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) [1]. Scientific evidence has conclusively demonstrated that the Demodex mite is a natural part of the healthy canine skin microflora (Mueller et al., 2020) [2]. 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) [3]. 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) (IN Izdebska and Rolbiecki, L, 2018) [4]. D. canis, primarily residing in hair follicles, is commonly found in the majority of clinical cases (Plant et al., 2011) [5]. 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) [6]. 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) [7]. 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 occurrences 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 (Saravanavan and Palanivel, 2018) [11]. Clinical signs resolved and new hair growth on affected skin started after 7th 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.

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 ± 11.48 μm) accounted for approximately 55-72% of the total body length of D. canis (217.29 ± 5.24 μm). Moreover, the average opisthosoma length of D. cornei (67.19 ± 8.27 μm) was approximately 50% of that observed in D. canis (132.86 ± 6.05 μm). 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]. 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 3: Adult – short tailed - Demodex cornei bar = 20 μm

Fig 4: Adult – ventral aspect - Demodex canis, Demodex mite egg (arrow) bar = 20 μm

Fig 5: Demodex canis (a), Demodex cornei (b) bar = 40 μm

5. References