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Short Communication

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Growing significance of *Microsporum canis* in tinea of animal handlers

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ABSTRACT

Aim: The primary objective of this study was to ascertain the etiologic role of *Microsporum canis* in various dermatological disorders of patients from rural areas of Bharuch, Gujarat, India. **Materials and Methods:** In all 27 patients of both sexes, and different age groups attending the outpatient department of Welfare Hospital, and Shashwat Clinic were investigated for *M. canis* infection by employing standard mycological techniques. **Results:** Of 27 patients examined, only three were found positive for *M. canis* both by direct microscopy and cultural isolation. All the three patients had no evidence of immunosuppression, and reported close contact with sick animals. The detailed microscopic morphology of the isolates in Narayan stain confirmed the identity as *M. canis*. Chemotherapy with topical application of antifungal drugs such as *clotrimazole* (1%), terbinafine (1%), and luliconazole (1%) was successful in all the patients. None of the patients showed any side effects. **Conclusion:** It is deduced that patients with a history of contact with animals should be investigated for the zoophilic dermatophyes particularly *M. canis* as this fungus has emerged as a global mycotic pathogen of humans and animals. It is recommended that epidemiological investigation should be conducted to establish the source of infection. The patient with few small ringworm lesions can be successful with treated with topical application of antimycotic drugs, and thus avoid the use of systemic therapy. Furthermore, the early diagnosis and prompt therapy is imperative to prevent the spread of infection.

KEY WORDS: Animal handler, dermatophytes, *Microsporum canis*, Narayan stain, tinea, zoonosis

INTRODUCTION

Zoonoses of multiple etiologies have been recognized as a significant cause of morbidity and mortality in humans as well as in a variety of animals throughout the world [1]. Among such zoonoses, dermatophytosis is the most commonly occurring highly contagious mycozoonosis of global importance [2]. Dermatophytosis, also known as ringworm or tinea, can occur in sporadic and epidemic form, and has public health and economic significance [3-7]. It is estimated that one-fifth of the world population is affected with dermatophytosis [8]. Dermatophytosis is reported from 147 countries of the world including India [2,6,9]. The disease is caused by a group of keratinophilic fungi called as dermatophytes in the genera of *Epidermophyton*, *Microsporum*, and *Trichophyton* [6]. Dermatophytes are strict aerobic, filamentous, non-motile, non-acid fast, and uncapsulated organism which attack on the keratinized tissues of the body namely, the skin, hair, nail, etc., [6]. Dermatophytes are susceptible to common disinfectants such as iodine, chlorine, cresol, formaldehyde, and can survive for years in the inanimate environment [7]. The transmission of infection involves direct contact with a symptomatic or asymptomatic host or indirect contact with contaminated fomites besides contact with the contaminated soil [2,6]. The persons living in rural areas are frequent victims of ringworm due to zoophilic dermatophytes due to their contact with animals. The role of *Microsporum canis* in the etiology of ringworm in animal handlers in not well studied in Gujarat, western region of India. Therefore, the present study was contemplated to elucidate the causative role of *M. canis* in dermatological disorders of patients coming from rural areas of Bharuch, Gujarat, India.

MATERIALS AND METHODS

A total of 27 patients of both sexes (19 males and 8 females), and different age groups with various dermatological problems

presented at the Out-patient Department of Welfare Hospital, and Shashwat Clinic, Bharuch, India, were investigated for the prevalence of *M. canis* from June 2013 to October, 2013. The skin scrapings after sterilizing with 70% ethyl alcohol were collected from the periphery of the lesion/s from various sites of each patient into sterilized disposable plates, and each specimen was subjected to detailed examination by employing standard mycological procedures. The name, age, sex, history of contact with animal, previous treatment if any, injury to the skin, etc. was obtained in each patient. Each patient was examined under Wood's lamp before the collection of the clinical sample. A small part of the skin scrapings was treated with a 10% solution of potassium hydroxide (KOH) and Parker blue-black ink (INK) [6] for direct microscopy under low and high power; and the loop full of the clinical material was inoculated onto plates of nutrient agar, and the duplicate slants of Sabouraud dextrose agar with chloramphenicol (0.05 mg/ml) and actidione (0.5 mg/ml), and also on dermatophyte test medium (DTM) [6]. Both the media were incubated at 25°C and examined daily for the growth of dermatophytic fungi. The detailed microscopy of the isolates was done in "Narayan" stain, which contained 0.5 ml of methylene blue (3% aqueous solution), 4.0 ml of glycerin, and 6.0 ml of dimethyl sulfoxide [10]. The hair perforation test was conducted *in vitro* on human hairs collected from a 4 year old child [6].

RESULTS

The patients exhibited many types of lesions on different of the body such as head, face, hand, neck, trunk, leg, etc., Some of the manifestation of the skin lesions included erythema, vesicle, pustule, scaliness, crustation, alopecia, and pruritus. The wood lamp showed bright greenish yellow flurorescence in three patients. However, fungal elements could be detected in 14 of the 27 skin scrapings under direct microscopy. However, *M. canis* could isolated be from the cutaneous lesions of only 3 of the 27 specimens on mycological medium. The clinical and mycological findings of three positive patients are summarized in Table 1. The direct microscopic examination of the skin scrapings in KOH-INK mounts revealed thin, branched hyaline, hyphae morphologically simulating dermatophytes. There was no growth of bacteria on nutrient agar. On Sabouraud medium, the colonies grew fast, appeared white, and reverse side showed bright yellow pigment. The growth of dermatophytes on DTM changed the colour from yellow to red due to rise in pH of the medium due to metabolic activity. The wet mount preparation of cultures in Narayan stain revealed spindle-shaped macroconidia, and few slender, clavate microconidia. The human hairs exposed to *M. canis* cultures when examined in Narayan stain showed a wedged shaped perforation. Based on the gross cultural, and microscopic morphology, all the three isoalates of dermatophytic fungi were identified as *M. canis*. All the positive patients had contact with diseased animals [Table 1]. We did not collect the skin scrapings from the animals that had direct contact with our patients. These patients belonged to far away area in remote villages of Bharauch. Treatment in our three positive patients was done with topical application of clotrimazole (1%), terbinafine (1%), and luliconazole (1%) [Table 1]. The patients were advised to apply the drug two times daily on the lesions for at least 3 weeks, and in case of any side-effects, they should immediately stop the medication, and contact the physician. The topical application of antifungal drugs showed good clinical response in our patients. Interestingly, none of the drugs showed any signs of erythema or pruritus indicating that all the drugs prescribed were safe to our patients.

Table 1: Clinical and mycological observations in three *M. canis* positive patients

Age in years	Sex	Clinical diagnosis	Contact with animal	Diagnosis		Chemotherapy (%)
				DM*	Culture**	
17	Male	Tinea corporis (neck)	Cow calf	+	+	Clotrimazole (1)
23	Male	Tinea faciei	Dog	+	+	Terbinafine (1)
28	Male	Tinea manuum	Goat	+	+	Luliconazole (1)

*Direct microscopy of the skin scrapings in KOH-INK positive for *M. canis*, **Cultural isolation yielded pure growth of *M. canis* from the skin scrapings, *M. canis*: Microsporum canis, DM: Diabetes mellitus, KOH: Potassium hydroxide

DISCUSSION

Dermatophytosis is an important occupational fungal zoonosis of pet owners, animal handlers, dairymen, abattoir workers, veterinarians, bird keepers, and agricultural farmers [6,11,12]. The disease is prevalent globally but is more common in tropics, and may reach epidemic proportions in geographical areas with high humidity, poor hygienic living conditions, and overpopulation [6,9]. The hot and humid climate of India make dermatophytosis a common superficial fungal infection of the skin [9]. A large number of animals act as vectors of dermatophytes, and all the zoophilic dermatophytes are highly communicable to human beings [6]. In the present study, the mycological investigation of 27 patients of both sexes, and various age groups was undertaken. However, the causative role of *M. canis* could be established in the etiology of ringworm of only 3 patients who had no evidence of immunosuppression (human immunodeficiency virus, tuberculosis, and diabetes mellitus) as revealed by the laboratory findings. All our patients had close direct contact with different animals such as dog, goat, and cattle [Table 1]. Though cats, and dogs are considered the chief reservoir of *M. canis* [13-15], other animals such as goat, monkey, horse, and cattle can also serve as source of infection to humans [16,17,6]. Currently, *M. canis* is recognized as an emerging global dermatophyte which is implicated in the etiology of human ringworm. It is important to mention that about 80% of cases of human ringworm in rural areas, and 10% in urban localities are of animal origin [6]. About 30% of dogs and cats in USA are infected with *M. canis*, a frequent cause of tinea capitis in children [18]. A study conducted by Pal *et al*. [15] indicated that pets can serve as an important source of *M. canis* to family members. Similarly, Cafarchia *et al*. [19] from Southern Italy reported *M. canis* as the most important dermatophyte in dogs. In India, *M. canis* is frequently isolated from various types of tinea by several investigators [20,2,9]. Similarly, the incidence of *M. canis* has increased in several countries such as Croatia, Greece, Italy, Slovenia, and Yemen [21-23]. We did not conduct any epidemiological investigation for establishing the source of

infection in our three patients. However, our patients narrated that the animals to which they were continuously exposed had skin lesions on different parts of the body, and they strongly believed that sick animals were the transmitter of infection to them. In our clinical practice of over two decades, we have observed that if the patient has few small ringworm lesions (one to three), the topical drugs can treat the patients, and there is no need to prescribe the oral antifungal medications. The efficacy of Narayan stain in the study of morphology of fungi has been reported by Pal and Dave [6,2]. As Narayan stain is cheaper and easy to prepare than lactophenol cotton blue and other stains, therefore, can be recommended for its wider use in public health and microbiology laboratories dealing with the study of fungi. It is advised that the role of *M. canis* should be further investigated in the etiology of human ringworm in rural and urban settings.

CONCLUSION

Dermatophytosis is one the most common cutaneous infectious diseases of humans, and animals all over the world. The present study elucidated that several species of animals can transfer *M. canis* to human beings. The isolation of dermatophytes on mycological media, and its direct demonstration in the skin scrapings in KOH-INK solution still remains the gold standard of diagnosis. Hence, early diagnosis and prompt therapy with antifungal drugs is highly essential to prevent the further spread of dermatophytes as they are highly contagious in nature. Since zoophilic dermatophytes are of great public health importance, the persons dealing with sick animals must take precautions to avoid the infection.

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REFERENCES

1. Pal M. Public health concern due to emerging and re-emerging zoonoses. Int J Livest Res 2013;3:56-62.
2. Pal M, Dave P. Ringworm in cattle and man caused by *Micropsoum canis*: Transmission from dog. Int J Livest Res 2013;3:100-3.
3. Pal M. Dermatophytosis in cattle: Clinical and mycological studies. Indian J Anim Sci 1987;57:856-7.
4. Pal M, Thapa BR. An outbreak of dermatophytosis in barking deer (*Muntiacus muntjak*). Vet Rec 1993;133:347-8.
5. Pal M, Dave P. Transmission of *Trichophyton verrucosum* infection from cattle to man. Intas Polivet 2006;7:429-31.
6. Pal M. Veterinary and Medical Mycology. 1st ed. New Delhi, India: Indian Council of Agricultural Research; 2007.
7. CFSPH. Dermatophytosis. Ames, Iowa, USA: Iowa State University, The Center for Food Security and Public Health; 2013.
8. Pal M. Importance of zoonoses in public health. Indian J Anim Sci 2005;75:589-91.
9. Jain N, Sharma M, Sharma M, Saxena VN. Spectrum of dermatophytosis in Jaipur, India. Afr J Microbiol Res 2014; 8:237-243.
10. Pal M. Efficacy of Narayan stain for morphological studies of moulds, yeasts and algae. Rev Iberoam Micol 2004;21:219.
11. Pal M, Lee CW. *Trichophyton verrucosum* infection in a camel and its handler. Korean J Vet Clin Med 2000;17:293-4.
12. Pal M, Tesfaye S, Dave P. Zoonoses occupationally acquired by abattoir workers. J Environ Occup Sci 2013;2:155-62.
13. Fiedler H. *Microsporum* infection (*M. canis* Bodin) as zooanthroponosis (author's transl). Mykosen 1979;22:143-8.
14. Pal M. Isolation of *Microsporum canis* from man and dog. Arogya J Health Sci 1981;7:125-7.
15. Pal M, Dahiya SM, Lee CW. Family pets as a source of *Microsporum canis*. Korean J Vet Clin Med 1990;7:151-5.
16. Pal M, Lee CW. *Microsporum canis* infection in a horse and its transmission to man. Korean J Vet Clin Med 1997;15:196-8.
17. Pal M. Dermatitis in a goat and its handler due to *Microsporum canis*. Indian J Anim Sci 2001;71:138-9.
18. Pal M. Animal dermatophytes communicable to humans. Addis Ababa,Ethiopia: Govt. of Ethiopia Daily News Paper, The Ethiopian Herald; 2011. p. 8.
19. Cafarchia C, Romito D, Sesanelli M, Lia R, Capelli G, Otranto D. The epidemiology of canine and feline dermatophytosis in Southern Italy. Mycoses 2004;47:508-13.
20. Pal M, Dave P. Tinea faciei in a goat handler due to *Microsporum canis*. Rev Iberoam Micol 2005;22:181-2.
21. Maraki S, Tselentis Y. Dermatophytoses in Crete, Greece, between 1992 and 1996. Mycoses 1998;41:175-8.
22. Mahmoud AL. A study of dermatophytoses in Sana'a, Yemen Republic. Mycoses 2002;45:105-8.
23. Seebacher C, Bouchara JP, Mignon B. Updates on the epidemiology of dermatophyte infections. Mycopathologia 2008;166:335-52.

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