

COMPARISON OF PATIENT AND CLINICAL DIFFERENCES BETWEEN SUPERFICIAL SKIN INFECTIONS DUE TO *MICROSPORUM CANIS* AND *TRICHOPHYTON RUBRUM*

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Abstract. Dermatophytosis is a common skin problem worldwide and may be caused by *Trichophyton rubrum* or *Microsporum canis*, which is zoophilic and requires treatment of the pet to reduce the risk of reinfection. Most dermatophytosis are diagnosed without culture so no identification of the causative organism is made. In this study, we aim to determine patient and clinical differences between infection due to *T. rubrum* and *M. canis* in order to inform appropriate management and prevention strategies. This study was performed at the Department of Dermatology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand. Data of patients who were diagnosed as superficial cutaneous dermatophytosis from *T. rubrum* or *M. canis* between 2014 to 2016 were retrospectively reviewed. Of 566 patients, *T. rubrum* was isolated in 518 (91.5%), while *M. canis* was detected in 48 (8.5%). *M. canis* infections were significantly ($p < 0.001$) more common among female (93.8%) than males (6.2%) but *T. rubrum* infections did not vary significantly between females (42.5%) and males (57.5%). Median age of *T. rubrum* and *M. canis* infections was 57 and 39.5 years old, respectively ($p = 0.005$). Patients with *T. rubrum* significantly had tinea cruris ($p < 0.001$), tinea pedis ($p = 0.004$), and tinea unguium of toenail ($p < 0.001$), compared to those with *M. canis* infection. *M. canis* was frequently detected as tinea corporis on the exposure areas of the body above umbilicus (40.4%, $p < 0.001$) and significantly more likely ($p < 0.001$) to involve only one area of the body. In summary, patients with *M. canis* infection were significantly more likely to be female predomination, aged 30-39 years, have tinea corporis in exposed skin above the umbilicus and involve only a single area on the body. Dermatophytosis patients with those characteristics should be consider treating their pets in addition to themselves to reduce their risk of becoming reinfection.

Keywords: *Microsporum canis*, *Trichophyton rubrum*, dermatophytosis, tinea

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INTRODUCTION

Cutaneous dermatophytosis is a worldwide problem (Cai *et al*, 2016; Rashidian *et al*, 2015). Pathogenic organisms are classified into anthropophilic, zoophilic, and geophilic dermatophytes,

depending on their corresponding habitat association (Coulibaly *et al*, 2018; Hainer, 2003; Pires *et al*, 2014). Anthropophilic dermatophytes are from human sources, while zoophilic fungi are from animal sources (Coulibaly *et al*, 2018; Hainer, 2003; Pires *et al*, 2014; Weitzman and Summerbell, 1995). Dermatophytosis can also be classified by area of infection, such as tinea corporis, tinea pedis, tinea manuum, tinea cruris, tinea capitis, and onychomycosis (Ameen, 2010; Cai *et al*, 2016).

Dermatophytosis is based on clinical and laboratory findings. A typical feature of dermatophytosis is a greater inflammatory response at the margin of the lesion and central clearing (Hainer, 2003). Although physical examination may suggest dermatophytosis, a potassium hydroxide (KOH) microscopic examination is recommended to confirm the diagnosis (Hainer, 2003; Weitzman and Summerbell, 1995).

Trichophyton rubrum is an anthropophilic dermatophyte isolated from 80-90% of dermatophytosis cases (Ameen, 2010; Cai *et al*, 2016; Havlickova *et al*, 2008; Lee *et al*, 2015; Negroni, 2010; Nenoff *et al*, 2014; Rashidian *et al*, 2015; Seebacher *et al*, 2008; Vena *et al*, 2012). *Microsporum canis* is an zoophilic dermatophyte that relatively frequently causes tinea capitis in children (Cai *et al*, 2016; Negroni, 2010; Rashidian *et al*, 2015; Seebacher *et al*, 2008; Segal and Frenkel, 2015). Zoophilic dermatophytosis has more inflammation (Bunyaratavej *et al*, 2008). Dermatophytosis secondary to zoophilic dermatophytes may require systemic fungal therapy (Gomez-Moyano and Crespo-Erchiga, 2010) and disinfection of pets to reduce the chances of reinfection (Hainer, 2003). However, there are few studies of whether

there are clinical characteristics unique to *M. canis* infection. In this study, we aimed to determine if there were significant differences in clinical findings and between patients infected with *M. canis* and *T. rubrum* in order to inform management and prevention strategies.

MATERIALS AND METHODS

We retrospectively reviewed the charts of all subjects who presented to the Department of Dermatology, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand from 2014 to 2016 who had the diagnosis of superficial cutaneous dermatophytosis by KOH microscopic examination and who had a fungal culture showing *T. rubrum* or *M. canis*. Each chart was reviewed and the following information was recorded for each case: demographics of subject, location on the body of infection, nail involvement and KOH and fungal culture results.

The χ^2 and Fisher's exact test were used to evaluate potential associations between the causative fungi and the following: demographic characteristics, location on body of infection and nail involvement. The Mann-Whitney U test was used to evaluate significant differences in causative fungi by age. A p -value ≤ 0.05 was considered statistically significant. All statistical analyses were performed using Statistical Package for the Social Sciences for Microsoft Windows, version 18.0 (Statistical Package for the Social Sciences, Chicago, IL).

This study was approved by Institutional Review Board, Siriraj Hospital, Mahidol University, Bangkok, Thailand.

RESULTS

A total of 566 subjects were included

in the study. *T. rubrum* was isolated in 91.5% ($n=518$) and *M. canis* was detected in 8.5% ($n=48$). No subjects had dual infection with both *T. rubrum* and *M. canis*. *M. canis* infections were significantly ($p < 0.001$) more common among female (93.8%) than males (6.2%) but *T. rubrum* infections did not vary significantly

between females (42.5%) and males (57.5%). The median age of subjects with *T. rubrum* (57 years) was significantly ($p=0.005$) higher than subjects with *M. canis* infection was (39.5 years).

As to body sites of infection, patients with *T. rubrum* significantly had tinea cruris ($p < 0.001$), tinea pedis ($p=0.004$), and tinea

Table 1
Comparison between patients infected with *T. rubrum* and *M. canis*.

	<i>T. rubrum</i> $n=518$	<i>M. canis</i> $n=48$	p -value
	n (%)	n (%)	
Sex			<0.001
Male	298 (57.5)	3 (6.2)	
Female	220 (42.5)	45 (93.8)	
Median age, years (P_{25} , P_{75})	57 (13,95)	39.5 (26.3, 63)	0.005
Body site infected	766	57	
Tinea capitis and faciei	32 (4.2)	8 (14.0)	0.001
Tinea corporis			
Body, above umbilicus, exposed	31 (4.0)	23 (40.4)	<0.001
Body, above umbilicus, unexposed	68 (8.9)	9 (15.8)	0.084
Body, below umbilicus, exposed	27 (3.5)	7 (12.3)	0.001
Body, below umbilicus, unexposed	33 (4.3)	4 (7.0)	0.341
Tinea cruris	131 (17.1)	0 (0.0)	<0.001
Tinea manuum	26 (3.4)	2 (3.5)	0.963
Tinea pedis	143 (18.7)	2 (3.5)	0.004
Tinea unguium			
Fingernail	69 (9.0)	1 (1.8)	0.058
Toenail	206 (26.9)	1 (1.8)	<0.001
Number regional site			0.013
1	338 (65.3)	40 (83.3)	0.011
2	136 (26.3)	7 (14.6)	0.075
More than 2	44 (8.4)	1 (2.1)	0.116
Nail involvement	145	2	<0.001
Fingernail	45 (31.0)	1 (50.0)	
Toenail	100 (69.0)	1 (50.0)	

unguium of toenail ($p<0.001$), compared to those with *M. canis* infection. In contrast, tinea corporis on the exposed skin above the umbilicus was significantly diagnosed in patients with *M. canis* infection (40.4%), compared to patients with *T. rubrum* infection (4%, $p<0.001$). *M. canis* infection can also significantly detected as tinea capitis and faciei ($p=0.001$) and tinea corporis on the exposed skin below the umbilicus ($p=0.001$). Moreover, *M. canis* infections were significantly more likely ($p<0.001$) to involve only one area of the body (Table 1).

DISCUSSION

In our study, *M. canis* was significantly more likely among women similar to a study by Bunyaratavej *et al* (2008). This could be because women are more likely to have close contact with pets (Vitulli, 2006). Subjects with *T. rubrum* were significantly older than those with *M. canis* infections, similar to previous study (Ilkit and Durdu, 2015; Lee *et al*, 2015).

In our study, there were significant differences in the parts of the body infected by the studied fungi. *M. canis* was significantly more likely to cause tinea corporis in exposed areas above umbilicus (40.4%), similar to finding of a previous study (Bunyaratavej *et al*, 2008). Pets are a reservoir for *M. canis* (Segal and Frenkel, 2015). Exposed areas above the umbilicus are more likely to come into contact with pets than unexposed areas or areas below the umbilicus.

A main limitation of this study was that it was retrospective study so selection bias could not be avoided.

In summary, our study found significant difference clinically and between patients with *M. canis* and *T. rubrum* infections. Patients with *M. canis*

infection were significantly more likely to be female, aged 30-39 years, have tinea corporis in exposed skin above the umbilicus and involve only a single area on the body. Dermatophytosis patients with those characteristics should consider treating their pets in addition to themselves to reduce their risk of becoming reinfection.

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