

Full Length Research Paper

Prevalence of *Demodex* infection in pet dogs in Southern China

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Canine demodicosis caused by ectoparasitic mites in the genus *Demodex* is a major and common ectoparasitic disease of dogs. However, little is known of the prevalence of *Demodex* infection in pet dogs in China. The present study was conducted to determine the prevalence of *Demodex* infection in pet dogs in Guangzhou, Southern China. A total of 3977 pet dogs admitted to several animal hospitals in Guangzhou City were investigated for *Demodex* infection from January to December 2009. The result showed that 977 (24.57%) dogs were positive for dermatosis and 130 (13.31%) of the dermopathic dogs were positive for *Demodex* infection. No significant association was found between *Demodex* prevalence and season, age, and gender of pet dogs. Seasonal prevalence showed that the highest and lowest were in March (4.15%) and December (1.39%), respectively. The prevalence in male dogs (3.67%) was higher than that in female dogs (2.74%). Dogs of 1 to 5 year old were more commonly infected than other age groups. The present investigation revealed the prevalence of *Demodex* infection in pet dogs in China's subtropical Guangzhou City, which accounts for 13.31% of canine dermatosis cases. These results have important implications for conducting control strategies and measures against canine demodicosis in this region.

Key words: Prevalence, *Demodex* infection, pet dog, Southern China.

INTRODUCTION

Demodicosis is one of the important skin diseases caused by ectoparasitic mites of the genus *Demodex* (family Demodecidae) (Jekl et al., 2006; Aşkin and Seçkin, 2010; Gakuya et al., 2011) that inhabit the hair follicle and glandulae sebaceae of humans (Fernandez-Flores and Alija, 2009; Klemm et al., 2009), pets (Alvarez et al., 2007; Saari et al., 2009), domestic livestock (Chanie et al., 2010; Mulugeta et al., 2010), and wild animals (Fryderyk

and Izdebska, 2001; Wolhuter et al., 2009). Infestations by *Demodex* mites are often subclinical (Starost et al., 2005), however, *Demodex* infestation can cause symptoms including localized or diffuse alopecia, erythema, comedones associated with papular and pustular dermatitis, and also can cause secondary bacterial and/or mycotic infections in immune depressed individuals (Anane et al., 2007; Tarallo et al., 2009).

Nowadays, dogs are the most preferred pet animal in the world. However, they harbour a number of helminths and mites, which can result in significant health problems as well as financial losses globally (Morsy et al., 1995; Eguía-Aguilar et al., 2005; Sager et al., 2006; Rani et al., 2011). Canine demodicosis is mainly caused by *Demodex*

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canis (Jekl et al., 2006), and occasionally by short- or long-bodied unnamed *Demodex* (Alvarez et al., 2007; Ordeix et al., 2009). *Demodex* infection in dogs has been reported in different parts of the world among which are in Europe, Asia, America, Africa, and Latin America. In China, canine demodicosis cases have been reported in Kunming city (Yunan province) (Li et al., 1995), Zhengzhou city (Henan province) (Dong et al., 2009), Jinzhou city (Liaoning province) (Li and Zhao, 2008) and several dog farms (Ye et al., 2003). However, prior to the present study, there has been no published article on *Demodex* infection in pet dogs in southern China.

The objectives of the present investigation was to determine the prevalence of *Demodex* infection in pet dogs in Guangzhou City, Guangdong province, using microscopic examination of deep skin scraping, plucked hairs and skin biopsy, and to analyze the associations between prevalence and epidemiological factors (age, season, gender of pet dogs).

MATERIALS AND METHODS

Study site

The study was conducted in Guangzhou city, southern China, which is located between latitudes of 22°26'-23°56' N and longitudes of 112°57'-114°05' E. Guangzhou is an urban centre and the capital of Guangdong province. This city covers an area of approximately 7434 m², with a population of approximately 10.33 million people.

Collection and examination of dogs

From January to December 2009, a total of 3977 pet dogs admitted to 5 animal hospitals in Guangzhou City were used in the present investigation and they were examined in the animal hospitals for the presence of *Demodex*. The sex and age (estimated by dental examination and inquiries from owners) were recorded for each dog. The presence of *Demodex* in dogs examined was determined using the methods described by Chee et al. (2008). This involves microscopic examination of deep skin scrapings, plucked hairs and skin biopsy. Briefly, the presence of *Demodex* was detected by microscopic examination of deep skin scraping, plucked hairs and skin biopsy. Samples were collected from the head, pinna, ear canal, thoracic-abdominal areas, elbow or paws of each animal. Areas of the skin with dermatologic lesions were moistened with mineral oil and scraped with a scalpel blade until capillary bleeding was visible. The scrapings or hair follicles were placed on glass slides with a drop of 10% KOH solution and were examined microscopically for the presence of mites. The mites observed were identified as *Demodex* sp. based on morphological features and site of predilection (Wall and Shearer, 1997; Taylor et al., 2007). The presence of one mite at any developmental stage in dogs examined was considered to be a positive result. The number of mites collected from each infected dogs were estimated for the intensity of *Demodex* infection. This study was approved by the Animal Ethics Committee of South China Agricultural University.

Statistical analysis

Differences in the prevalence of *Demodex* infection in pet dogs

between different months, sexes and age groups were analyzed using a Chi square test within the SPSS for Windows (Release 18.0 standard version, SPSS Inc., Chicago, Illinois) (Wu et al., 2011; Zhao et al., 2011). The differences were considered statistically significant when $P < 0.05$.

RESULTS

Of 3977 pet dogs examined, 977 (24.57%) dogs were observed to be positive for dermatosis, while *Demodex* infection was recorded in 130 (13.31%) of the dermatopathic dogs (Table 1). The monthly prevalence of *Demodex* infection in dogs is shown in Table 1 with the highest prevalence of 4.15% recorded in March 2009 and the lowest prevalence of 1.39% in December 2009, however there was no significant difference in the prevalence of infection in different months ($P > 0.05$). The prevalence of *Demodex* in male dogs (3.67%) was higher than that in female dogs (2.74%), but the difference in prevalence was not statistically significant difference ($P > 0.05$) (Table 2). Dogs of 1 to 5 years old were more commonly infected than other dogs, and the prevalence in pet dogs less than 1 yr old was higher than that in pet dogs more than 5 years old (Table 3), but the difference in prevalence among different age groups was not statistically significant ($P > 0.05$).

DISCUSSION

The present study provides the first systematic assessment of *Demodex* infection in pet dogs in Guangzhou city, subtropical southern China. The results of the study revealed that *Demodex* infection accounts for 13.31% of canine dermatosis cases, which was similar to the findings of some previous studies (Nayak et al., 1997; Choi et al., 2000; Chee et al., 2008).

Demodex infection in dogs had previously been reported in different parts of the world, with varying differences in prevalences and intensities among regions (Nayak et al., 1997; Chee et al., 2008; Li and Zhao, 2008; Ugbomoiko et al., 2008; Dong et al., 2009). The overall prevalence of *Demodex* infection in pet dogs (3.27%) recorded in this study was similar to that reported from Orissa in India (3%) (Nayak et al., 1997), but higher than that in Zhengzhou city (Henan province) of China (2.86%) (Dong et al., 2009) and Ilorin of Central Nigeria (1%) (Ugbomoiko et al., 2008), and significantly lower than that in Jinzhou (Liaoning province) (30%) (Li and Zhao, 2008), in dog farms in different ecological settings in China (23.6%) (Ye et al., 2003) and in Gwang-ju in Korea (Chee et al., 2008).

In the present study, the prevalence of *Demodex* infection was more frequent in male dogs than female dogs. This is consistent with the result of a previous study (Dong et al., 2009), but in contrasts to the findings of Nayak et al. (1997) and Rodriguez-Vivas et al. (2003),

Table 1. Prevalence of canine demodicosis in pet dogs in different months in 2009.

Month	Total cases (N _t)	Dermatosis cases (N _d)	Demodicosis cases (N _p)	Prevalence of demodicosis (N _p /N _t , %)	Detection rate (N _p /N _d , %)
January	155	23	5	3.23	21.74
February	124	22	5	4.03	22.73
March	241	49	10	4.15	20.41
April	220	53	8	3.64	15.09
May	172	53	6	3.49	11.32
June	231	95	7	3.03	7.37
July	702	207	19	2.71	9.18
August	719	157	20	2.78	12.74
September	729	179	28	3.84	15.64
October	309	80	11	3.56	13.75
November	231	38	9	3.90	23.68
December	144	21	2	1.39	9.52
Total	3977	977	130	3.27	13.31

Table 2. Prevalence of *Demodex* infection in pet dogs by sex.

Sex	No. of dogs	No. of positive dogs	Prevalence (%)
Male	2263	83	3.67
Female	1714	47	2.74
Total	3977	130	3.27

Table 3. Prevalence of *Demodex* infection in pet dogs by age.

Age	No. of dogs	No. of positive dogs	Prevalence (%)
<1 yr	2007	67	3.34
1-5 yr	1486	53	3.57
>5 yr	484	10	2.07
Total	3977	130	3.27

who reported that the females were more susceptible than males. These differences could not be easily explained, but may be attributed to epidemiological factors, such as weather, seasonal variations, geographical location, innate resistance, and particularly the age of the animals examined (Nayak et al., 1997; Chee et al., 2008). Previous studies have shown that dogs less than 1 year old are more susceptible to ectoparasite infestations (Kwochka, 1987; Nayak et al., 1997; Chee et al., 2008), owing to their constant exposure to carrier mothers (Scott, 1979). However, in this study dogs aged 1 to 5 years were more commonly infected than dogs of other age groups. The possible explanation could be that the survey of canine demodicosis in our study included only dermatosis cases, whereas healthy dogs were also included in previous studies.

Conclusion

The present investigation revealed the prevalence of *Demodex* infection in pet dogs in Guangzhou City, subtropical southern China, which accounts for 13.31% of canine dermatosis cases. In view of the fact that canine demodicosis is a zoonotic disease based on the reports from previous studies, there is a need to educate dog owners and the general public regarding the public health importance of this disease. In addition, a control strategy should be put in place to reduce the prevalence of *Demodex* infection in the area of study.

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