. Helminthiasis can involve different types of parasitic worms, including nematodes, trematodes and cestode worms [1]. Ancylostomiasis and strongyloidiasis are

two parasitic diseases that commonly affect dogs [2]. Both diseases are caused by nematodes, specifically hookworms in the case of ancylostomiasis and strongyles in the case of strongyloidiasis [3]. The prevalence rate of ancylostomiasis in the tourist areas of Bali reaches 34% [4]. Ancylostomiasis and strongyloidiasis will

generally cause gastrointestinal clinical symptoms such as perineal itching, diarrhoea to vomiting, which may vary clinically depending on the age of the animal [5]. Respiratory disorder may occur under certain clinical conditions due to the life cycle of migratory larvae [6]. One of the respiratory disorders that occurs in ancylostomiasis is bronchopneumonia. Bronchopneumonia is a type of inflammation of the lungs and airways (bronchi and bronchioles) that can make breathing difficult and worsen the prognosis [7].

Tick infestation is the presence of ticks on the body of the host, which is a common and significant health problem for dogs [8]. This blood-feeding parasite (arachnid) can transmit various diseases and cause discomfort and health problems to dogs. Ticks can transmit many pathogens including bacteria, viruses, and parasites to dogs. Tick infestation may cause various symptoms in dogs, including excessive scratching, skin irritation, anemia, and, in severe cases, paralysis. In addition, it often worsens the condition of animals already infected with other diseases [9].

Ignoring the clinical signs in dogs and failing to provide treatment, can be dangerous and may worsen the dog's condition. Therefore, this case report intended to provide information that the clinical signs of coughing, scratching, and

anus dragging after defecation indicate a problem. An investigation must be carried out to determine the cause so that appropriate treatment can be given and the animal's quality of life improved.

II. MEDICAL RECORD

Signalement

The case dog is a two-old-male mixed dog named Vino, with a golden-brown color and a body weight of 10 kg. In this case, the dog's female parent is a mixed breed dog and the male parent's breed is unknown.

Anamnesis

The dog was brought to the Laboratory of Veterinary Internal Medicine, Faculty of Veterinary Medicine, Udayana University because of a non-productive cough since four months before the examination. The intensity of the cough is about 12 times/day and occurs from morning to night. Two weeks after the onset of the cough, the dog started showing signs of itching. The dog scratches and bites the body with high intensity, also frequently seen rubbing his back on the floor. The feces of the dogs had blood spots and the stool was very soft in consistency but still had a shape (Figure 1). After defecation, the dog exhibits a posture of dragging anus on the floor. The dog's appetite and drinking were normal. Food was given three times daily in the form of

rice mixed with meat. The dog has been routinely vaccinated but has never been dewormed. Since the onset of symptoms of coughing, itching, and blood spots in the stool, the dog has never been treated. The case dog was kept on a chain outside the house, but after the onset of coughing symptoms, the dog was released to go in and out of the house. The number of dogs kept by the owner is six and none of the other dogs show the same symptoms. There are many ownerless dogs living around the case dog owner's house. Physical Examination

Examination of the case dogs was carried out on Wednesday, March 29, 2023, at the Laboratory of Veterinary Internal Medicine, Faculty of Veterinary Medicine, Udayana University. The dog has an upright posture, calm temperament with a habitus of frequent coughing and scratching. Praesens status (rectal

temperature, heart rate frequency, pulsus frequency, respiratory frequency, and capillary refill time) were within the normal range.

Respiratory examination revealed an abnormal result in that the case dog had a non-productive cough. On palpation of the trachea, there was a cough reflex. Auscultation of the lungs revealed deep breath sounds and soft crackles. Skin examination revealed infestation of *Rhipicephalus* sp. Ulcer lesions were also seen on the body along the dorsal side of the body to the base of the tail and on the proximal forelimbs, which were filled with blood. There was erythema on the interdigital and ventral areas of the body, papules on the ventral parts of the body, lichenification hyperpigmentation on the dorsal area of the body to the base of the tail, and alopecia in areas where there are ulcerous lesions. There appears to be a crust



Figure 1. Blood spots in the feces of a case dogs (red arrows).

on the ulcer that has dried. The rate of pruritus of the dogs was high

Radiography

The X-ray result showed a bronchial pattern and radiopaque spots in the lungs (Figure 3).



Laboratory Examination

Figure 2. Ulcer lesion (yellow arrow); lichenification hyperpigmentation, alopecia, ulcers (blue arrow); papules (red arrow); erythema (black arrow) on the body of the case dog.

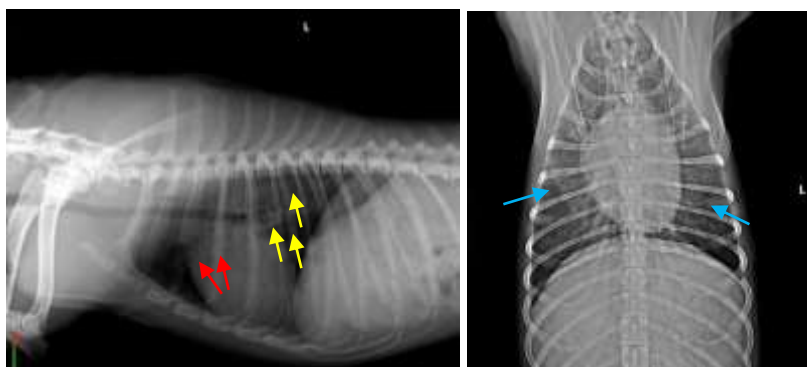


Figure 3. X-ray results of the patient in the right lateral recumbency position show radiopaque in the bronchial walls (red arrows) and white spots in the lungs (yellow arrows). In the ventrodorsal position, a bronchial pattern was seen (blue arrows).

Hematology (Complete Blood Count/CBC)

The result of CBC (Table 1) showed that the case dog had leukocytosis, mild neutrophilia, eosinophilia, and mild hypochromia.

Fecal Examination

The results of fecal examination using the floating method showed the presence of *Ancylostoma* spp. and *Strongyloides* spp. eggs (Figure 4). *Ancylostoma* spp. eggs were identified by having a thin, smooth, oval-shaped wall and containing morula [10] while the eggs of

Strongyloides spp. were identified by a thin, oval-shaped wall and filled with larvae [11]. Calculation of worm eggs (eggs per gram) showed the results of *Ancylostoma* spp. 1320 eggs/g feces and *Strongyloides* spp. 640 eggs/g feces. The results of worm egg counting showed that the case dog was infected with *Ancylostoma* spp. with severe infection and *Strongyloides* spp. moderate infection.

Table 1. CBC Examination Results of Case Dogs

Item	Unit	Result	Reference Range*	Category
WBC	10 ⁹ /L	22.69	6.00-17.00	Increase
Limfosit	10 ⁹ /L	3.35	1.00-4.80	Normal
Monosit	10 ⁹ /L	1.07	0.20-1.50	Normal
Neutrofil	10 ⁹ /L	12.44	3.00-12.00	Increase
Eosinofil	10 ⁹ /L	5.49	0.00-0.80	Increase
Basofil	10 ⁹ /L	0.34	0,00-0.40	Normal
RBC	10 ¹² /L	6.26	5.50-8.50	Normal
HGB	g/dl	1.3	12.0-18.0	Normal
HCT	%	43.19	37.00-55.00	Normal
MCV	fL	69	60-77	Normal
MCH	Pg	21.2	19.5-24.5	Normal
MCHC	g/dL	30.7	31.0-39.0	Decrease
PLT	10 ⁹ L	303	165-500	Normal
MPV	fL	8.2	3.9-11.1	Normal
PCT	%	0.25		Normal

Notes:

WBC (*White Blood Cell*); RBC (*Red Blood Cell*); HGB (*Hemoglobin*); HCT (*Hematocrit*); MCV (*Mean Corpuscular Volume*); MCH (*Mean Corpuscular Hemoglobin*); MCHC (*Mean*

Corpuscular Hemoglobin Concentration); PLT (Platelet/Trombosit); MPV (*Mean Platelet Volume*); PCT (*Procalcitonin*).

*) Source: VETSCAN HM5 Operator Manual, LBL-03063, Zoetis, Inc.

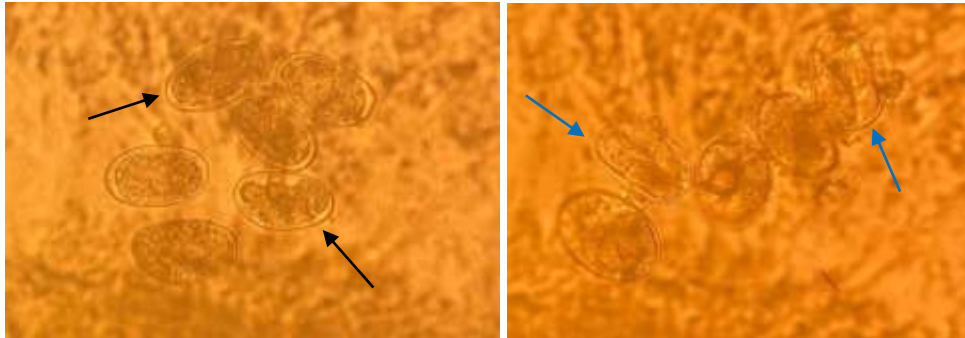


Figure 4. *Ancylostoma* spp. (black arrows) and *Strongyloides* spp. (blue arrows) eggs in the feces of a case dog (1000× magnification) (Personal Documentation).

Skin Examination

Some neutrophils were found on examination of the impression smear and tape acetate preparation test with cytologic staining. No pathogens were found on deep skin scraping.

Blood Parasite Test Kit

The results of confirmatory testing with a test kit using the SNAP 4Dx Plus Test ELISA showed that the case dog's blood did not contain antibodies to

Anaplasma phagocytophilum, *Anaplasma platys*, *Borrelia burgdorferi*, *Ehrlichia canis*, and *Ehrlichia ewingii*.

Diagnosis and Prognosis

Based on the history, physical examination, and supporting examinations, the case dog was diagnosed with helminths infestation with *Ancylostoma* spp. and *Strongyloides* spp. accompanied by bronchopneumonia and tick infestation with a fausta prognosis.

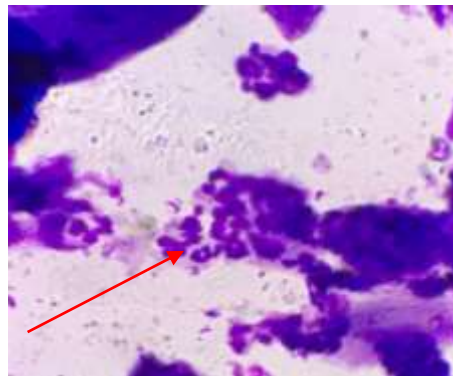


Figure 5. The results of a tape acetate preparation test microscopic examination with cytological staining found neutrophils (red arrows). (Diff Quik, 1000×) (Personal Documentation).

Treatment

Therapy for case dog consisted of antiparasitic as causative therapy and anti-inflammatory as symptomatic therapy. For helminths infestation, a combination of fenbendazole 150 mg, pyrantel embonas 144 mg, and praziquantel 50 mg (Caniverm®, Bioveta, a.s., Czech Republic) was administered once with a total dose of 1 tablet per 10 kg body weight per oral (PO). For treatment of tick infestation, an antiparasitic combination of imidacloprid 10 mg and moxidectin 2.5 mg (Advocate®, KVP Pharma, Germany) was administered as a single dose of 0.1 mL per kg body weight topically (spot on). Symptomatic therapy for pulmonary inflammation is by the anti-inflammatory methylprednisolone (Lameson®, PT. Lapi

Laboratories, Serang, Indonesia) given orally twice daily for seven days at a dose of 0.4 mg/kg body weight. It is recommended that dogs be bathed once a week with shampoo that contains sulphur, econazole nitrate, sodium salicylate, chloroxylenol (Sebazole®). The dog's entire body is rubbed, and the shampoo is left on the body for 10 minutes then rinsed and dried. Food for dog cases was replaced with food that has a balanced nutritional diet to increase stamina, which is commercial dry food. During therapy, case dogs are isolated to avoid reinfection with infectious agents. Cleaning and disinfection were performed daily where the case dogs were housed using a mixture of please write the active agent in here (Bayclin) and water.

Evaluation

On the third, fifth, and tenth day after the administration of the therapies, a fecal examination was performed, and the result showed that there were no worm eggs, and no ticks were found throughout the body of the case dog. On the 14th day after treatment the stool had a solid consistency, no blood spots (Figure 6), the case dog no longer showed the behaviour of dragging the anus to the floor after defecation, and no longer coughed and scratched. There are no ulcers, crusts, erythema, and papules on the skin. In some areas of alopecia, a few hairs have begun to grow (Figure 7). The clinical symptoms of

bronchopneumonia are no longer visible, but the results of a chest x-ray show only slight changes in the lungs, namely a slight reduction in the white spots at the top of the lungs. It is recommended to give clavulanic acid which aims to help clear the white spots on the lungs. On the 14th day after treatment no ticks were found anywhere on the body of the case dog.



Figure 6. Dog feces after treatment. The feces has solid consistency and no blood spots.



Figure 7. A few hairs (yellow arrow) grow back in the alopecic area after treatment.

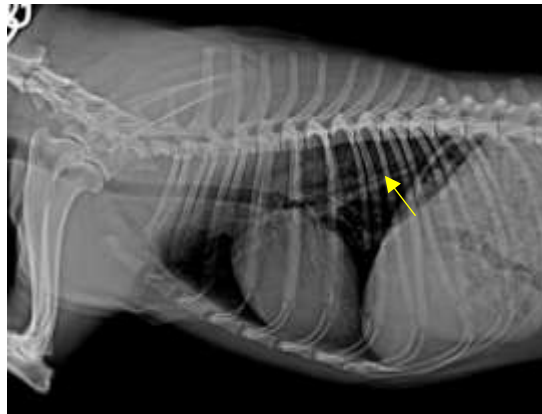


Figure 8. There were still some white spots left on the lungs after treatment (yellow arrow).

III. DISCUSSION

In the feces of the animal cases, blood streaks were seen, and the stools had a soft consistency. After defecation, the case dog showed an attitude of dragging the anus on the floor. After examining the stool with the flotation test, *Ancylostoma* spp. and *Strongyloides* spp. eggs were found. *Strongyloides* spp. is one of the roundworms that is transmitted through the soil. *Ancylostoma* spp. is a species of nematode known as hookworm, which primarily infects the small intestine of dogs. While eating and reassociating, hookworms cause small ulcerative areas in the intestines. Other clinical signs observed in young animals include diarrhoea with melena and failure to thrive in puppies. Hookworm infection can cause weight loss,

poor hair, loss of appetite, and pica [12]. The stool is usually black due to the presence of hemoglobin which comes from the blood [13]. Chronic infection can cause anemia due to iron deficiency [12]. The number of eggs per gram of feces can be used as an estimate of the severity of the infection. Mild infection has a worm egg count (eggs per gram) <199 eggs, moderate infection has a worm egg count (eggs per gram) 200-999 worm eggs, and severe infection has a worm egg count (eggs per gram) >1,000 eggs [14].

Ancylostoma spp. and *Strongyloides* spp. generally infect the small intestine of dogs. *Ancylostoma* spp. is a cutaneous larva migrans that the larval migration takes place from the dermis to the circulatory system, lungs, and trachea then

reaches the intestine by swallowing the contents of the trachea [15]. Dogs heavily infected with *Ancylostoma* spp. can cause coughing and pneumonia from lung migration, and transcutaneous infection could cause localized skin disease [12]. Drobatz *et al.* [16] stated that parasitic pneumonia can be caused by some intestinal nematodes that normally migrate through the lung tissue during their life cycle (e.g., *Ancylostoma*), while others may aberrantly migrate to the lungs. *Strongyloides* spp. infection may be asymptomatic or cause acute or chronic disease. High worm loads cause diarrhoea and bronchopneumonia. More severe clinical signs include extensive skin lesions and bronchopneumonia, sometimes leading to death [17].

The dog has had a non-productive cough of about 12 times/day for four months. The dog still breathes using both noses, and the frequency of the dog's breath is still within the normal range. A cough is a meaningful clinical sign indicating an underlying disease process. Non-productive chronic cough can cause damage to the airway mucosa and other respiratory problems, patient discomfort, and decreased quality of life [18]. One of the causes of cough is due to disorders of the respiratory tract, and it is important to determine the affected anatomic location

(e.g., upper or lower respiratory tract, pleural cavity, or lung parenchyma) [19].

The radiographic examination of the case dog showed a bronchial pattern and radiopaque spots in the lungs. It indicated that the case dog had bronchopneumonia. Bronchopneumonia is an inflammation of the lungs and airways (bronchi and bronchioles). Pneumonia is defined as inflammation of the lung parenchyma. It is a common diagnosis with a wide range of etiologies and a spectrum of severity. Bronchoalveolar inflammation is a characteristic physiologic feature of pneumonia. It is usually caused by an infectious agent that passes through an individual's normal or damaged airway defenses or enters the lungs hematogenously, causing inflammation [20]. Infectious agents can be viruses (*canine parainfluenza virus*, *canine adenovirus type 2*, *canine distemper virus*, *coronavirus*, *canine influenza virus*), bacteria (*Bordetella bronchiseptica*, *Staphylococcus* spp., *Streptococcus* spp., *Mycoplasma*), fungi (*Histoplasma capsulatum*, *Blastomyces dermatitidis*, *Coccidioides immitis*, *Cryptococcus neoformans*), protozoa (*Toxoplasma gondii*), and parasites (*Aelurostrongylus* spp. and *migrating nematode larvae*, including *Toxocara*, *Ancylostoma*, *Strongyloides*) [21]. In this case, the canine

bronchopneumonia is thought to be caused by migrating larvae that invade the lungs.

Skin examination of the dog revealed infestation with *Rhipicephalus* sp. Skin lesions included papules, erythema, ulcers, hyperpigmented lichenification, alopecia, and crusts on dried ulcers. The rate of pruritus in case dog is high. Ticks can transmit several types of blood parasites, but the blood parasite testing (SNAP 4Dx Plus Test ELISA) was negative. Neutrophils were seen on microscopic examination of the tape acetate preparation with cytologic staining. Tick infestation on the body of a dog may cause skin irritation. Ticks may cause local irritation and infection. The salivary secretions of ticks contain neurotoxins and other pharmacologically active compounds that cause impaired hemostasis and suppression of immunity at tick feeding sites [22]. Ticks with long mouths produce deep, painful bite wounds that are prone to inflammation [23]. Ticks can cause papules and erythema as a result of direct skin damage from tick bites. Ulcers found in case dogs were caused by scratching and biting at the tick bite sites and hookworm migration [22]. Lichenification is a thickening of the epidermis and hyperpigmentation is an increase in skin pigmentation, both of which occur after chronic inflammation as a result of tick bites that are continuously scratched and

bitten by case dogs. Crusts in dog are caused by dried exudate [24].

On CBC examination (Table 1, the dog had leukocytosis, mild neutrophilia, eosinophilia, and mild hypochromia. In this case, there was an increase in eosinophils and a slight increase in neutrophils. Eosinophilia is a host response to worm infection. Eosinophils can increase dramatically during worm infection. Cytokines play a role in inducing the activation and recruitment of eosinophils to sites of infection, while eotaxins also promote eosinophilia [25]. Eosinophils are required for parasite-specific IgM responses during primary infection with *Strongyloides stercoralis* [26]. Neutrophilia is an increase in the number of neutrophils in the bloodstream and is caused by inflammation. In this case mild neutrophilia was thought to be caused by an inflammatory response in the dog's skin due to tick infestation and an inflammatory response in the dog's intestines due to worm infestation. The mild hypochromia in the case dog indicated a nutritional deficiency in the case dog's diet.

The case dog showed improvement after 14 days of treatment. The treatment was with Caniverm® containing fenbendazole 150 mg, pyrantel embonas 144 mg, and praziquantel 50 mg. Fenbendazole is a broad-spectrum antiparasitic drug. Fenbendazole is a

benzimidazole group that works by binding to tubulin, an important structural protein of microtubules. This blocks the microtubules in the worm so that glucose uptake is inhibited, which eventually depletes glycogen reserves, disrupting the worm's energy management system, leading to paralysis and death of the worm [27]. Fenbendazole has high anthelmintic activity and a broad spectrum of action, destroying adult nematodes. Pyrantel is effective against immature forms of worms (larvae) and adults in the intestine, but does not against larvae migrating in the tissues. Praziquantel kills cestode worms. Treatment was continued with the administration of Advocate® (imidacloprid and moxidectin). Imidacloprid binds to postsynaptic nicotinic receptors, resulting in paralysis and death of the ectoparasites. Moxidectin is a macrocyclic lactone that binds to specific glutamate ion channels for nematodes and arthropods, thereby increasing the influx of chloride ions, resulting in hyperpolarization of nerve cells, causing paralysis and death [28]. Symptomatic treatment with administration of methylprednisolone as an anti-inflammatory. Methylprednisolone can be used to treat respiratory diseases, skin diseases and digestive diseases. Methylprednisolone works by altering DNA transcription, which causes changes in cell metabolism that produce anti-

inflammatory, immunosuppressive, and antifibrotic effects [29]. Methylprednisolone is an anti-inflammatory drug that belongs to the class of glucocorticoid. Glucocorticoids remain the mainstay of treatment to help reduce inflammation in the respiratory tract. The administration of methylprednisolone aims to suppress the inflammatory response and reduce coughing [30].

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