

DOI 10.7251/VETJEN2001152S

UDK 636.7:616.995.42-085

Case report

SEVERE FORM OF GENERALIZED SARCOPTIC MANGE WITH SECONDARY PIOTRAUMATIC FOLLICULITIS IN DOGS: DIFFERENTIAL DIAGNOSIS AND EPIZOOTIOLOGICAL APPROACH**Oliver STEVANOVIĆ^{1*}, Dejan VUJANIĆ¹, Miljan DOBRIJEVIĆ¹, Igor TRBOJEVIĆ², Željko SLADOJEVIĆ³, Dejan LAUŠEVIĆ⁴, Drago NEDIĆ⁵**¹Veterinary ambulance „BL vet“, Banja Luka, Bosnia and Herzegovina²Faculty of Natural Science and Mathematics University of Banja Luka, B&H³PI Veterinary Institute of the Republic of Srpska “Dr. Vaso Butozan“ Banja Luka, B&H⁴PI Specialist Veterinary Laboratory, Podgorica, Montenegro⁵PI Veterinary Institute of the Republic of Srpska “Dr. Vaso Butozan“ Banja Luka, B&H and Faculty of Veterinary Medicine University of Belgrade, Republic of Serbia

* Corresponding author: Oliver Stevanović, e-mail: oliver.13.stevanovic.bih@gmail.com

Abstract:

This paper describes a case of generalized sarcoptic mange (*Sarcoptes scabiei*) in a stray dog found in the Kotor Varoš Municipality. Clinical and dermatological examinations revealed the suspicion of *Sarcoptic mange* in the dog, which was confirmed by the finding of eggs and adult forms of *Sarcoptes scabiei* var. *canis*. As a secondary complication of mange, the presence of staphylococcal pyotraumatic folliculitis was determined. Hematological examination revealed anemia and leukocytosis. In basic therapy, 0.4 mg/kg of ivermectin was administered parenterally, with cephalexin administered orally at a dose of 40 mg/kg every 12 hours. The therapy lasted 30 days. Control examinations did not reveal parasitic elements in the scraped surface layer of the skin. In the discussion of this paper, the epizootiological characteristics of the disease and the list of dog's skin diseases, that should be distinguished from sarcoptic mange in everyday practice, are presented.

Key words: sarcoptic mange, dog, pyotraumatic folliculitis

INTRODUCTION

Sarcoptic mange (*Sarcoptes scabiei*) is a highly contagious, cutaneous parasitic dog's disease, caused by *Sarcoptes scabiei* var. *canis*. This mite parasitizes in carnivores, on the superficial layers of the epidermis. There are several specifics related to this severe dermatosis: - there are no new data related to the presence of parasites in dogs and other carnivores (wolves, foxes, jackals) in the world; - diagnosis is demanding - a smaller number of mites in the skin is detected by skin surface scraping. The disease belongs to zoonoses. Based on a limited number of studies, it can be concluded that, nowadays,

sarcoptic mange is a rare disease, since the prevalence of *Sarcoptes scabiei var. canis* is below 5% in some parts of Europe (Carlotti, 2004). It occurs in 3.8% of all dermatological cases, and the definitive diagnosis (finding of mites or mite eggs in superficially scraped skin) is successful in 20-50% of cases in dogs with mange (Scott and Miller, 2013). Given its low prevalence and limiting diagnostic procedures, sarcoptic mange is considered undiagnosed and most cases remain unreported in Europe (Carlotti, 2004). There are relatively new data from Albania (Balkan Peninsula) indicating that the prevalence of parasites is around 4.4% and 0.2% (Xhaxhiu et al., 2009; Shukullari et al., 2017). The disease spreads rapidly and in a short period of time can affect numerous animals in a certain susceptible animal population in a certain territorial area. The occurrence of sarcoptic mange in humans and animals is regulated by the competent services, which perform epidemiological measures, as control and eradication in the epidemic focus: treatment and separation of sick animals/humans, diagnostic tests of all susceptible animals and humans, and finally, limit the movement of sick animals and humans (Salavastra et al., 2017; Written et al., 2019). The clinical sign of sarcoptic mange is characterized by the appearance of typical bilateral, large, yellow scabs that first appear on the top of the earlobes, elbows, and tarsus (Scott and Miller, 2013). Pruritic lesions can spread to other parts of the body and often affect the entire face and torso, although the dorsum is usually spared from skin alterations. In humans, *Sarcoptes scabiei var. canis* causes pseudoscabies, a condition that develops 24 hours after humans are exposed to diseased dogs. Pseudoscabies is characterized by pruritic papillomatous or vesicular skin lesions on the trunk, arms, and legs (Walton et al., 2004). These conditions have often been described in the literature (Walton et al., 2004), and this condition is also described in human mange where sarcoptes of animal origin puncture canals in human skin as well. There are no new data on the prevalence of mange in dogs in Republic of Srpska and Bosnia and Herzegovina, but the disease is considered sporadic in clinical practice. In the available literature, there is only one described case of mange in a dog in Bosnia and Herzegovina (Levi et al., 1975).

This paper presents a case of severe generalized sarcoptic mange with secondary pyotraumatic folliculitis in a stray dog, in the light of the epizootiological characteristics and other skin diseases of dogs that should be distinguished from sarcoptic mange.

CASE PRESENTATION

Epizootiological anamnesis. At the end of January 2020, the local Association for the protection of animals in Obodnik, a rural part of the Kotor Varoš municipality (location: 44°34'05.3 "N 17°28'04.8" E), received information related to a sick dog. The Association was informed by a local female resident, who observed the dog who entered the garage next to the family home. The local female resident had no other domestic animals, except the family dog and a few cats. There was no direct contact of the diseased dog with these animals. According to the female local resident, the dog came from an unknown direction

and she immediately observed that dog was seriously ill, i.e. that he had health problems related to skin (the local female resident photographed the dog). Members of the animal protection association from Čelinac and Kotor Varoš came to pick up the dog on the same day and, under strict personal protection measures, transported the dog to the Veterinary ambulance in Banja Luka. About six hours passed from the time the dog was observed in Obodnik to the first examination in the Veterinary ambulance. The dog was admitted to the Veterinary ambulance around 6 PM on the same day. Two people had direct contact with the dog - members of local associations who transported the dog to the veterinary ambulance.

Nacional. At the beginning of the clinical examination, it was established that the dog was a stray (access to the examination without identification and health documentation). The dog was a mixed breed male, about 10 months old. The presence of a subcutaneous identification transponder was not detected in the dog. The basic color of the coat was black and white, and the dog weighed about 8 kilograms during the examination. Other innate features of the hair cover (mark, coat pattern) could not be assessed. The dog was not castrated.

Habitus. The constitution of the dog corresponded to race, age, and gender. Since it was a smaller dog breed, the constitution was judged to be gentle. The dog's condition was significantly altered and assessed as starved. The dog was frightened and distrustful but showed no signs of aggression towards people. Calm temper and mild temperament were assessed.

General clinical and dermatological examination. The general condition was changed significantly. The dog was oriented, responding to external stimuli of the environment, but there was general weakness and depression. Advanced cachexia was present. Parameters of vital signs were not changed. The visible mucous membranes were pale, without noticeable changes on them. Examination of the body openings did not reveal any significant abnormalities. The subcutaneous lymph nodes were slightly enlarged and palpable. Skin turgor was reduced indicating general dehydration. General symmetrical alopecia with secondary cutaneous alterations was present. Auscultation of the thorax did not indicate abnormalities. The abdomen was retracted, hard to the touch, and painless due to its thinness.

Dermatological examination of the dog revealed symmetrical, generalized alopecia with severe pruritus (Figure 1). The pinopedal reflex was positive. Alopecia was markedly present on the head, earlobes, and trunk, and complete hair loss was expressed on the skin of the lumbar back, neck, hind limbs, and tail. The quality of the hair was poor. The skin was dry. The presence of fleas was established by adsppection and dermatological analysis. The presence of dry, hyperkeratotic, yellow scabs was observed on the skin in the area of the head, i.e. face and forehead. Scabs showed a high degree of coalescence and a tendency to excoriate. Shallow, moist erosions of the epidermis remained after scabs removal. Signs

of automutilation with discrete zonal signs of lichenification were observed due to scratching on the hips. On the skin of the left side of the neck, a compact, moist and irregular zone of superficial pyotraumatic inflammation with a significant amount of superficial suppurative content with traces of blood was found.

Hematological examination. Table 1. shows the complete blood count of the diseased dog. Based on the hematological examination, advanced leukocytosis with anemia was established in the dog.

Table 1. Complete blood count of the diseased dog

Parameter	Obtained values ¹	Reference ranges ²
Erythrocytes	4.31 x 10⁶/μL	4.95–7.87 x 10 ⁶ /μL
Hematocrit	29.4 %	35–57 %
Hemoglobin	9.7 g/dL	11.9–18.9 g/dL
Leucocytes	21.5 x 10³/μL	5.0–14.1 x 10 ³ /μL
Platelets	592 x 10 ³ /μL	211–621 x 10 ³ /μL
Granulocytes	16.2 x 10 ³ /μL	2.9–12.0 x 10 ³ /μL
Monocytes	2.0x 10 ³ /μL	0.1–1.4 x 10 ³ /μL
Lymphocytes	3.3 x 10 ³ /μL	0.4–2.9 x 10 ³ /μL

¹ abnormal values are marked as bold; ² MVM (2020)



Figure 1. Sarcoptic mange in the dog: general cachexia, symmetrical alopecia, crustal dermatitis of the head and pyotraumatic folliculitis

Definitive diagnosis. Based on the anamnesis, clinical signs and dermatological examination, a list of differential diagnoses was made: sarcoptic mange, atopic dermatitis, contact dermatitis, dermatitis caused by *Malassezia pachydermatis*, food, and drug allergy. Since the dermatological examination was highly suggestive of sarcoptic mange, skin superficial scraping with a scalpel was performed from the border areas of healthy and pathologically altered skin. Mechanical removal of the surface skin was performed from five different places on the dog's skin from an area of 2.5-3 cm². The scraped material of the epidermis and dermis was macerated with 10% potassium hydroxide and observed under a light microscope (lens magnification 10x-40x) after 5-10 minutes. In the second sample, eggs and adult forms of the mites of the species *Sarcoptes scabiei var canis* were identified (figure 2. and 3.). A swab was taken from the site of pyotraumatic pyoderma (folliculitis) to identify the bacterial cause of the infection. After 24 hours, a pure, beta hemolytic culture of white, smooth colonies grew on the blood (Colombia) medium. Based on the primary identification, the causative agent was identified as *Staphylococcus spp.* The antimicrobial drugs of choice in the treatment of staphylococcal pyotraumatic folliculitis, amoxicillin, and cephalexin, were identified by the disk diffusion method.



Figure 2. and 3. Adult (female) and egg of parasitic mite *Sarcoptes scabiei var. canis* (20x)

Therapeutic protocol and control. After the diagnosis, the dog was isolated from humans and other animals and treated by persons with mandatory personal protection (disposable gloves). Mandatory disinfection of the immediate environment after each therapy was undertaken. The dog was first bathed in warm water and physiological shampoo for dogs to mechanically remove dry scabs and hyperkeratotic mass from the skin. Basic therapy for sarcoptic mange with secondary pyotraumatic folliculitis was based on parenteral administration of 0.4 mg/kg of ivermectin (s.c) every 7 days, for a total of four weeks. On

the first day, dexamethasone in a dose of 0.25 mg/kg (i.m) and 2 milliliters of vitamin AD₃E (s.c) was administered. Based on the antibiogram, cephalexin-based syrup, orally at a dose of 40 mg/kg every 12 hours for a total of 30 days, was prescribed. The dog was bathed once with an aqueous solution of transmethrin and tetramethrin. Twice a week, the dog was bathed with an antiseptic shampoo based on chlorhexidine, for a total of 30 days. For secondary excoriations, a zinc ointment-based astringent was used topically as needed. In the dog's diet, multivitamin tablets and omega fatty acid capsules were used during the recovery period. The diet was based on commercial food for dogs suffering from dermatopathies.

The control examination was performed after seven (figure 4.), 14 and 21 days from the beginning of the therapy. After the seventh day of therapy, a significant clinical improvement was observed (figure 4.). The pinopedal reflex was positive, but the presence of parasites was not established by control skin surface scraping. Subsequent examinations were performed on days 14 and 21 when clinical improvement was still present, the pinopedal reflex was negative, and no parasitic elements were found in the skin scarifications. After 30 days of therapy, the dog was transferred to the quarantine of the asylum in Čelinac. Three months after the primary diagnosis, the dog was considered to be fully recovered from sarcoptic mange (figure 5.).



Figure 4. First control examination after diagnosis – seven days after beginning of therapy



Figure 5. Dog after three months from primary diagnosis – fully recovered from the disease

Prognosis. With the timely use of acaricides as well as antibiotics in the treatment of secondary complications, the prognosis in this case of sarcoptic mange was favorable. With proper personal protection during care and therapy, no cases of the disease have been observed in people who have been in direct contact with the dog.

DISCUSSION

Developmental cycle of the mite *Sarcoptes scabiei var. canis* in the dog's skin lasts 14-21 days, and recovery from sarcoptic mange is expected 4 to 12 weeks after diagnosis (Scott and Miller, 2013). Prolonged pruritus and pinopedal reflex are present after mites are eliminated from the skin of diseased dogs, and this itching is caused by allergies (Scott and Miller, 2013). We had a similar situation in our case. Due to the low sensitivity of skin scarification and pinopedal reflex in the diagnosis of sarcoptic mange, in our case at the time of diagnosis, these tests were useful. The finding of mites in the second scarification was a sign that the degree of infection was extremely high in this dog, and the severity of clinical presentation and dermatological condition supported that. The significance of this case description lies in the presentation of a rare disease in our area and in the proper approach to therapy and measures to prevent the further spread of the disease to other animals and people who have cared for the dog. The source of infection is difficult to determine in this case, but according to the author's experience and literature data, red foxes (*Vulpes vulpes*) are a significant source of infection for other susceptible species (Soulsbury et al., 2007; Written et al., 2019). A significant number of foxes in Republic of Srpska are infected with sarcoptic mange - unpublished results (figure 6.).



Figure 6. Sarcoptic mange in the fox – autopsy

Foxes regularly move around houses and go deep into populated places in rural and suburban, but also urban areas of Republic of Srpska. It has been documented in the literature that foxes can transmit sarcoptic mange to a large number of animals and humans (Written et al., 2019). It is important to emphasize that a more comprehensive epizootiological examination is needed to determine the real distribution of sarcoptic mange in wild and domestic carnivores in our area. In Republic of Srpska, the presence of sarcoptides has been also confirmed - *Notoedres cati* in domestic cats (Stevanović et al., 2019).

Although a small number of cases of sarcoptic mange have been diagnosed in clinical practice, mainly due to the limitation of diagnostic tests, this disease is probably widespread in the population of stray dogs. If the clinical signs are highly suggestive of sarcoptic mange, and no mites have been found in deep scarification, then a positive reaction to antiparasitic treatment - acaricidal agents is a confirmation of the diagnosis (Scott and Miller, 2013). Despite a large number of acaricidal preparations in use (organophosphates, moxidectin, selamectin, amitraz, fipronil, pyriprol, sulfur derivatives, afoxolaner, fluralaner), ivermectin is still highly effective in the treatment of sarcoptic mange, because there are still only a few cases with no positive response to this acaricidal agent (Scott and Miller, 2013). There is an isolated case registered in two dogs, that describes the resistance of *Sarcoptes scabiei* to ivermectin (Terada et al., 2010). Many cases of sarcoptic mange that do not respond to the recommended “spot on” therapy with selamectin, fipronil, and amitraz have been described (Scott and Miller, 2013). In this case, we decided to use ivermectin for several reasons: it was available, the therapy was cheap, it was easy to apply, and it was not a breed that would be potentially sensitive to ivermectin.

Regarding the clinical signs, in our case, an extremely severe and advanced form of sarcoptic mange with secondary pyotraumatic folliculitis was described. This is supported

by anemia and significant leukocytosis, which is the dominant indicator of secondary bacterial skin infection. Eosinophilia, as an indicator of parasitic infection, was not observed in this case. The pyotraumatic folliculitis was a result of a staphylococcal skin infection (the primary causative agent is *Staphylococcus pseudintermedius*), and as a result of self-injury due to intense scratching (Veco et al., 2013). Regardless of the dominant generalized presentation of sarcoptic mange, localized forms of sarcoptic mange have also been described, which further complicates the diagnosis (Pin et al., 2006). In addition to the mentioned diagnoses, which may have a similar presentation as sarcoptic mange and which occur significantly in practice (atopic dermatitis, contact dermatitis, allergy to drugs and food), differentially diagnostically important skin diseases may also include a generalized form of dermatitis caused by *Malassezia pachydermatis* (figure 7.) and autoimmune disease *Pemphigus foliaceus* (figure 8.). Although there are some differences in dermatological presentation, these diseases are rarely seen in practice compared to other dermatopathies and need to be distinguished from sarcoptic mange. Unlike sarcoptic mange, these diseases are proven by typical cytological and other laboratory findings. Atopic and contact allergic dermatitis can be eliminated based on anamnesis (the type of breeding, seasonal appearance, breeds and, age predisposition) and detailed dermatological examination (distribution of lesions, the primary initial sign is erythema, there is always symmetry of lesions, pruritus is milder, no pinopedal reflex occurs, the possible occurrence of hyperhidrosis, the possible occurrence of blepharitis, positive reaction to individual application of corticosteroids) (Rhodes and Werner, 2018). Food allergy is expected in younger dogs (as well as in all ages) and they react to hypoallergenic food.



Figure 7. Generalized dermatitis caused by *Malassezia pachydermatis*



Figure 8. *Pemphigus foliaceus* in the dog

Finally, this finding should indicate the importance of the proper diagnosis of skin diseases and the principles of long-term and proper therapy. Regardless of the similarities and the difficulty of the diagnosis, in all symmetrical papulo-crustose and pruritic lesions on the scalp, ears, abdomen, and legs, it is necessary to make deep scarifications and try to exclude or prove sarcoptic mange.

Acknowledgment

The authors thank Svjetlana Trifunović and Jelena Jerilović Rulić for technical assistance and care for the sick dog. The authors' own gratitude to Dr. Marko Vrebac for providing the photo of pemphigus, which was diagnosed in cooperation with the first author of this paper.

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Paper received: 31.05.2020.

Paper accepted: 20.10.2020.
