

Scientific Report

Microsporium canis infection in a red fox (*Vulpes vulpes*)

Malmasi, A.^{1*}; Khosravi, A. R.²; Selk Ghaffari, M.³
and Shojaee Tabrizi, A.¹

¹Department of Clinical Sciences, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran;

²Department of Pathobiology, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran;

³Department of Clinical Sciences, Faculty of Veterinary Medicine, Karaj Branch, Islamic Azad University, Karaj, Iran

*Correspondence: A. Malmasi, Department of Clinical Sciences, Faculty of Veterinary Medicine, University of Tehran, Tehran, Iran. E-mail: Malmasia@vetmed.ut.ac.ir

(Received 23 Jun 2008; revised version 10 Nov 2008; accepted 17 Nov 2008)

Summary

A 3-month-old male red fox that was in contact with a Persian cat referred to the small animal hospital, Faculty of Veterinary Medicine, University of Tehran with multi-focal circular non-pruritic skin lesions and hair loss mainly on the head and extremities. A complete series of dermatologic tests such as Wood's light examination, direct microscopic examination, and fungal culture were performed. The isolated pathogen was identified as *Microsporium canis*. The animal was treated using topical and systemic ketoconazole for 4 weeks. After treatment, the lesions were completely disappeared, and there was no recurrence of skin lesions during the follow-up period. It should be noted that asymptomatic cats may carry *M. canis*, thus may increase the risk of fungal infections for their owners and other pets as well. This is the first documented report of *M. canis* infection and its treatment in a red fox.

Key words: *Microsporium canis*, Red fox (*Vulpes vulpes*), Dermatophytoses

Introduction

Dermatophytoses are infections of the skin and its appendages in humans and animals caused by a group of closely related species of fungi of the genera *Microsporium*, *Trichophyton* and *Epidermophyton* (Carlotti and Bensignor, 1999). As asymptomatic *Microsporium canis* carriers are considered to be a critical factor in the epidemiology of dermatophytosis, many researchers investigated the relationship between the presence of dermatophytes on the hair coats of dogs and cats without cutaneous lesions and the occurrence of the disease in their respective owners and other pets (Abou-Gabal and Winkler, 1968; Cafarchia *et al.*, 2006). *Microsporium canis* infection has been reported in silver-grey foxes (Levenberg, 1960). Literature review indicates that there is no report of dermatophytoses caused by *M. canis* in red fox (*Vulpes vulpes*). From thirty captured

wild foxes examined for keratinophilic fungi, *Arthroderma cuniculi* has been isolated from 7 of the animals and *Trichophyton verrucosum* from 1 of them (Kubo *et al.*, 1990). The present report describes *M. canis* infection in a red fox lived closely with an asymptomatic Persian cat. To the best of authors' knowledge, this is the first reported case in this species of fox.

Case history

A 3-month-old male red fox (*Vulpes vulpes*) was referred to the small animal hospital, Faculty of Veterinary Medicine, University of Tehran with a 10-day-history of multi-focal circular non-pruritic alopecia. The head (Fig. 1) and legs were the most severely affected parts. Clinical examination revealed multiple (more than 9) alopecic patches. Lesions ranged from 1 to 3 cm in diameter, were firm and well-circumscribed.

Initially the skin lesions had been limited to the face but gradually were distributed to the extremities. The animal had been adopted by the owner since two months before admission. The fox was kept in a house with a Persian cat and feed home-made diet. On presentation, the animal was alert, bright and responsive. Physical examination revealed no abnormalities apart from the skin lesions. The clinical history, living closely with a cat, and the physical examination findings suggested that the fox had fungal skin lesions as the most likely diagnosis; although ectoparasitic dermatitis could not be ruled out among other less likely differentials.



Fig. 1: Classical ringworm lesions in the head and face of the fox

The hair over the lesions had no fluorescence under Wood's light examination. Hair and scales were collected by coat brushing and multiple skin scrapings were examined using a magnifying glass and a microscope. While microscopic examination of skin scrapings for ectoparasites was negative, chains of ectothrix arthrospores were present on the surface of hairs (Fig. 2). Fungal cultures on Sabouraud glucose agar containing chloramphenicol and cycloheximide was incubated at room temperature. This led to growth and isolation of *M. canis* after 7 days.

M. canis was also isolated from the cat that had been kept with the fox by the owner. There was no significant skin lesion on physical examination of the cat. The fox was treated by oral ketoconazole tablets (Soha, Tehran, Iran) (10 mg/kg once daily) and topical ketoconazole cream 2%

(Behvazan, Tehran, Iran) on the skin lesions (twice daily) for 4 weeks. Complete remission of alopecic skin lesions was noticed after one month. Five months after treatment there was no recurrence of the lesions.



Fig. 2: Photomicrograph of infected hair. Note the swollen distorted appearance of the hair shaft with masses of ectothrix spores clustered around it, ($\times 40$)

Discussion

Diagnosis of dermatophytosis in this case was based on history, clinical examination and complementary aids, such as Wood's light, light microscope and fungal culture. History of close contact with a cat was an important finding in the presented fox. Although the cat had no clinically significant skin lesions, but the isolation of *M. canis* from its hairs supported the hypothesis that the acquired dermatophyte infection of the fox was secondary to direct contact with the cat. The most commonly isolated pathogen from cats is *M. canis* (Newbury *et al.*, 2007). Isolation of *M. canis* from an asymptomatic cat may represent passive carriage of arthrospores and hyphae on the haircoat, acquired either directly from an infected cat or indirectly from a contaminated environment (Peano *et al.*, 2005).

Results of Wood's light examination for presence of fluorescence were negative in this case. Wood's lamp examination for fluorescence causes only certain strains of *M. canis* to produce a positive yellow-green colour on infected hair. Only about 50% of *M. canis* infections have fluorescence and

several major pitfalls exist in the use and interpretation of Wood's lamp results (Scott *et al.*, 2001). The sensitivity of direct microscopic hair examination varies from 37 to 70% in dogs and cats; its specificity, evaluated in humans, is about 60% (Peano *et al.*, 2005). There is no published information with regard to its sensitivity in red foxes.

In this case, we used a combination of oral and topical ketoconazole. Literature review indicates that there is little clinical experience about the efficacy of commonly prescribed antifungal drugs in human and small animals for treatment of dermatophytosis in red foxes. Knudtson *et al.* (1980) described *Trichophyton mentagrophytes* infection in eight red foxes. They discussed the importance of combination of topical and systemic antifungal treatment in the affected cases. Due to chronic nature of dermatophytosis in fur animals, the disease recurs when medication is stopped. In the presented case, we did not observe any recurrence during the follow-up period. In dogs, it is generally assumed that animals less than one-year-old have a higher incidence of dermatophytoses (particularly due to *M. canis*), probably due to a delay in development of adequate host immunity (Carlotti and Bensignor, 1999). It seems that the same reason contributed as a predisposing factor in development and progression of skin lesions in our case.

In conclusion, direct contact with a cat that was asymptomatic carrier of *M. canis* in association with other factors was the predisposing element for induction of fungal infection in this case. This is the first documented report of *M. canis* infection and its treatment in a red fox.

References

- Abou-Gabal, M and Winkler, A (1968). Dermatophytosis in humans caused by mixed infection of *Trichophyton verrucosum* and *Trichophyton mentagrophytes* of animal origin. *Mykosen*. 11: 647-650.
- Cafarchia, C; Romito, D; Capelli, G; Guillot, J and Otranto, D (2006). Isolation of *Microsporum canis* from the hair coat of pet dogs and cats belonging to owners diagnosed with *M. canis* tinea corporis. *Vet. Dermatol.*, 17: 327-331.
- Carlotti, DN and Bensignor, E (1999). Dermatophytosis due to *Microsporum persicolor* (13 cases) or *Microsporum gypseum* (20 cases) in dogs. *Vet. Dermatol.*, 10: 17-27.
- Knudtson, WU; Gates, CE; Ruth, GR and Haley, LD (1980). *Trichophyton mentagrophytes* dermatophytosis in wild fox. *J. Wildl. Dis.*, 16: 465-468.
- Kubo, H; Tamura, T; Iizuka, H; Shibaki, H and Udagawa, SI (1990). Isolation of keratinophilic fungi from hair of wild fox (*Vulpes vulpes schrenckii*) and soil from the affected areas in Hokkaido Prefecture of Japan. *Jap. J. Med. Mycol.*, 31: 317-324.
- Levenberg, IG (1960). *Microsporum* infection in silver-gray foxes. *Trudy Vesoyies Inst. Vet. Sanit.* 16: 379-382.
- Newbury, S; Moriello, K; Verbrugge, M and Thomas, C (2007). Use of lime sulphur and itraconazole to treat shelter cats naturally infected with *Microsporum canis* in an annex facility: an open field trial. *Vet. Dermatol.*, 18: 324-331.
- Peano, A; Rambozzi, L and Gallo, MG (2005). Development of an enzyme-linked immunosorbent assay (ELISA) for the serodiagnosis of canine dermatophytosis caused by *Microsporum canis*. *Vet. Dermatol.*, 16: 102-107.
- Scott, DW; Miller, WH and Griffin, CE (2001). Fungal skin diseases. In: *Muller and Kirk's small animal dermatology*. (6th Edn.), Philadelphia, W. B. Saunders Co., PP: 336-361.