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## Dual demodicosis in a dog: Diagnosis and micrometry analysis

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### Abstract

A nondescript dog aged six months was presented with a history of alopecia, severe itching, thickening of skin on ears, around eyes, forehead and lateral aspects of abdomen. Clinical examination revealed dermatitis, irregular skin lesions, crust formation, erythema, pruritis and alopecia on the affected area. Upon microscopic analysis of the skin scrapings, it was found that there were abundant short tailed *Demodex cornei* mites and long tailed *Demodex canis* mites. Micrometry was carried out for the two different species of *Demodex* mites and statistically analysed. The dog was treated with oral ivermectin @ dose of 400 µg/kg body weight for 21 days along with topical application of amitraz. A marked improvement was observed as the dog achieved complete clinical recovery, accompanied by the absence of mites in skin scrapings during two consecutive weekly examinations.

**Keywords:** Dermatitis, *Demodex canis*, *Demodex cornei*, Micrometry, Ivermectin

### 1. Introduction

Canine demodicosis is a prevalent parasitic skin disease frequently encountered in veterinary practice, resulting from the proliferation of *Demodex* mites in the hair follicles and sebaceous glands of affected dogs (Kelly *et al.*, 2022) [2]. Scientific evidence has conclusively demonstrated that the *Demodex* mite is a natural part of the healthy canine skin microflora (Mueller *et al.*, 2020) [5]. Furthermore, it has been observed that puppies acquire these mites from their mother during the initial days of their life (O'Neill *et al.*, 2020) [6]. There are three distinct species of *Demodex* mites known to affect dogs, which include *Demodex canis* (*D. canis*), *Demodex injai* (*D. injai*), and *Demodex cornei* (*D. cornei*) (JN Izdebska and Rolbiecki, L, 2018) [1]. *D. canis*, primarily residing in hair follicles, is commonly found in the majority of clinical cases (Plant *et al.*, 2011) [7]. Additionally, the long-bodied *D. injai*, which inhabits the sebaceous glands, has also been implicated. Male *D. injai* mites were observed to be more than twice the length of male *D. canis* mites (Moskvina *et al.*, 2017) [3]. A short-bodied *D. cornei* mite is found in the superficial layer of the epidermis, measuring approximately half the length of a female *D. canis* mite. *D. canis* causes demodectic folliculitis and/or furunculosis in dogs, while *D. Injai* is associated with the development of oily skin and hair coat on the trunk of dogs. On the other hand, *D. cornei* is responsible for pruritic skin disease in canines (Sakulploy and Sangvaranond, 2010) [8]. The definitive diagnosis of canine demodicosis is achieved by detecting a large number of adult mites and/or immature forms in deep skin scrapings, hair plucking, or acetate tape impressions. In certain cases, otic swabs and histopathology may be utilized based on the type and location of the lesion (Mueller *et al.*, 2017) [4]. This paper describes occurrence of concurrent infestation by *D. cornei* and *D. canis* in a dog. The study includes a detailed analysis of mite measurements and outlines the therapeutic approach utilized for effective management of the infestation.

### 2. Materials and Methods

A six months old female nondescript dog was presented to the Veterinary Clinical Complex, Veterinary College and Research Institute, Udumalpet with a history of hair loss, pruritis, itching and thickening of the skin on ears, around eyes, forehead and lateral aspect of abdomen since 3 weeks.

Clinical examination revealed alopecia, papules, pustules, erythema, crust formation, thickening of the skin and cellulitis. The lesions were distributed over the ears, forehead, around eyes and lateral aspects of abdomen (Fig 1). Superficial and deep skin scrapings were collected from the affected areas following the application of paraffin oil to moisten the skin.

### 3. Results and Discussion

Microscopic analysis of the skin scrapings revealed the presence of numerous *Demodex* mites in various stages of their life cycle (Fig 2). Superficial skin scrapings demonstrated numerous short tailed *D. cornei* (Fig 3) and less number of *D. canis*. Deep skin scrapings showed large numbers of *D. canis* mites (Fig 4). The identification of *Demodex* mite species was determined by evaluating clinical signs, mite habitats and morphological features, including size. Based on these observations and laboratory findings, the case was diagnosed as a mixed infestation of *D. canis* and *D. cornei*, confirming the presence of demodicosis (Fig 5). The dog was treated for 21 days with oral ivermectin at a dosage of 400 µg/kg body weight. Additionally, topical application of 12.5% amitraz at a concentration of 5 mL per litre of water was administered twice weekly for a duration of 4 weeks (Saravanan and Palanivel, 2018) [11]. Clinical signs resolved and new hair growth on affected skin started after 7<sup>th</sup> day of treatment and complete uneventful recovery observed after 21 days of treatment. Two consecutive skin scrapings at weekly interval were found negative.

Ten adult mites, both male and female of *D. canis* and *D. cornei* were used for morphological studies and morphometric analysis. *Demodex* spp. exhibits a characteristic overall structure, comprising the head or gnathosoma containing the mouthparts, as well as the idiosoma and extremities. The idiosoma consists of the podosoma, where the legs are attached, and the opisthosoma, located distally to the legs. Notably, *Demodex* species are characterized by an elongated, cigar-like idiosoma, ring-like segmentation of the opisthosoma, and very short legs with claw-like hooks at the tips. *D. cornei* mites exhibited a long body structure with short and stumpy legs on the podosoma region, notably possessing a shorter opisthosoma compared to *D. canis*. Measurements of the gnathosoma, podosoma, opisthosoma, and total body length were recorded for both mite species (Table 1). Statistical analysis was conducted using Student's t-test in the SPSS software.



**Fig 1:** Dog – Demodicosis - Erythema on forehead – alopecia - crust formation

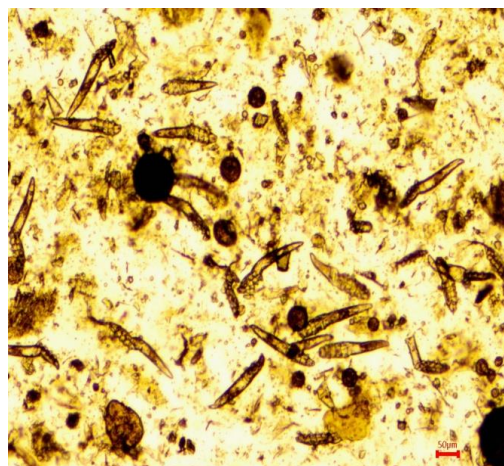
Based on the measurements of the mites, it was observed that *D. cornei* exhibited a shorter body length compared to *D. canis*. Specifically, the total body length of *D. cornei* ( $149.46 \pm 11.48 \mu\text{m}$ ) accounted for approximately 55-72% of the total body length of *D. canis* ( $217.29 \pm 5.24 \mu\text{m}$ ). Moreover, the average opisthosoma length of *D. cornei* ( $67.19 \pm 8.27 \mu\text{m}$ ) was approximately 50% of that observed in *D. canis* ( $132.86 \pm 6.05 \mu\text{m}$ ). These findings are consistent with the results reported in previous studies conducted by Sakulploy and Sangvaranond (2010) [8] as well as Sivajothi *et al.*, 2015 [9]. Significant differences ( $P < 0.01$ ) were observed in the lengths of the total body and opisthosoma between the two types of mites. However, there were no significant differences ( $P > 0.05$ ) in the lengths of the podosoma and gnathosoma.

In this study, *D. cornei* infestation manifested as scaly and pruritic skin diseases, which is consistent with previous reports (Tater and Patterson, 2008; Sivajothi *et al.*, 2015) [10, 9]. Furthermore, the authors observed that the intensity of pruritus in *D. cornei* infestations was correlated with the mite burden, suggesting a relationship between the number of mites and the degree of pruritus. In contrast, canine demodicosis resulting from *D. canis* infestation commonly presents as alopecic skin diseases rather than pruritic skin diseases, unless there is a concurrent secondary bacterial infection, in which case the intensity of pruritus may be influenced by the severity of the secondary infection (Muller *et al.*, 2020).

The technique used for mite collection can provide valuable diagnostic information. Since *D. cornei* resides in the stratum corneum of the epidermis, superficial skin scraping or tape preparation techniques are suitable for its collection. On the other hand, *D. canis* inhabits hair follicles, sebaceous glands, and deeper layers of the dermis, necessitating deeper skin scrapings or hair plucking techniques for effective diagnosis (Sakulploy and Sangvaranond, 2010) [8].

### 4. Conclusion

This study presents a case of canine demodicosis caused by a mixed infestation of *Demodex canis* and *Demodex cornei* mites. Species identification of the mites was determined by considering clinical signs, mite habitats, morphology, and morphometric analysis. The treatment approach involved administering oral ivermectin at a dosage of 400 µg/kg body weight for duration of 21 days, accompanied by appropriate supportive therapy. The treatment administered in this study achieved a successful eradication of the mite infestation in the dog, leading to a complete recovery from the condition.



**Fig 2:** *Demodex* mites in the skin scraping bar = 50 µm



**Fig 3:** Adult – short tailed - *Demodex cornei* bar = 20  $\mu$ m



**Fig 4:** Adult – ventral aspect - *Demodex canis*, *Demodex* mite egg (arrow) bar = 20  $\mu$ m



**Fig 5:** *Demodex canis* (a), *Demodex cornei* (b) bar = 40  $\mu$ m

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