

## Dermatophytoses in Sarajevo Area between 1998-2005

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The progressive increase of zoophilic dermatophytes, especially *Microsporum (M.) canis*, in the etiology of human dermatophytoses has been observed in many regions in Europe. The aim of our study was to assess the frequency of dermatophytes in Sarajevo area during the period 1998-2005.

A total of 3302 samples (skin scrapings, hair, scalp and nail fragments) were collected from patients suspected to have tinea infection and cultured on Sabouraud agar. After three weeks of incubation 633 (19.2%) dermatophytes species were identified based on macroscopic and microscopic morphology. Zoophilic species were found in 554 (87.5%) patients.

The most frequent isolated dermatophyte was *M. canis* (80.3%), followed by *Trichophyton (T.) mentagrophytes* var. *mentagrophytes* (6.7%), *T. mentagrophytes* var. *interdigitale* (4.7%), *Epidermophyton (E.) floccosum* (3.0%), *T. violaceum* (1.4%), *T. schoenleinii* (1.1%), *M. gypseum* (0.9%), *T. rubrum* (0.8%), *T. verrucosum* (0.6%), *T. tonsurans* (0.3%) and *M. ferrugineum* (0.2%). The most common types of *M. canis* infection were tinea capitis (31.7%) and tinea corporis (26.4%).

Our findings indicate increase in the frequency of *M. canis* infection between 1998 and 2002 and the decline over the last years of the observation period, while rate of other zoophilic species *T. mentagrophytes* var. *interdigitale* and *T. verrucosum* did not change significantly.

Key words: Dermatomycoses; Sarajevo; Bosnia-Herzegovina

### Introduction

Mycotic infections are among the most common skin diseases. The spectrum of agents of dermatophytosis varies throughout the

world and is constantly changing under the influence of various factors, such as life style, regional ecology, human migration and climatic conditions (1). This change is remarkable especially in the case of zoophilic der-

matophytes (2-4). The increasing frequency of *M. canis* was first observed in southern Europe, especially in Mediterranean countries, and spread from there to northern Europe (5). In some countries, such as Italy, Spain and Greece this species was the most isolated dermatophyte (6-8). In the last decade, an increasing incidence of *M. canis* has been observed in Bosnia and Herzegovina. This study investigated the prevalence of zoophilic dermatophytes and in Sarajevo area during the period 1998-2005.

### Patients and methods

Between 1998 and 2005, a total of 3302 samples (skin scrapings, hair, scalp and nail fragments) from patients with suspected tinea infections were collected at the Department of Dermatovenerology and examined in the Mycological Laboratory of the Institute of Microbiology, Parasitology and Immunology, Sarajevo University Clinical Center. All samples were treated with lactophenol to detect the possible presence of fungal elements and inoculated on Sabouraud agar with chloramphenicol and cycloheximide. The plates were incubated at 27°C for up to three weeks. Grown isolates were identified using conventional methods based on macroscopic and microscopic morphology (9).

### Results

A total of 3302 samples with suspected tinea infections were collected. Dermatophytes were isolated from 633 (19.2%) patients. The most frequent isolated dermatophyte was *M. canis*, which accounted for 80.3% of all dermatophytes recovered. There followed *T. mentagrophytes* var. *mentagrophytes*, *T. mentagrophytes* var. *interdigitale* and *E. floccosum*, while other species: *T. violaceum*, *T. schoenleinii*, *M. gypseum*, *T. rubrum*, *T. verrucosum*, *T. tonsurans* and *M. ferrugineum* were less frequently isolated (Table 1).

Table 1. Dermatophytes isolated from 633 patients with tinea infection

Species	Number of isolates (n: %)
<i>Microsporum canis</i>	508 (80.3)
<i>Trichophyton mentagrophytes</i> var. <i>mentagrophytes</i>	42 (6.7)
<i>Trichophyton mentagrophytes</i> var. <i>interdigitale</i>	30 (4.7)
<i>Epidermophyton floccosum</i>	19 (3.0)
<i>Trichophyton violaceum</i>	9 (1.4)
<i>Trichophyton schoenleinii</i>	7 (1.1)
<i>Microsporum gypseum</i>	6 (0.9)
<i>Trichophyton rubrum</i>	5 (0.8)
<i>Trichophyton verrucosum</i>	4 (0.6)
<i>Trichophyton tonsurans</i>	2 (0.3)
<i>Microsporum ferrugineum</i>	1 (0.2)
TOTAL	633 (100)

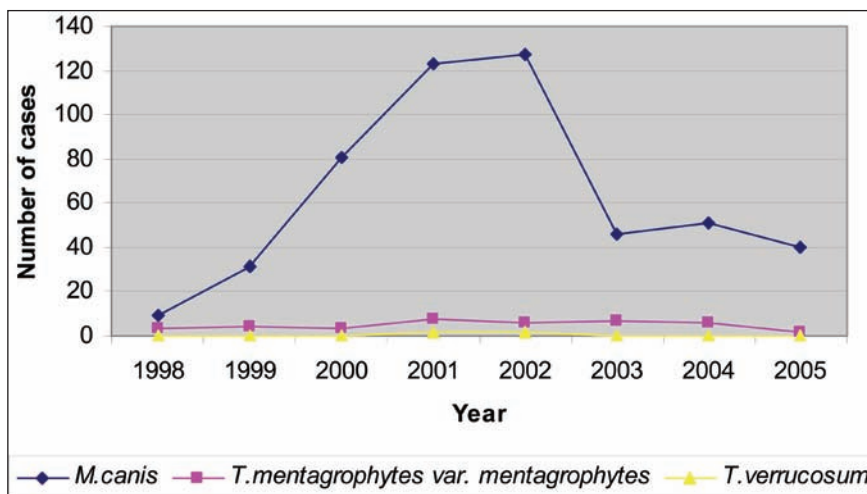


Figure 1. Frequency of zoophilic dermatophytes during the period 1998-2005

Table 2. Distribution of dermatophytes by location of infection

Location of infection	<i>M. canis</i>	<i>M. gypseum</i>	<i>M. ferrugineum</i>	<i>T. mentagrophytes</i> var. <i>mentagrophytes</i>	<i>T. mentagrophytes</i> var. <i>interdigitale</i>	<i>T. violaceum</i>
Tinea capitis	<b>161</b> (31.7%)	<b>2</b> (33.3)	<b>1</b> (100)	<b>3</b> (7.1)	/	<b>4</b> (44.4)
Tinea corporis	<b>134</b> (26.4%)	<b>2</b> (33.3)	/	<b>22</b> (52.4)	/	<b>2</b> (22.2)
Tinea faciei	<b>67</b> (13.2)	<b>1</b> (16.7)	/	<b>14</b> (33.3)	/	<b>3</b> (33.3)
Tinea pedum	<b>55</b> (10.8)	<b>1</b> (16.7)	/	/	24 (80.0)	/
Tinea manuum	<b>35</b> (6.9)	/	/	<b>3</b> (7.1)	/	/
Tinea unguium	<b>39</b> (7.7)	/	/	/	3 (10.0)	/
Tinea cruris	<b>17</b> (3.3)	/	/	/	3 (10.0)	/
TOTAL (%)	<b>508</b> (80.3)	<b>6</b> (0.9)	<b>1</b> (0.2)	<b>42</b> (6.7)	<b>30</b> (4.7)	<b>9</b> (1.4)

Location of infection	<i>T. schoenleini</i>	<i>T. rubrum</i>	<i>T. verrucosum</i>	<i>T. tonsurans</i>	<i>E. floccosum</i>	TOTAL (%)
Tinea capitis	<b>5</b> (71.4)	<b>2</b> (40.0)	/	<b>1</b> (50.0)	/	<b>179</b> (28.3)
Tinea corporis	<b>1</b> (14.3)	<b>3</b> (60.0)	<b>1</b> (25.0)	/	<b>8</b> (42.1)	<b>173</b> (27.3)
Tinea faciei	/	/	<b>1</b> (25.0)	/	/	<b>86</b> (13.6)
Tinea pedum	/	/	/	/	<b>1</b> (5.3)	<b>81</b> (12.8)
Tinea manuum	<b>1</b> (14.)	/	<b>1</b> (25.0)	/	<b>2</b> (10.5)	<b>42</b> (6.6)
Tinea unguium	/	/	<b>1</b> (25.0)	/	<b>1</b> (5.3)	<b>44</b> (7.0)
Tinea cruris	/	/	/	<b>1</b> (50.0)	<b>7</b> (36.8)	<b>28</b> (4.4)
TOTAL (%)	<b>7</b> (1.1)	<b>5</b> (0.8)	<b>4</b> (0.6)	<b>2</b> (0.3)	<b>19</b> (3.0)	<b>633</b> (100.0)

M=Microsporium; T=Trichophyton, E=Epidermophyton

Lesions of tinea capitis were the most prevalent type of *M. canis* infection (31.7%), followed by tinea corporis (26.4%), tinea faciei (13.2%), tinea pedis, tinea unguium, tinea manuum and tinea cruris (10.8%, 7.7%, 6.9% and 3.3%, respectively) (Table 2).

Figure 1 shows the frequency of zoophilic dermatophytes (*M. canis*, *T. mentagrophytes* var. *mentagrophytes* and *T. verrucosum*). In the period 1998-2002 a constant increase in frequency of *M. canis* was observed, while during the last three years we recorded a decline in the rate of this dermatophyte species. The frequency of other zoophilic dermatophytes remained unchanged (Figure 1).

## Discussion

Zoophilic dermatophytes were the most common pathogens recovered from our patients during the period 1998-2005. They were isolated from 87.5% of positive cul-

tures, clearly outnumbering anthropophilic species.

Dermatophytes flora in Bosnia and Herzegovina in period 1964-1978 was characterized by *T. violaceum* and *T. tonsurans* as the agents of superficial trichophytosis and *T. schoenleinii* as the agent of the favus. Zoophilic dermatophytes were represented by *T. mentagrophytes* var. *mentagrophytes* and *T. verrucosum*, but no isolate of *M. canis* was found in clinical patients. Microsporiasis was detected only from affected animals and no one case of human infection was noted until 1998 (10, 11).

Since then, the number of infected persons has been constantly growing to up 508 positive isolates in 2005. The prevalence of *M. canis* in our patients is one of the highest in Europe and is comparable only with rates reported from Italy (accounting for 90.5% of all dermatophytes), Brazil (70.5%) and Spain (62.6%) (12-14). In other countries on

the territory of ex-Yugoslavia, such as Slovenia and Croatia, the isolation rate of this fungus is also very high (46.8% and 36.5%, respectively) (15, 16). On the contrary, some other European laboratories revealed a step increase in infection caused by *T. rubrum*, whereas the frequency of *M. canis* remained unchanged (17-19). A similar pattern has been observed in Brazil, Malaysia and Mexico (20-22). In the United States, *M. canis* has been superseded by *T. tonsurans* as well (23).

After the dramatic increase in the rate of *M. canis* infection, recorded in the first years, a significant decline was noted over the last three years of the observed period. Similar to our results, a decrease of this fungus is noted in Greece (8). The rate of two other zoophilic species, *T. mentagrophytes* var. *mentagrophytes* and *T. verrucosum* did not change significantly.

This dramatic change in dermatophytes flora of our patients could be explained as the results of antimycotic campaign in Bosnia and Herzegovina carried out by griseofulvin. Those few cases of *T. violaceum* and *T. schoenleinii* as well as *T. tonsurans* reflect migration of rural population from occupied territories in urban regions. The prevalence of *M. canis* is probably related to the increase in the number of domestic animals particularly cats living outside of homes and consequently an increase in the phenomenon of animals stray and semistray (24). Presumably stray cats are the most important carriers and transmitters of *M. canis*. The elimination of obvious vectors, such as stray animals, could improve conditions of life and hygiene, may be able to reduce dermatophytes, particularly *M. canis*.

The distribution of dermatophytes in this study is similar to the epidemiological pattern reported in some European countries (2-5). *M. canis* remains one of the most important dermatophytes in southern Europe. Further studies are needed to find out

whether the present trend in decreasing frequency of *M. canis* infection will continue.

## References

1. Aly R. Ecology and epidemiology of dermatophyte infections. *J Am Acad Dermatol*. 1994;31(3 Pt 2): S21-5.
2. Sberna F, Farella V, Geti V, Taviti F, Agoistini G, Vannini P, et al. Epidemiology of the dermatophytoses in the Florence area of Italy: 1985-1990. *Mycopathologia*. 1993;122(3):153-62.
3. Mangiaterra ML, Giusiano GE, Alonso JM, Pons de Storni L, Waisman R. Dermatofitosis en el area del Gran Resistencia, Provincia del Chaco, Argentina. *Rev Argent Microbiol*. 1998;30(2):79-83.
4. Pereiro Miguens M, Pereiro M, Pereiro M Jr. Review of dermatophytoses in Galicia from 1951 to 1987, and comparison with other areas of Spain. *Mycopathologia*. 1991;113(2):65-78.
5. Korstanje MJ, Staats CG. Tinea capitis in Northwestern Europe 1963-1993: etiologic agents and their changing prevalence. *Int J Dermatol*. 1994;33(8):548-9.
6. Mercantini R, Moretto D, Palamara G, Mercantini P, Marsella R. Epidemiology of dermatophytoses observed in Rome, Italy, between 1985 and 1993. *Mycoses*. 1995;38(9-10):415-9.
7. Pereiro Miguens M, Pereiro M, Pereiro M Jr. Review of dermatophytoses in Galicia from 1951 to 1987, and comparison with other areas of Spain. *Mycopathologia*. 1991;113(2):65-78.
8. Maraki S, Tselentis Y. Survey on the epidemiology of *Microsporum canis* infections in Crete, Greece over a 5-year period. *Int J Dermatol*. 2000;39(1):21-4.
9. Weitzman I, Summerbell RC. The dermatophytes. *Clin Microbiol Rev*. 1995;8(2):240-59.
10. Ozegovic L, Grin EI, Ajello L. Natural history of endemic dermatophytoses in Bosnia and Herzegovina, Yugoslavia. *Mykosen*. 1985;28(6):265-70.
11. Grin E, Ozegovic L. Endemske dermatofitije u Bosni i Hercegovini. Sarajevo : Akademija nauka i umjetnosti Bosne i Hercegovine, 1992. p. 1-90. (Grada, knj. 27; Odjeljenje medicinskih nauka, knj. 2).
12. Romano C. Tinea capitis in Siena, Italy. An 18-year survey. *Mycoses*. 1999;42(9-10):559-62.
13. Moraes MS, Godoy-Martinez P, Alchorne MM, Boatto HF, Fischman O. Incidence of Tinea capitis in Sao Paulo, Brazil. *Mycopathologia*. 2006;162(2):91-5.
14. Rubio-Calvo C, Gil-Tomas J, Rezusta-Lopez A, Benito-Ruesca R. The aetiological agents of tinea

- capitis in Zaragoza (Spain). *Mycoses*. 2001;44(1-2):55-8.
15. Dolenc-Voljc. Dermatophyte infections in the Ljubljana region, Slovenia, 1995-2002. *Mycoses*. 2005;48(3):181-6.
  16. Babic-Erceg A, Barisic Z, Erceg M, Babic A, Borzic E, Zoranic V, et al. Dermatophytoses in Split and Dalmatia, Croatia, 1996-2002. *Mycoses*. 2004;47(7):297-9.
  17. Monod M, Jaccoud S, Zaugg C, Lehcenne B, Baudraz F, Pannizon R. Survey of dermatophyte infections in the Lausanne area Switzerland. *Dermatology*. 2002;205(2):201-3.
  18. Monzon de la Torre A, Cuenca-Estrella M, Rodriguez-Tudela JL. Estudio epidemiologico sobre las dermatofitosis en Espana (abril-junio 2001). *Enfrem Incc Microbiol Clin*. 2003;21(9):477-83.
  19. Valdigem GL, Pereira T, Macedo C, Duarte ML, Oliveira P, Ludovico P, et al. A twenty-year survey of dermatophytoses in Braga, Portugal. *Int J Dermatol*. 2006;45(7):822-7.
  20. Chinelli PA, Sofiatti A de A, Nunes RS, Martins JE. Dermatophyte agents in the city of Sao Paulo, from 1992 to 2002. *Rev Inst Med Trop Sao Paulo*. 2003;45(5):259-63.
  21. Ng KP, Soo-Hoo TS, Na SL, Ang LS. Dermatophytes isolated from patients in University Hospital, Kuala Lumpur, Malaysia. *Mycopathologia*. 2002;155(4):203-6.
  22. Welsh O, Welsh E, Ocampo-Candiani J, Gomez M, Vera-Cabrera L. Dermatophytoses in Monterrey, Mexico. *Mycoses*. 2006;49(2):119-23.
  23. Weitzman I, Chin NX, Kunjukunu N, Della-Latta P. A survey of dermatophytes isolated from human patients in the United States from 1993 to 1995. *J Am Acad Dermatol*. 1998;39(2 Pt 1):255-61.
  24. Sparkes AH, Gruffydd-Jones TJ, Shaw SE, Wright AI, Stokes CR. Epidemiological and diagnostic features of canine and feline dermatophytosis in the United Kingdom from 1956 to 1991. *Vet Rec*. 1993;133(3):57-61.