

Morphometry of *Demodex* species in dogs

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Abstract

The present study was carried out to record the mean length and width of gnathosoma, podosoma and opisthosoma of two different *Demodex* mites in dogs. The mean lengths gnathosoma, mean width of gnathosoma, podosoma and opisthosoma did not differ significantly ($P>0.05$); mean length of podosoma, opisthosoma and the total body differed significantly ($P<0.05$) between both types of mites of *Demodex canis* and *Demodex cornei*. The present study suggests that apart from examination of deep skin scrapings, tape impression smears may also be made a regular practice while dealing with demodicosis suspected dogs in order to detect the surface dweller like *Demodex cornei*.

Keywords: *Demodex cornei*, *Demodex canis*, Dog, Morphometry

Introduction

Demodicosis presents as a severe and intensely itchy inflammatory condition affecting the hair follicles and sometimes in sebaceous glands of a dog's skin. *Demodex* is a cigar-shaped, eight-legged parasite, is the culprit, visible under microscopic examination (Mueller *et al.*, 2020). Typically, it is normal resident on canine skin and it can proliferate rapidly, leading to generalized disease, particularly in immunocompromised dogs, regardless of breed, sex, or age (Reddy *et al.*, 2015). Among the *Demodex* species commonly found in dogs are *Demodex canis*, *Demodex cornei* and *Demodex injai* (Izdebska *et al.*, 2011). In 2010, identification of the different *Demodex* mites was done based on the morphological variation such as shape and length of opisthosoma (Reddy *et al.*, 2011; Sivajothi *et al.*, 2015). Molecular studies were carried out to distinguish between the *Demodex canis* and *Demodex cornei* (deRojas *et al.*, 2012; Yoon *et al.*, 2020). The aim of this communication is to present a comparison of the morphometry of these two different *Demodex* mites with gap of 12-year period in the same geographical location, highlighting the importance of collection of samples for dermatological examination.

Materials and Methods

Present study was carried out at Department of Veterinary Medicine, College of Veterinary Science, Proddatur on four dogs which were presented with generalized alopecia, hyperpigmentation, scales, mild to

moderate pruritus. Physical examination of dogs revealed widespread alopecia, hyperkeratosis, lymphadenopathy and lichenification on the feet, trunk, abdomen, tail and periorbital alopecia. For further dermatological examination, skin scrapings were obtained using a scalpel blade dipped in glycerin, continuing until a slight ooze of blood was observed from the dermal capillaries. Tape impression smears were collected for further identification of mites. Morphological characteristics of the two types were evaluated, including the lengths of gnathosoma, podosoma and opisthosoma (Fig. 1A). The precise size of the microorganisms was determined using calibrated ocular lenses and a stage micrometer (Erma objective micrometer, Japan) under a compound light microscope (Olympus microscope Model CH-20i). The data were analyzed and results were recorded as mean $\pm$ standard error. Comparison between the two different mites was conducted using Student's t-test in the SPSS®. Dogs were administered with weekly subcutaneous injections of doramectin at a dosage of 0.6 mg/kg body weight along with the supportive medications. After 6 - 8 weeks of treatment, the skin lesions successfully resolved and dogs were free from mites.

Results and Discussion

Microscopic examination of deep skin scrapings revealed *Demodex canis* and tape impression examination revealed the *Demodex cornei* mites. *Demodex canis* displayed distinctive characteristics, including a cigar-shaped body divided into three parts: gnathosoma, podosoma with four pairs of stumpy legs, and opisthosoma with transverse striations on both dorsal and ventral surfaces. The gnathosoma bore

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mouthparts consisting of paired palps, chelicerae, and an unpaired hypostome. Epimeral plates, trapezoidal in shape, were observed on the ventral surface of the podosoma. The opisthosoma was elongated and slender, tapering towards the posterior end. *Demodex cornei* exhibited short, stumpy legs on the podosoma and a shorter opisthosoma with rounded terminal end (Fig.1B, 1C). Identification of the mites based on the morphology as per the previous references (Sivajothi *et al.*, 2013).

The morphometric measurements of *Demodex* species were summarized in Table 1. For *Demodex canis* including both adult males and females, mean length of gnathosoma, podosoma, opisthosoma and total body length were $20.78 \pm 0.87 \mu\text{m}$ (range from 19.4 to 22.1), $63.18 \pm 0.67 \mu\text{m}$ (range from 62.1 to 64.7), $132.71 \pm 2.66 \mu\text{m}$ (range from 129.2 to 135.3) and $216.67 \pm 4.33 \mu\text{m}$ (range from 209.7 to 222.5) respectively. Measurement of *Demodex cornei*, including adult males and females, yielded mean length of gnathosoma, podosoma, opisthosoma and total body length as $19.01 \pm 0.15 \mu\text{m}$ (range from 18.7 to 20.2), $60.87 \pm 1.77 \mu\text{m}$ (range

from 58.1 to 62.2), $64.71 \pm 0.96 \mu\text{m}$ (range from 62.7 to 66.2) and $143.81 \pm 3.12 \mu\text{m}$ (range from 139.7 to 148.5) respectively. The mean length of gnathosoma, mean width of gnathosoma, podosoma and opisthosoma did not differ significantly; mean length of podosoma, opisthosoma and the total body differed significantly between both types of mites of *Demodex canis* and *Demodex cornei*. In the present study, morphological variation and the difference in the morphometry can be useful to separate the two different mites.

The present study suggests that apart from examination of deep skin scrapings, examination of tape impression smears may also be made a regular practice while dealing with demodicosis suspected dogs in order to detect the surface dweller like *Demodex cornei*. Further research studies are warranted to record the variations in the pathophysiology, development of clinical signs and therapeutic variations in formulation of treatment protocol for the two types of *Demodex* mites in dogs.

Table 1. Micrometry of *Demodex canis* and *Demodex cornei* mites

Parameters		Different mites			Reddy et al., (2011)	
		<i>Demodex canis</i> (n:30)	<i>Demodex cornei</i> (n:30)	P-value	<i>Demodex canis</i>	<i>Demodex cornei</i>
Gnathosoma	L (μm)	20.78 $\pm$ 0.87	19.01 $\pm$ 0.15	0.058 ^{NS}	19.02 $\pm$ 0.15	18.86 $\pm$ 0.13
	W (μm)	19.91 $\pm$ 0.31	17.92 $\pm$ 0.72	0.072 ^{NS}		
Podosoma	L (μm)	63.18 ^b $\pm$ 0.67	60.87 ^a $\pm$ 1.77	0.048*	63.13 $\pm$ 0.75	57.52 $\pm$ 1.14
	W (μm)	38.92 $\pm$ 0.28	37.17 $\pm$ 0.18	0.092 ^{NS}		
Opisthosoma	L (μm)	132.71 ^b $\pm$ 2.66	64.71 ^a $\pm$ 0.96	0.001**	130.19 $\pm$ 2.35	50.82 $\pm$ 1.78
	W (μm)	34.82 $\pm$ 0.18	35.81 $\pm$ 0.55	0.088 ^{NS}		
Total body length	L (μm)	216.67 ^b $\pm$ 4.33	143.81 ^a $\pm$ 3.12	0.001**	212.57 $\pm$ 2.06	123 $\pm$ 1.9

*P<0.05; **P<0.01; ^{NS}P>0.05; ^{ab}Columns bearing different superscripts differ significantly.

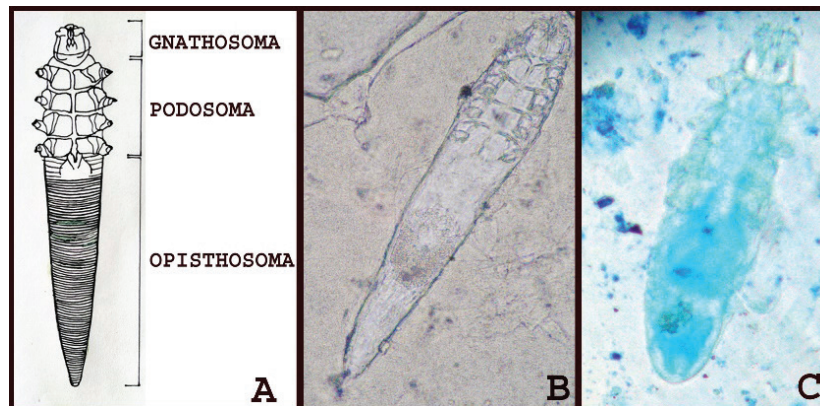


Fig.1. Morphometry of two different mites (*Demodex canis*; *Demodex cornei*)

References

- de Rojas. M, Riazzo. C., Callejón. R., Guevara .D and Cutillas .C. (2012). Molecular study on three morphotypes of Demodex mites (Acarina: Demodicidae) from dogs. *Parasitol. Res.*, **111**(5) :2165-72.
- Izdebska. J. N. and Fryderyk. S. (2011). Diversity of three species of the genus *Demodex* parasitizing Dogs in Poland. *Polish Journal of Environmental Studies*, **20** (3): 565-569.
- Mueller. R.S., Rosenkrantz. W., Bensignor, E., Karaś-Tęcza. J., Paterson.T and Shipstone, M. A. (2020). Diagnosis and treatment of demodicosis in dogs and cats: clinical consensus guidelines of the World Association for Veterinary Dermatology. *Vet. Dermatol.*, **31**(1) : 4-e2.
- Reddy. B.S., Kumari. K.N., Rayulu. V.C. and Sivajothi. S. (2011). *Demodex cornei* causing demodicosis in dogs. *Indian J. Vet. Med.*, **31**(2): 100-102.
- Reddy. B.S., Kumari. K.N and Sivajothi. S. (2015). Haematobiochemical findings and thyroxin levels in canine demodicosis. *Comp. Clin. Pathol.*, **24**:287–290. DOI 10.1007/s00580–014–1893–y.
- Sivajothi .S., Reddy B.S and Rayulu. V.C. (2015). Demodicosis caused by *Demodex canis* and *Demodex cornei* in dogs. *J. Parasitic Dis.*, **39**(4) :673-676.
- Yoon .J, Kim. G., Yoon. E., Cho. K., Jung. D., Park. J, and Yu. D. (2020). **Adult-onset Demodicosis Caused by *Demodex canis* and *Demodex cornei* in a Yorkshire Terrier Dog.** *J. Vet. Clin.*, **37**: 96-99.