



A Survey of Mange-Mite in Stray Dogs from Hatay Province

Özlem Makbule KAYA¹ Şerife AKKÜÇÜK² Mustafa KARAGÖZ² Aykut ZEREK³ Mehmet YAMAN³

¹ Mustafa Kemal University, Faculty of Medicine, Department of Parasitology, Hatay, Turkey

² Mustafa Kemal University, Health Science Institute, Department of Veterinary Parasitology, Hatay, Turkey

³ Mustafa Kemal University, Faculty of Veterinary Medicine, Department of Parasitology, Hatay, Turkey

Received: 12.10.2017

Accepted: 12.12.2017

ABSTRACT

The survey aims to determine the presence of mange mites in stray dogs from Hatay province, as they are a cause of public health problem. In the present study, mange mites were investigated in 100 dogs that were brought to Hatay Metropolitan Municipality Unattended Animals Care and Rehabilitation Center between 15 September - 15 November 2016, by obtaining samples from six different areas in each dog. According to the examinations, none of the dogs had *Otodectes cynotis*, whereas *Sarcoptes scabiei* var. *Canis* was present in 2%, and *Demodex canis* was present in 21% of dogs. There was statistically significant correlation between clinical appearance and *D. canis* positivity ($p < 0.005$). There was no significant association of *D. canis* positivity with age, sex or race ($p > 0.005$). Nearly $\frac{1}{4}$ of dogs were infested with *D. canis*. The high rate of mite infestation may pose great risk for dog owners and people sharing the same environment.

Keywords: *Demodex canis*, *Sarcoptes scabiei* var. *Canis*, *Otodectes cynotis*, Hatay, Mange

ÖZ

Hatay Yöresi Sokak Köpeklerinde Uyuz Etkenlerinin Araştırılması

Çalışmada; Hatay sokak köpeklerinde hem hayvanlar hem de insanlar için halk sağlığı problemi olan uyuz etkenlerinin varlığının araştırılması amaçlanmıştır. Hatay Büyükşehir Belediyesi Sahipsiz Hayvan Bakım ve Rehabilitasyon Merkezi'ne 15 Eylül / 15 Kasım 2016 tarihleri arasında girişi yapılan 100 köpekte her bir köpeğin altı farklı bölgesinden numune alınarak uyuz etkenleri araştırılmıştır. Yapılan incelemede *Otodectes cynotis*'e rastlanmazken, *Sarcoptes scabiei* var. *Canis* %2, *Demodex canis* %21 oranında pozitif bulunmuştur. Klinik görünüm ve *D. canis* pozitifliği arasındaki fark istatistiksel olarak anlamlı bulunmuştur. ($p < 0.005$). *Demodex canis* ile yaş, cinsiyet ve ırk arasında istatistiksel olarak anlamlı fark tespit edilmemiştir ($p > 0.005$). Köpeklerin yaklaşık $\frac{1}{4}$ 'ü *D. canis* ile enfekte bulunmuştur. Yüksek orandaki uyuz enfestasyonu aynı çevreyi paylaşan köpek sahipleri ve insanlar için risk teşkil edebilmektedir.

Anahtar Kelimeler: *Demodex canis*, *Sarcoptes scabiei* var. *Canis*, *Otodectes cynotis*, Hatay, Uyuz

INTRODUCTION

In dogs, *Demodex canis*, is a cause of mange causing demodicosis, which is a common skin disease, observed clinically in veterinary practice (Beyazit et al. 2010; Singh et al. 2011; Sivajothi et al. 2015). This parasite can be transmitted to the newborn puppies following birth from their mothers via direct contact. Therefore, it is an ectoparasite that can be normally observed in the skin flora of healthy dogs (Beyazit et al. 2010; Fondati et al. 2010; Ravera et al. 2013; Sivajothi et al. 2015). Loss of hair, inflammation of hair follicles and sebaceous glands, furunculosis and secondary bacterial infections are the main symptoms of demodicosis (Beyazit et al. 2010). The disease generally occurs in two forms as localized and generalized disease, although pododemodicosis, a type of the generalized form that is restricted to the paws also exists. The localized form causes a mild, benign disease

with well-defined borders in head and front feet. Unlike localized form, generalized form spreads to the body, causing a serious, life-threatening disease with irregular borders (Beyazit et al. 2010; Hutt et al. 2015). Localized form is generally seen in dogs aged less than 1 year old, whereas the more serious generalized form occurs in dogs aged above 4 years due to weakened immune system (Beyazit et al. 2010; Martinez-Subiela et al. 2014; Hutt et al. 2015). Localized demodicosis heals spontaneously in 90% of the cases, while the remaining 10% can transform to the generalized form (Arslan et al. 2009).

As the main agent of mange in dogs, *Sarcoptes scabiei* var. *canis* is important in veterinary practice. It is transmitted via direct contact between dogs, and causes severe itching. *Otodectes cynotis* is the most common cause of otitis externa characterized by irritation and itching in ears and head shaking, present in 50% of cats and far less common in dogs and foxes. It is an important cause of mange, and it

has also been reported to be transmitted to humans (Chee et al. 2008; Khaxhiu et al. 2009; Maazi et al. 2010).

Commonly used medications to treat mange in dogs include amitraz, ivermectin, selamectin, moxidectin, doramectin and milbemycin oxime (Six et al. 2000; Beyazit et al. 2010; Martinez-Subiela et al. 2014; Hutt et al. 2015; Sivajothi et al. 2015).

The study aims to determine the presence of mange mites, in stray dogs of various age, sex and race from Hatay province that are brought to animal shelter, as they are a cause of public health problem.

MATERIALS and METHODS

Ethics Committee, with issue number 2016/7-5. The study included 100 dogs 48 were female and 52 were male that were brought to Hatay Metropolitan Municipality Unattended Animals Care and Rehabilitation Center between 15 September - 15 November 2016. The dogs included in the study were especially selected among the dogs that did not receive treatment. A score was given to every dog based on the clinical appearance with regard to mange (Table 1). Clinical scoring was determined similar to the literature (Ural et al. 2012; Yipel 2014). According to these scores, dogs that did not show any clinical signs, and dogs that had at least one of the findings including itching, alopecia, erythema, hyperpigmentation and crusting were categorized clinically as healthy, or in mild, moderate or severe disease groups. The associations of mange mites with dogs' age, sex and race were evaluated.

In each dog, totally six samples were obtained from inside of the ear, face (side of the mouth), neck, abdominal region, inguinal region and hind foot. The samples were obtained by scraping the skin along with hair follicles using a scalpel dipped in glycerine. The scraping was done as to make the skin bleed, from an area approximately 5 cm², and collected to a petri dish. Then, the samples were transferred to a 10% KOH solution, and the preparations were examined under a light microscope with x10 and x40 magnification for presence of *D. canis* and *S. scabiei* var. *canis* agents. Samples obtained from inside of the ear were subjected to the same procedures, and were examined for presence of *O. cynotis*.

Table 1. Clinical scoring in mange in dogs.

Symptom	0	1	2	3
Erythema	-	Mild	Moderate	Severe
Pruritus	-	Mild itching	Intermittent itching	Continuous itching
Alopecia- hair loss	-	0-50%	50-75%	>75%
Hyperpigmentation	-	Mild	Moderate	Severe
Crusting	-	Mild	Moderate	Severe

Statistical Analysis

Statistical analysis was performed using SPSS for Windows version 22. Assessment of the distribution of variables was made with visuals (histograms) and analytic (Kolmogorov-Smirnov/ Shapiro Wilk's) tests. Statistical comparisons between variables were made using nonparametric X² test. p<0.05 was accepted as statistically significant.

RESULTS

Of the 100 dogs included in the study, 48 were female and 52 were male. Age of the dogs varied between 1-96 months old, and means age was 29.19±18.6 months. Regarding their races, majority of the dogs (92%) were mixed race as there is no control over breeding of stray dogs, whereas 4% were terrier, 1% was hound, 1% was german shepherd, 1% was kangal, 1% was pit bull.

The dogs were classified according to their scores with regard to the severity of skin findings including erythema, alopecia, hyperpigmentation, pruritus and crusting (Table 2). In examination of the clinically healthy and diseased dogs, *O. cynotis* was not detected in any of the dogs. *Sarcoptes scabiei* var. *canis* was detected only in two female puppies that were two months old each, in all body areas except ear.

Table 2. Distribution of dogs by disease status.

Clinical Status	n	%
Healthy	59	59
Mild	27	27
Moderate	10	10
Severe	4	4
Total	100	100

Demodex canis was found in 21 of the 100 dogs. The parasite was detected in a single region in only two dogs (neck, foot), where it was detected in at least two areas in the remaining 19 dogs. The number of dogs according to the infested regions is shown in Table 3.



Fig 1. *Demodex canis* (x10 Original magnification)

Demodex canis was detected in 4 of the 59 dogs that were classified as healthy based on external inspection, in 9 of 27 dogs with mild disease, in 6 of 10 dogs with moderate disease, and in 2 of 4 dogs with severe disease (Figure 1).

There was statistically significant correlation between clinical appearance and *D. canis* positivity ($p < 0.005$).

Table 3. The number of regions where *Demodex canis* were detected in dogs.

	Face	Neck	Abdomen	Inguinal region	Feet
Number	16	10	9	10	14

Mean age was 33.1 ± 19.23 months in dogs that were positive for *D. canis*, and 27.82 ± 18.4 months in dogs that were negative. There was no statistically significant association between age and *D. canis* positivity ($p > 0.005$).

Of 21 dogs that were positive for *D. canis*, 9 were female and 12 were male. There was no statistically significant association between sex and *D. canis* positivity ($p > 0.005$).

DISCUSSION

Mange mites are infectious agents that pose threat to the human and animal health in the whole world. They have high risk of recurrence, and therefore require long-term follow-up in the treatment. Currently three hundred thousand people are estimated to be infested with *Sarcoptes scabiei*. Besides other animals infested with mange mites, these mites are an important problem for dogs as well. They affect different body areas in dogs, causing flaking, erythema, crusting and alopecia (Chen et al. 2014).

Demodex canis is a mite present in the normal skin flora of healthy dogs, and it is present in almost every dog in small numbers. Most animals are only carriers, and do not develop clinical symptoms (Gothe 1989). On the other hand, it can cause an inflammatory disease called demodicosis, which is more prevalent in pedigree dogs and have hereditary tendency in kennels (Lacey et al. 2009; It et al. 2010).

Between 2000-2011, several studies from around the world, including countries like Korea, Albania, Mexico and Iran, have examined these mange mites. These studies reported the prevalence of *D. canis* as 0.2-23%, *S. scabiei* var. *canis* as 0.7-35.6% and *O. cynotis* as 2.8-24.26% (Six et al. 2000; Rodriguez-Vivas et al. 2003; Chee et al. 2008; Xhaxhiu et al. 2009; Mosallanejad et al. 2012; Ebrahimzade et al. 2016; Shukullari et al. 2017). One study from Turkey found *D. canis* positivity as 40% (Değer et al. 1994). In this study, we found the presence of animals infested with mange mites as 23%. This rate was found as 21% for *D. canis*, and 2% for *S. scabiei* var. *canis*. We did not detect *O. cynotis* in the present study. This is because *O. cynotis* is more prevalent in cats and less frequently observed in dogs (Maazi et al. 2010; Lefkaditis et al. 2015).

One study compared the sexes in terms of infestation rates, and found significantly high 26.9% rate in male dogs (Chee et al. 2008). On the other hand, another study did not find difference between the sexes regarding the infestation rate (Xhaxhiu et al. 2009). In the present study, we did not find significant difference between different sexes. Similar results have been reported regarding the relationship between age and infestation rate. One study from Korea reported higher prevalence (66.7%) among dogs aged younger than one year, whereas other studies from Albania and Iran did not find any significant difference regarding age (Chee et al. 2008; Xhaxhiu et al. 2009; Mosallanejad et al. 2012). In the present study, we did not

find statistically significant relationship between age and infestation.

Susceptibility to demodicosis and clinical progression of the disease can be influenced by various factors including hormonal state, race, age, nutritional state, oxidative stress, stage of the menstrual cycle, giving birth, endoparasitism and weakening diseases. Among these factors, immune state is thought to be the most important (Singh and Dimri 2014). Our results regarding the relationship between infestation and age and sex are observed to be similar with other studies. The reasons for the variations between the results of different studies are not easy to identify, but can be attributed to many factors such as seasonal changes, geographical region, and biological and epidemiological factors including race and body resistance of the examined animals.

In the present study, all of the dogs which were found to have *Demodex* agent around their mouth also had the same agent in at least one other area in their body. None of the dogs had isolated *Demodex* infestation of the face. Foot was the second most frequently infested area in dogs. The reason why mouth and foot region were more frequently infested may be because dogs use their mouth and feet for itching. We found significant correlation between clinical scores and infestation. At least 1/3-1/2 of the dogs that had a lesion were found to be infested by *D. canis*. This indicates that up to half of the dogs that have lesions in their body may be infested by *D. canis*, and should be evaluated in terms of this mite.

In this study, nearly ¼ of stray dogs were found to harbor zoonotic mange mites. This quite high rate can pose risk for dog owners that share the same environment with stray dogs, and for the health of shelter workers, people dealing with stray dogs, veterinary physicians, and dog owners. Therefore, people under risk should be warned to take necessary precautions, and to take hygienic measures for protection.

ACKNOWLEDGEMENT

The authors declare that there are no funding support and no conflict of interest in this study.

REFERENCES

- Arslan HH, Açıcı M (2009). Bir Alman Çoban Köpeğinde lokal demodikozis enfestasyonunda tedavi yaklaşımı. *Vet Hekim Der Derg*, 80(3), 13-16.
- Beyazit A, Inceboz T, Over L (2010). Contribution to one world, one health: a dog with demodicosis. *Turkiye Parazitol Derg*, 34(1), 68-71.
- Chee JH, Kwon JK, Cho HS, Cho KO, Lee YJ, Abd El-Aty AM, Shin SS (2008). A survey of ectoparasite infestations in stray dogs of Gwang-ju City, Republic of Korea. *Korean J Parasitol*, 46(1), 23-27.
- Chen YZ, Liu GH, Song HQ, Lin RQ, Weng YB, Zhu XQ (2014). Prevalence of *Sarcoptes scabiei* infection in pet dogs in southern China. *ScientificWorldJournal*, 2014, 718590.
- Deger S, Taşçı S, Akgül Y, Alkan İ (1994). Van ve Yöresinde Evcil Hayvanlarda Ektoparazitler Dermatitler. *YYU Vet Fak Derg*, 5(1), 155-161.
- Ebrahimzade E, Fattahi R, Ahoo MB (2016). Ectoparasites of Stray Dogs in Mazandaran, Gilan and Qazvin Provinces, North and Center of Iran. *J Arthropod Borne Dis*, 10(3), 364-369.
- Fondati A, De Lucia M, Furiati N, Monaco M, Ordeix L, Scarpella F (2010). Prevalence of *Demodex canis*-positive healthy dogs at trichoscopic examination. *Vet Dermatol*, 21(2), 146-151.
- Gothe R (1989). Demodicosis of dogs a factorial disease? *Berl Munch Tierarztl Wochenschr*, 102(9), 293-297.
- Hutt JH, Prior IC, Shipstone MA (2015). Treatment of canine generalized demodicosis using weekly injections of doramectin: 232 cases in the USA (2002-2012). *Vet Dermatol*, 26(5), 345-349, e373.

- It V, Barrientos L, Lopez Gappa J, Posik D, Diaz S, Golijow C, Giovambattista G (2010).** Association of canine juvenile generalized demodicosis with the dog leukocyte antigen system. *Tissue Antigens*, 76(1), 67-70.
- Lacey N, Kavanagh K, Tseng SC (2009).** Under the lash: *Demodex* mites in human diseases. *Biochem (Lond)*, 31(4), 2-6.
- Lefkaditis MA, Sossidou AV, Panorias AH, Koukeri SE, Pastiu AI, Athanasiou LV (2015).** Urban stray cats infested by ectoparasites with zoonotic potential in Greece. *Parasitol Res*, 114(10), 3931-3934.
- Maazi N, Jamshidi S, Hadadzadeh H (2010).** Ear mite infestation in four imported dogs from Thailand; a case report. *Iran J Arthropod Borne Dis*, 4(2), 68-71.
- Martinez-Subiela S, Bernal LJ, Tvarijonavičiute A, Garcia-Martinez JD, Tecles F, Ceron JJ (2014).** Canine demodicosis: the relationship between response to treatment of generalised disease and markers for inflammation and oxidative status. *Vet Dermatol*, 25(2), 72-76, 23-74.
- Mosallanejad B, Alborzi A, Katvandi N (2012).** A Survey on Ectoparasite Infestations in Companion Dogs of Ahvaz District, South-west of Iran. *J Arthropod Borne Dis*, 6(1), 70-78.
- Ravera I, Altet L, Francino O, Sanchez A, Roldan W, Villanueva S, Bardagi M, Ferrer L (2013).** Small *Demodex* populations colonize most parts of the skin of healthy dogs. *Vet Dermatol*, 24(1), 168-172
- Rodriguez-Vivas RI, Ortega-Pacheco A, Rosado-Aguilar JA, Bolio GM (2003).** Factors affecting the prevalence of mange-mite infestations in stray dogs of Yucatan, Mexico. *Vet Parasitol*, 115(1), 61-65.
- Shukullari E, Rapti D, Visser M, Pfister K, Rehbein S (2017).** Parasites and vector-borne diseases in client-owned dogs in Albania: infestation with arthropod ectoparasites. *Parasitol Res*, 116(1), 399-407.
- Singh SK, Dimri U (2014).** The immuno-pathological conversions of canine demodicosis. *Vet Parasitol*, 203(1-2), 1-5.
- Singh SK, Dimri U, Sharma MC, Swarup D, Sharma B, Pandey HO, Kumari P (2011).** The role of apoptosis in immunosuppression of dogs with demodicosis. *Vet Immunol Immunopathol*, 144(3-4), 487-492.
- Sivajothi S, Sudhakara Reddy B, Rayulu VC (2015).** Demodicosis caused by *Demodex canis* and *Demodex cornei* in dogs. *J Parasit Dis*, 39(4), 673-676.
- Six RH, Clemence RG, Thomas CA, Behan S, Boy MG, Watson P, Benchaoui HA, Clements PJ, Rowan TG, Jernigan AD (2000).** Efficacy and safety of selamectin against *Sarcoptes scabiei* on dogs and *Otodectes cynotis* on dogs and cats presented as veterinary patients. *Vet Parasitol*, 91(3-4), 291-309.
- Ural K, Voyvoda H, Ulutas B, Pasa S, Aysul N, Gultekin M (2012).** Understanding Primary and Secondary Skin Lesions among Infectious Dermatoses in Dogs: Lessons We Learned from Cases. *Animal Health, Prod. and Hyg*, 1(2), 86-99.
- Xhaxhiu D, Kusi I, Rapti D, Visser M, Knaus M, Lindner T, Rehbein S (2009).** Ectoparasites of dogs and cats in Albania. *Parasitol Res*, 105(6), 1577-1587.
- Yipel FA (2014).** Kedilerde Kulak Uyuzu (*Otodectes cynotis*) Sağaltımında Ozonlanmış Zeytinyağı ve Bazı Esansiyel Yağların (*Allium sativum L.*, *Origanum majorana L.*) Etkileri MSc, Afyon Kocatepe Üniversitesi.