

Canine Demodicosis caused by *Demodex canis* and short opisthosomal *Demodex cornei* in Shi Tzu dog from Bangkok Metropolitan Thailand

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บทคัดย่อ

สุนัขพันธุ์ Shi Tzu เพศผู้ อายุ 4 ปีถูกนำมาที่คลินิกสัตวแพทย์แห่งหนึ่งซึ่งตั้งอยู่ในเขตภาษีเจริญ กรุงเทพมหานคร โดยมีปัญหาเกี่ยวกับโรคผิวหนังซึ่งไม่ตอบสนองต่อการรักษามาเป็นเวลานานประมาณ 2 ปี สุนัขมี generalised skin erythema และ greasy skin โดยเฉพาะอย่างยิ่งบนเท้าทั้ง 4 ข้าง บริเวณหน้าและใบหูด้านในทั้ง 2 ข้าง บนพื้นผิวหนังด้านบนของลำตัวสุนัขจะพบ follicular papules และ furuncles จำนวนมาก ซึ่งแผ่ปกคลุมพื้นที่ทั้งหมด สุนัขมีอาการคันอย่างรุนแรงที่ใบหูทั้ง 2 ข้าง และพบ hot spots บนแก้มทั้ง 2 ข้างซึ่งมีเส้นผ่าศูนย์กลางประมาณ 2 ซม. ผลการทำ cytology ของช่องหูทั้ง 2 ข้างของสุนัขพบ cocci จำนวนมาก และพบ yeasts ในจำนวนน้อย intracellular cocci ถูกตรวจพบจากการทำ cytology ของผิวหนังสุนัข และยังพบการติดไร้เรื้อรัง 2 ชนิดในสุนัขดังกล่าวโดยไรที่พบส่วนใหญ่ได้แก่ *Demodex cornei* และส่วนน้อยได้แก่ *D. canis* โดยการใช้วิธีการตรวจแบบ hair-plucking จะสามารถตรวจพบ *D. canis* และโดยวิธีการตรวจแบบ tape preparation technique จาก ใบหูด้านในทั้ง 2 ข้างของสุนัขสามารถตรวจพบระยะตัวเต็มวัยของไร short-tail *Demodex* จำนวนมาก ไร short-tail *Demodex* ได้ถูกแยกชนิดโดยการคาดการณ์ว่าเป็น *Demodex cornei* ในการศึกษานี้ได้รายงานการวัดขนาดความยาวของ gnathosoma podosoma opisthosoma total body length และ body width ของ *Demodex* ทั้ง 2 ชนิด ผลการวัดขนาดจากตัวเต็มวัยจำนวน 30 ตัวของ *D. cornei* มีดังต่อไปนี้ opisthosoma length เท่ากับ 62.50 – 102.50 ไมครอน (59.25 ± 9.68 ไมครอน) (วัดจาก 30 ตัวอย่าง) body width เท่ากับ 32.50 – 42.50 ไมครอน (39.06 ± 2.31 ไมครอน) (วัดจาก 24 ตัวอย่าง) และ total body length เท่ากับ 132.50 – 187.50 ไมครอน (156.92 ± 11.12 ไมครอน) (วัดจาก 30 ตัวอย่าง) ส่วนผลการวัดขนาดตัวเต็มวัยจำนวน 16 ตัวของ *D. canis* พบว่า total body length เท่ากับ 175.00 – 262.50 ไมครอน (217.83 ± 30.06 ไมครอน) (วัดจาก 15 ตัวอย่าง) body width เท่ากับ

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37.50 – 47.50 ไมครอน (42.50 ± 2.89 ไมครอน) (วัดจาก 13 ตัวอย่าง) และ opisthosoma length เท่ากับ 120.00 – 175.00 ไมครอน (147.50 ± 19.56 ไมครอน) (วัดจาก 11 ตัวอย่าง) อัตราส่วนของค่าเฉลี่ยของ total body length และ opisthosoma length ระหว่าง *D. canis* และ *D. cornei* เท่ากับ 1.39 และ 2.49 ตามลำดับ สุนัขที่เป็นขี้เรื้อน demodectic ดังกล่าวได้รับการรักษาอย่างประสบความสำเร็จด้วย 3.3% lime sulphur และ daily oral ivermectin โดยใช้ขนาดยา 600 ไมโครกรัม/กก. ร่วมกับการรักษาเสริมด้วยยาปฏิชีวนะ และการใช้ antimicrobial shampoo

คำสำคัญ: การปรากฏ *Demodex cornei* *Demodex canis* สุนัขพันธุ์ Shi Tzu กรุงเทพมหานคร ประเทศไทย

ABSTRACT

A 4 year old male Shi Tzu was brought to a veterinary clinic in Bhasricharoen, Bangkok with a problem of skin disease which was unresponsive to any treatments for about 2 years. The dog had generalised skin erythema and greasy skin especially on all feet, face and both inner pinnae. On dorsum of body of the dog, there were numerous follicular papules and furuncles which spreaded to all areas. The dog had severe pruritus on both ear pinnae and hot spots with diameter about 2 cm on both cheeks were found. Cytology of both ear canals revealed a large number of cocci and small number of yeasts. Intracellular cocci were found from cytology of skin. Mixed infestations of *Demodex cornei* (majority) and *D. canis* (minority) were detected in the same dog. By using hair-plucking examination, *D. canis* were detected and by tape preparation technique from both inner pinnae, a large number of adult short-tail *Demodex* mites were found. Short-tail *Demodex* mites were identified tentatively as *Demodex cornei*.

Measurements of lengths of gnathosoma, podosoma, opisthosoma, total body length and body width of both *Demodex* spp. were done. Thirty adult *D. cornei* were measured, opisthosoma length was 62.50 – 102.50 microns (59.25 ± 9.68 microns) ($n = 30$), body width was 32.50 – 42.50 microns (39.06 ± 2.31 microns) ($n = 24$) and total body length was 132.50 – 187.50 microns (156.92 ± 11.12 microns) ($n = 30$). Total body length of sixteen adult *D. canis* was 175.00 – 262.50 microns (217.83 ± 30.06 microns) ($n = 15$), body width was 37.50 – 47.50 microns (42.50 ± 2.89 microns) ($n = 13$) and opisthosoma length was 120.00 – 175.00 microns (147.50 ± 19.56 microns) ($n = 11$). The ratio of mean of total body length and opisthosoma length between *D. canis* and *D. cornei* were 1.39 and 2.49 respectively. The demodectic mangy dog was treated successfully with 3.3% lime sulphur, daily oral ivermectin with the dosage of 600 µg/kg, and supportive treatments with antibiotic and topical antimicrobial shampoo.

Key words: prevalence, *Demodex cornei*, *Demodex canis*, Shi Tzu dog, Bangkok, Thailand

INTRODUCTION

Canine demodicosis is one of well known skin diseases encountered in veterinary practice (Scott *et al.*, 2001). Recently, *Demodex canis* was found that can cause folliculitis and furunculosis in dogs; however, during last 2 decades, reports about immigrating of new species of *Demodex* mites were published in many countries of the world (Scott *et al.*, 2001; Chen, 1995; Mason, 1993; Mueller and Bettenay, 1999). Currently, there are 3 species of *Demodex* mites that are able to cause demodicosis in dogs. *D. canis* causes demodectic folliculitis and/or furunculosis in dogs, *D. injai* induces oily skin and hair coat on trunk of dogs; however, *D. cornei* can cause a pruritic canine skin disease.

The morphology of adult *D. canis*, which is considered as a slender and elongate mite, the opisthosoma length is 91-115 microns, body width is 40-45 microns and total body length is 167-244 microns (Robson *et al.*, 2003) compared with the short-tail *Demodex* mite (*D. cornei*), which is shorter especially of its opisthosoma. The opisthosoma length was about 56.40 microns, and the total body length was 139.00 microns (Tamura, 1999); therefore, body length of adult *D. cornei* was about 50% shorter than those of *D. canis*. Moreover, terminal end of opisthosoma of adult *D. cornei* was blunted whereas those of adult *D. canis* were more tapered. In addition, morphology of *D. cornei* looks similar with *D. criceti* of hamsters and *D. gatoi* of cats (Mason, 1993).

The diagnostic approaches included

superficial and deep skin scrapings to detect mites, and cytology to reveal concurrent infections, while treatment of canine demodicosis comprised of (1) application of topical miticides (e.g. amitraz and/or lime sulphur) and/or systemic treatment using macrocyclic lactones (e.g. ivermectin, doramectin, milbemycin oxime and moxidectin), (2) control of secondary bacterial infections and (3) managing predisposing factors or underlying causes. (Scott *et al.*, 2001; Chen, 1995; Foster and Foil, 2003; Mueller, 2004; Gortel, 2006; Tater and Patterson, 2008; Mecklenburg *et al.*, 2009)

This paper was aim to report the occurrence of mixed *Demodex* infestations between *D. cornei* and *D. canis* in a Shi Tzu dog in Bangkok metropolitan, Thailand, especially of the short form *Demodex* which was firstly detected in one domesticated dog in Thailand.

MATERIALS AND METHODS

Case history

A 4 years old male Shi Tzu dog was brought to a veterinary clinic located in Bangkok metropolitan area with a problem of its skin disease that was unresponsive to any treatments. According to the past history, this dog had suffered from demodicosis during its puppy life, and was received some treatments until clinically resolved. Since its second year of life, the dog has suffered from pruritic skin diseases associated with folliculitis and furunculosis and the skin condition got worse during the rainy season. The dog received several

treatments including various flea and tick controls, daily oral ivermectin 400 µg/kg and various types of antibiotics and also a herbal spray.

Cytology and skin examination technique for demonstrating mites

Cytology of both ear canals and skin cytology of the mangy dog were performed. Dermatological examination techniques for demonstrating mites in this study consisted of hair-plucking examination technique and tape preparation technique. The acetate tape was used to investigate short bodied *Demodex* mites. The sticky surface of the tape was pressed on the suspected lesions for several times in order to collect the superficial short bodied *Demodex* mites. The tape was then mounted directly on a glass slide without any mounting medium. The glass slides were brought to examine for the causative demodectic mites under compound microscopes with 400 and 1000 times of magnification.

Mite Identification

Species identification of *Demodex* mites in this study was based on data concerning habitats of the mites, clinical signs and confirmed by examination of sizes and morphology of the mites which was ever reported formerly by Patterson, 2008; Chesney, 1999; Tamura *et al.*, 2001 and Mason, 1993.

RESULTS

On physical examination, this dog had generalised erythema and greasy skin especially on all feet, face and both inner pinnae. The lesions were severe on both inner pinnae of the dog, and skin colour change to purple. On dorsum of body of the dog, there were numerous follicular papules and furuncles which spread over whole areas of the dorsal surface (generalised folliculitis and furunculosis). The mangy dog had severe pruritus on both ears (scratches his ear 20 times in 2 hours) and hot spots with diameter of 2 cm. were found on both cheeks.

Both ears cytology revealed a large number of cocci and a minor number of yeasts in both ear canals of the dog. Skin cytology demonstrated also intracellular cocci. The dog was infested by both *D. canis* and *D. cornei*. By using hair-plucking examination technique, a large number of *D. canis* were found. The tape preparation technique of both inner pinnae of the dog revealed a numerous number of short-tail *Demodex* mites (*D. cornei*) and also less number of *D. canis* with many spindle shape eggs of *Demodex* spp.

Morphological studies of both *Demodex* mites were recorded in this study. *D. cornei* had elongated body with short stumpy legs on podosoma area of their idiosomas. *D. cornei* was distinctly shorter than *D. canis* especially of their opisthosoma. Their bodies were divided into 2 parts, the gnathosoma which consisted of dorsal paired chelicerae and lateral paired pedipalpi and a ventral

single median hypostome. The short opisthosoma of *D. cornei* had blunted posterior end and distinct transverse striations. The size of opisthosoma which measured from one specimen was 62.50×40 microns. The fourth coxisternal plate of *D. cornei* was rectangular in shape

Measurements of both *D. canis* and *D. cornei* were done in this study. The measured mite specimens were mounted under Scotch-tapes. The measurement data consisted of the followings: gnathosoma length, podosoma length, opisthosoma length, body width and total body length. The adult

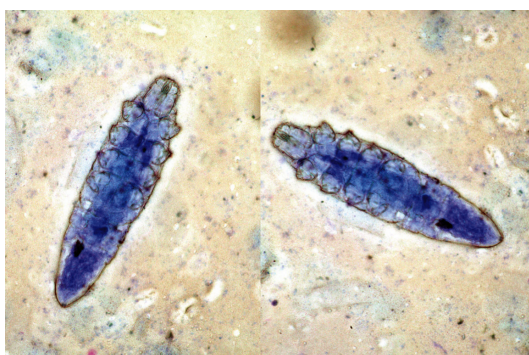


Figure 1 Ventral view of two adult *Demodex cornei* from the infested Shi Tzu dog from Bangkok metropolitan area

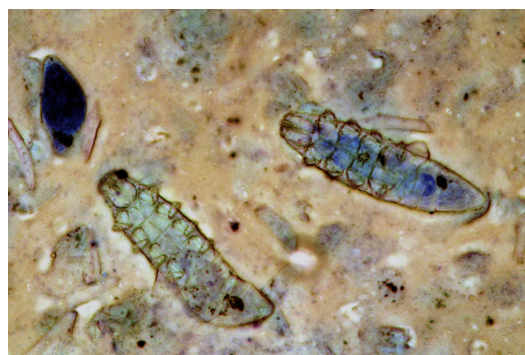


Figure 2 Ventral view of two adult *Demodex cornei* and mite egg from the infested Shi Tzu dog from Bangkok metropolitan area

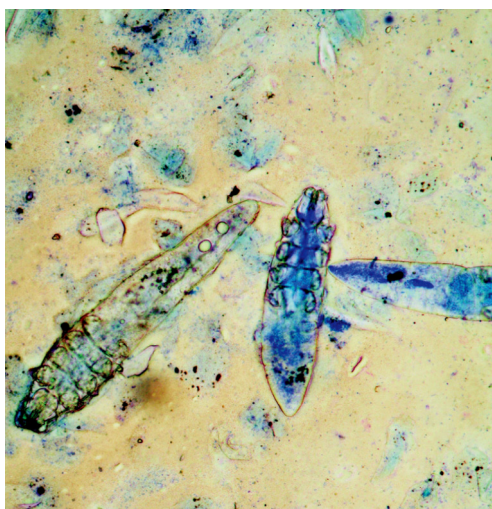


Figure 3 Ventral view of adult *Demodex cornei* (right) and *Demodex canis* (left) from the infested Shi Tzu dog from Bangkok metropolitan area

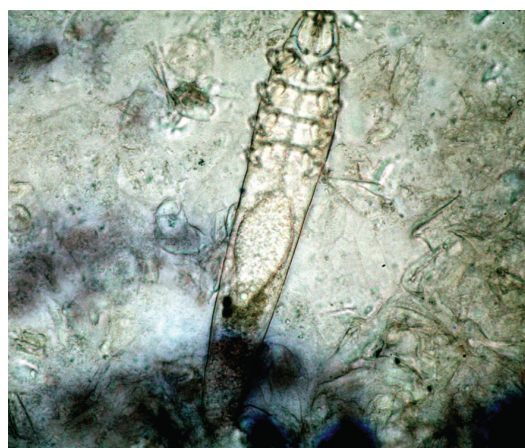


Figure 4 Ventral view of ovigerous female of *Demodex canis* from the infested Shi Tzu dog from Bangkok metropolitan area

mites were measured in microns by using ocular micrometers and under compound microscopes.

Measurement data of thirty adult (males and females) *D. cornei* from this study were reported. Gnathosoma length was 17.50 – 25.00 microns (23.50 ± 1.93 microns) ($n = 30$) (mean \pm standard deviation), podosoma length was 55.00 – 62.50 microns (60.00 ± 2.50 microns) ($n = 29$), opisthosoma length was 62.50 – 102.50 microns (59.25 ± 9.68 microns) ($n = 30$), body width was 32.50 – 42.50 microns (39.06 ± 2.31 microns) ($n = 24$), total body length was 132.50 – 187.50 microns (156.92 ± 11.12 microns) ($n = 30$).

Sixteen mounted adults of *D. canis* were measured under the microscopes and the following measurement data were also recorded: gnathosoma length was 22.50 – 27.50 microns (24.84 ± 1.70 microns) ($n = 16$), podosoma length was 57.50 – 65.00 microns (60.89 ± 2.10 microns) ($n = 14$), opisthosoma length was 120.00 – 175.00 microns (147.50 ± 19.56 microns) ($n = 11$), body width was 37.50 – 47.50 microns (42.50 ± 2.89 microns) ($n = 13$), total body length was 175.00 – 262.50 microns (217.83 ± 30.06 microns) ($n = 15$). The ratio of mean of total body length and opisthosoma length between *D. canis* and *D. cornei* were 1.39 and 2.49 respectively.

The diagnosis for this Shi Tzu dog's skin problems was a combination of generalised surface and superficial demodicosis due to *D. cornei*, generalised follicular demodicosis due to *D. canis* and infections of skin and ears concurrent with allergic skin diseases.

For treatment of the case, 3.3 % lime-sulphur was used in the form of topical application on mangy areas of the dog with weekly interval for eliminating surface and superficial *D. cornei*. Ivermectin was given orally with dosage of 600 $\mu\text{g/kg/day}$ to cure mite infestations cause by *D. canis* and *D. cornei*. Adjunctive therapy was done together with the treatment of miticides. Cephalixin was used to control secondary bacterial infection by using dosage of 30 mg/kg twice a day. The combination formula of gentamicin, clotrimazole and betamethasone was applied as ear-ointment by interval of twice a day for controlling otitis externa.

One week after application of 3.3 % lime-sulphur, pruritus on both pinnae of the dog was decreased and general skin condition was obviously improved. On the second week after treatment, the numbers of surface *Demodex* mites which were detected by the tape preparation technique were gradually decreased and the general skin condition was improved. Hot spots on both cheeks disappeared and pruritic degree was reduced significantly. On one month after treatment, the general skin condition was obviously improved when comparing with those of the second week, the pruritic degree was reduced, and numbers of surface *Demodex* mites were also decreased gradually.

DISCUSSION

According to the observation in this study,

the clinical presentation caused by *D. cornei* infestation often present in the form of a scaly and pruritic skin diseases that is relevant to the previous report and literature (Mason, 1993; Tater and Patterson, 2008). Moreover, it was observed by authors that degree of pruritus due to *D. cornei* infestations depended on the number of infested mites. In comparison, the clinical presentation of canine demodicosis which caused by *D. canis* infestation was often present in the form of alopecic skin diseases rather than pruritic skin diseases except in the case associated with secondary bacterial infection in which the degree of pruritus will depend on degree of the secondary infection.

In Taiwan, Chen (1995) reported that the demodectic dog showed major clinical sign as mild pruritus. In addition, other clinical signs were alopecia and dry scaling on ventral surface of abdomen and all four limbs, ventral aspect of neck and around eyes of the affected dog. While the study from the United Kingdom (Chesney, 1999) indicated that the early skin sign had first been observed at a mean age of about 7 months and the major clinical sign were alopecia and scaling. *D. cornei* infestation is considered by authors as a pruritic skin disease and differential diagnostic list may include the following skin conditions: scabies, allergic skin diseases, bacterial infection, and malassezia dermatitis.

The diagnostic approach for *D. cornei* infestation is superficial skin scraping or using tape preparation techniques (Mason, 1993; Tater and Patterson, 2008; Guaguere *et al.*, 2008); however,

the authors prefer to use the tape preparation techniques because of less invasive, decreasing chance to damage examined mites and also available for cytology in the same examined slide. According to the mite identification and reports (Chen, 1995; Mason, 1993; Tater and Patterson, 2008; Chesney, 1999; Tamura *et al.*, 2001; Patterson, 2008; Guaguere *et al.*, 2008) the simple ways of differentiation between *D. cornei* and *D. canis* were reported. From mite sizes, *D. cornei* is seemed obviously shorter than *D. canis*. The total body length of *D. cornei* is about 50 – 70 % of those of *D. canis*. The mite collection technique can also give a useful diagnostic data, because *D. cornei* inhabits in stratum corneum of epidermis, the suitable collection technique for *D. cornei* is superficial skin scraping or using tape preparation techniques (Tater and Patterson, 2008) while the habitat of *D. canis* is hair follicles and sebaceous glands which deeper into layer of dermis, so it may concluded that the suitable collection techniques for *D. canis* are deep skin scraping or hair-plucking examination (Tater and Patterson, 2008).

Currently, the information about *D. cornei* infestation in dogs was quite limit including information about the treatment, although the first report was published since 1998 (Scott *et al.*, 2001). The treatment protocol for *D. cornei* infestation could modify from the protocol for feline demodicosis and *D. canis* infestation (Scott *et al.*, 2001; Chen, 1995; Foster and Foil, 2003; Mueller, 2004; Gortel, 2006; Tater and Patterson, 2008;

Mecklenburg *et al*, 2009). For *D. canis* infestation, there is good evidence for recommending systemic daily ivermectin, or moxidectin or milbemycin oxime at the dosages of 300-600 µg/kg, 400 µg/kg and 2 mg/kg respectively for treatment of generalised canine demodicosis, and using topical application of amitraz rinse at the dosage of 0.025-0.06% weekly interval or fortnightly can also be recommended for generalised canine demodicosis as supported by good evidences (Mueller, 2004). In authors' opinion, these protocols may be also benefit in cases of *D. cornei* infestation.

In addition, in cat, there was good evidence to recommend lime sulphur dips at 2% every week for therapy of feline demodicosis (Mueller, 2004). Moreover, there was fair evidence for the use of higher concentration of amitraz rinse at higher frequency, using weekly doramectin (400 µg/kg subcutaneously) for treatment of generalised canine demodicosis caused by *D. canis* infestation, and using amitraz rinse at 0.0125-0.025% weekly and weekly doramectin 600 µg/kg subcutaneously can be benefit for treatment of feline demodicosis (Mueller, 2004). These protocols may be useful in cases of *D. cornei* infestation too.

It may be concluded that the short-bodied *Demodex* mites from this study were *D. cornei*. Because of their characters of short and wide body when compared with *D. canis* and from Tater and Patterson (2008), the short tailed *Demodex* mites was tentatively identified as *D. cornei*. The other diagnostic data of the short bodied mites was the location on body of the mangy dog which the mites

inhabit. The mean total body length of short form of *Demodex* spp. was 156.92 microns while the mean total body length of *D. canis* was 217.83 microns, so the short form adult *Demodex* mites from this study was about 72 % of the mean total body length of adult *D. canis*. However, the total body length was measured from both adult male and female mites in this study, and the male mites were shorter than the female mites. From result of this study, it was revealed that mean opisthosoma length (tail) of adult *D. cornei* was about 40.17% of the mean opisthosoma length of adult *D. canis* and this result was important evidence of the diagnostic data.

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