

## A retrospective study of *Trichophyton mentagrophytes* infection in dogs (1970-2002)

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### ABSTRACT

In the 33-year period from 1970 to 2002, 3854 dogs with different dermatological disorders were examined at the Department of Microbiology and Infectious Diseases, Faculty of Veterinary Medicine, University of Zagreb, Croatia. Clinical and laboratory examinations of all skin and hair samples yielded 66 (1.7%) isolates of *Trichophyton mentagrophytes*, while *Microsporum canis* was diagnosed in 840 cases (21.8%). Other dermatophytes were cultured less frequently. *Microsporum gypseum* was isolated in 38 dogs (1.0%), while *Microsporum persicolor* was diagnosed only twice (0.1%). A retrospective study of trichophytosis due to *T. mentagrophytes* was performed in order to present different clinical aspects in dogs. All 66 dogs showed clinical evidence of skin lesions, and four groups with different symptoms were identified. The majority of dogs 42 (63.6%) with *T. mentagrophytes* infection had lesions typical of dermatophyte infection. The remaining 24 dogs (36.4%) were without nummular lesions typical of dermatophyte appearance. The clinical picture included multifocal to diffuse appearance in 12 dogs (18.2%), severe inflammatory lesions in 10 (15.2%) or granulomatous lesions resembling pseudomycetoma in 2 dogs (3.0%). Considering the veterinary and public health importance of canine ringworm, attention was focused on *T. mentagrophytes* due to variations in clinical appearance which might make early diagnosis very difficult, together with duration of infection and reappearance due to persisting spores.

**Key words:** *Trichophyton mentagrophytes*, dog, clinical features

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### Introduction

Dermatophytosis (also known as ringworm), an important skin infection in dogs and also in other companion, domestic and wild animals, is a fungal superficial skin infection of keratinised tissues, claws, hair, and *stratum*

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*corneum* caused by different species of *Microsporum*, *Trichophyton*, *Epidermophyton*, *Keratinomyces* or *Chrysosporium*. Dermatophytes which most frequently infect dogs are *Microsporum* and *Trichophyton*, with *Trichophyton* being less common. The majority of cases are due to *Microsporum canis* (*M. canis*) (MANTELLI and SOMMARIVA, 1988; WRIGHT, 1989; BRGLEZ, 1991; SIESENOP et al., 1996; PINTER et al., 1999; SVOBODA and SVOBODA, 2001; MANCIANTI et al., 2002; CABANES et al., 2003) while very rare, the commonest species isolated from dogs is *Trichophyton mentagrophytes* (*T. mentagrophytes*) (SERTIĆ et al., 1973; HAJSIG et al., 1975; VOKOUN and KUCERA, 1991; SZEMEREDI and SZENCI, 2002). Occurrence of *T. mentagrophytes* varies usually between 3.1% and 12.4% of all dermatophytoses in dogs in Europe (MANTELLI and SOMMARIVA, 1988; BRGLEZ, 1991; SIESENOP et al., 1996; GALUPPI et al., 2002; MANCIANTI et al., 2002; CABANES et al., 2003).

*T. mentagrophytes* is a zoophilic dermatophyte of wild and domestic rodents which is occasionally transmitted to man and other animals by direct contact with an infected animal or asymptomatic carrier or with contaminated material (hair and scales) from the environment (KRISTENSEN and VIGGO KROGH, 1981; HAJSIG et al., 1983). It is a complex species and three perfect states have been determined: *Arthroderma* (*A.*) *vanbreuseghemii*, *A. simii* and *A. benhamiae* (TAKASHIO, 1977).

Clinical signs of trichophytosis due to *T. mentagrophytes* in various animals might be variable and not restricted only to classical nummular lesions. Variations in clinical appearance and the differing course of the disease make early diagnosis very difficult, particularly for *T. mentagrophytes* infections in dogs. Therefore, the aim of our work was to present observations on different aspects of trichophytosis due to *T. mentagrophytes* in dogs, including a summary of clinical appearances of dog infections over a 33-year period.

### Materials and methods

A retrospective study of canine dermatophytosis due to *T. mentagrophytes* was performed. During the period from 1970 to 2002, 3854 dogs with various skin lesions (not only resembling dermatophytosis) were examined at the Department of Microbiology and Infectious Diseases,

Faculty of Veterinary Medicine, University of Zagreb, Croatia, to determine the incidence of ringworm.

Patients' breed, sex, age and detailed clinical appearance of lesions were recorded, together with possible contacts with the source of dermatophyte infection. Samples were collected by plucking hair with forceps or by scraping epidermal scales with a sterile surgical blade from the affected areas for mycological and/or parasitological examination. Swabs for bacteriological testing were taken from animals with suspected bacterial infections. Cytology of fine-needle aspirates of cutaneous lesions was also performed when necessary.

Laboratory data were based on direct microscopy of hair and skin scrapings in lactophenol blue and cultures of sampled material. All the specimens were incubated at 27 and 37 °C for three to four weeks on Sabouraud's dextrose agar (Biolife) supplemented with chloramphenicol (0.5 mg/ml) as well as cycloheximide (0.5 mg/ml). Suspected dermatophyte cultures were identified by the morphology of the thallus and microscopic appearance of the hyphae, macroconidia and microconidia (REBELL and TAPLIN, 1970). A definitive diagnosis of trichophytosis was based on complete laboratory testing, together with clinical examination results.

### Results

A total of 3854 dogs were examined from which 66 hair and skin scrapings samples (1.7%) were positive to *T. mentagrophytes* (Figs. 1A and 1B), while *M. canis* was diagnosed in 840 cases (21.8%). Others from the known pathogenic fungal species were cultured much less frequently (*M. gypseum*, *M. persicolor*) (Table 2). The medical histories of all cases with *T. mentagrophytes* infection were reviewed separately and follow-up information was obtained from owners or referring veterinarians.

All 66 dogs showed clinical evidence of skin lesions. Trichophytosis was most frequently diagnosed in pure breeds, which was statistically significant when compared to crossbreeds ( $P > 0.001$ ). Data of these dogs with regard to sex and age are presented in Table 1.

Four major groups of animals were identified from the clinical results (Table 3). The majority of dogs (Group 1) with *T. mentagrophytes* infection



had lesions typical of dermatophyte infections (Fig. 1C). Twenty-four dogs (36.4%) were without nummular lesions typical of dermatophyte appearance. The clinical picture of these dogs included multifocal to diffuse



Figs. 1A-1H. Clinical features of canine dermatophytosis due to *T. mentagrophytes* and its cultural appearances. A) *T. mentagrophytes* culture on Sabouraud dextrose agar makes a colony with a powdery or cottony-flat surface. B) The reverse side of *T. mentagrophytes* colonies is usually brown. C) A classic crusting, erosive, alopecic well demarcated lesion on the tip of the nose. D) Irregular erythematous lesions resemble bacterial hypersensitivity and bacterial hypersensitivity-like lesions on the dog head. E) Pododermatitis (severe interdigital edema). F) Crusting, erosive, alopecic dermatitis with numerous draining tracts from the dog with generalised *T. mentagrophytes* infection. G) Fungal (*Trichophyton mentagrophytes*) nodules on the muzzle of a dog. The lesion is firm, raised and alopecic. H) Painful nodular lesion on the dogs digit caused by long-lasting *T. mentagrophytes* infection.

appearance, severe inflammatory or granulomatous lesions. Dogs in Group 2 had a multifocal appearance of diffuse alopecia with little evidence of inflammation (Fig. 1D). Group 3 consisted of dogs with inflammatory skin lesions and severe skin damage (Fig. 1F). Two dogs in Group 4 had pronounced granulomatous reactions resembling pseudomycetoma (Figs. 1G and 1H). Lesions were primarily found on the head and legs. In these two cases cytology of fine-needle aspirates of cutaneous nodules revealed neutrophilic inflammation but no fungal hyphae. Surface skin scrapings and hair samples from distance lesions revealed *T. mentagrophytes* culture.

Aetiology and correlation between “typical ringworm” and other varieties of clinical appearance of trichophytosis due to *T. mentagrophytes* is presented in Tables 2 and 3.

In a limited number of cases secondary bacterial component was documented, most frequently caused by *Staphylococcus intermedius* (S.

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Table 1. Number of dogs positive to *T. mentagrophytes* according to sex and age distribution

	Sex groups		Age groups (years)		
	Male	Female	<1	1 - 2	>2
Number of dogs	37 (56.1%)	29 (43.9%)	23 (34.8%)	32 (48.5%)	11 (16.7%)

Table 2. Dermatophyte species isolated in dogs

Causative agent and clinical features (groups)	Number of cases
<i>Microsporum canis</i>	840 (21.8%)
<i>Microsporum gypseum</i>	38 (1.0%)
<i>Microsporum persicolor</i>	2 (0.1%)
<i>Trichophyton mentagrophytes</i>	66 (1.7%)

Table 3. Varieties of clinical appearance of *T. mentagrophytes* infections

Clinical appearance	Number of cases
Group 1 - epidermal and shaft localised lesions	42 (63.6%)
Group 2 - multifocal diffuse lesions	12 (18.2%)
Group 3 - inflammatory lesions and severe skin diseases	10 (15.2%)
Group 4 - granulomatous lesions	2 (3.0%)

*intermedius*) strains (Fig. 1E). Deep skin scrapes of all 66 dogs were negative for ectoparasites.

*T. mentagrophytes* var. *interdigitale* was recovered twice from dog owners. Both animals and owners had a clear history of the same dermatophytosis.

All patients with trichophytosis were treated either with oral griseofulvin, ketoconazole or itraconazole. Use of topical antifungals and antibacterial antibiotics was often an additional therapy in complicated cases, particularly those with bacterial infection. In one patient treatment included surgical excision. Seven of the patients had recurrent episodes of *T. mentagrophytes* infection, one was euthanised and two did not report for final therapy control. The source of re-infection was unclear in all cases.

It is suspected that environmental contamination provided constant exposure to a large source of organisms which contributed to the eventual relapse of the infection.

In uncomplicated cases, clinical cure and negative fungal culture were achieved most often after 6 to 8-12 weeks of systemic and topical antifungal treatment.

### Discussion

It has been observed at the Department of Microbiology and Infectious Diseases, Faculty of Veterinary Medicine, University of Zagreb, Croatia, that the presence of *T. mentagrophytes* in canine skin and hair samples was low in comparison with *M. canis* (PINTER et al., 1999). We have also noticed several atypical cases of trichophytosis due to *T. mentagrophytes* in dogs. We therefore decided to undertake a retrospective review of all canine *T. mentagrophytes* cases over a 33-year period.

Due to the variable clinical aspects of mycotic lesions it is very important not to arrive at any conclusions about dermatophyte infection without instituting thorough and complete clinical and laboratory procedures. Diagnosis of canine *T. mentagrophytes* trichophytosis often requires correlation of data from various sources: history, physical examination, hair samples and skin scrapings with complete laboratory examination (SCOTT et al., 1995).

At the onset of infection, dermatophytoses caused by *T. mentagrophytes* in examined dogs were usually, but not invariably, nonpruritic. Occasionally, there was moderate to intense pruritus, most often in connection with secondary infection by *S. intermedius*. Clinical signs mostly included folliculitis, alopecia, erythema, scales and crusts. Classical nummular lesions due to central healing were found, together with lesions of irregular and diffuse outline. Generally, it was possible to conclude that the surface of the trichophyton lesions ranged from scaly nummular patches to diffuse alopecia, with little evidence of inflammation or alopecia with heavy inflammation and hyperpigmentation. It is known that some clinical inflammatory forms of trichophytosis may be easily confused with pemphigus erythematosus (PARKER and YAGER, 1997). Also, even more complicated cases are known, although very rare, in the form of granulomas (BERGMAN et al., 2002). Such dermal dermatophyte infections were previously confirmed in cats and dogs but mainly due to *M. canis* (TUTTLE, 1983; MEDLEAU, 1990; MEDLEAU and RAKICH, 1994). Two of our dogs

resembled such granuloma cases but apart from positive fungal culture from surface lesions there were no histological confirmations. Some *T. mentagrophytes* infections of dogs were remarkably persistent and difficult to resolve, together with the appearance of re-infection. The authors would like to stress the importance of underlying diseases.

In this study it was shown that clinical signs of trichophytosis due to *T. mentagrophytes* might be variable and not restricted to the classical ringworm nummular lesion which extends with erythema, scaling and alopecia. Quite often, there was a marked inflammatory response with redness, oedema and infiltration of the skin. Penetration of the *stratum corneum* and hair in many cases caused mechanical damage with consequent excessive desquamation of superficial epidermis, fracture of hairs and disintegration of the hair follicles. It was obvious that suppurative lesions also as diffuse, or nodular dermatitis, could be expected in canine trichophytosis, complicating differential diagnosis in many of our patients. Thus, final confirmation by the culture technique was an effective diagnostic tool in almost all cases. *T. mentagrophytes*, with its typical granular form during animal parasitism, was recovered from dog hair and skin samples. In two cases the family records of the animal owners had a clear history of *T. mentagrophytes* var. *interdigitale*. It is known that *T. mentagrophytes* var. *interdigitale* may take on a granular appearance during animal parasitism. In these cases it is most probable that the owners were source of the animal infection.

Considering the veterinary and public health importance of canine ringworm, attention is focused mainly on *M. canis* (WRIGHT, 1989; SVOBODA and SVOBODA, 2001; MANCIANTI et al., 2003). However, in dog trichophytosis, clinical appearance might be much more confusing; duration of infection and residual scarring may be equally or even more severe, together with reappearance due to the persisting spores in the environment, which is an important source of exposure and recontamination to men and animals. It is considered that dermatopytosis definitely demands more attention.

### References

- BERGMAN, R. L., L. MEDLEAU, K. HNILICA, E. HOWERTH (2002): Dermatophyte granulomas caused by *Trichophyton mentagrophytes* in a dog. *Vet. Dermatol.* 13, 49-52.



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- BRGLEZ, I. (1991): A contribution to the isolation of dermatophytes in dogs and cats. Zb. Vet. Fak. Univ. Ljubljana 28, 11-18.
- CABANES, F. J., F. MANCIANTI, M. P. TAMPIERI, M. G. GALLO, L. PINTER, B. MIGNON, R. FABIKOVA, A. TOMSIKOVA, A. WEBER, M. J. PAYA, M. T. CUTULI (2003): Survey of cat and dog dermatophytoses in Europe. Trends in medical mycology 49-54. ISSI Proceedings.
- GALUPPI, R., M. S. CARELLE, M. P. TAMPIERI (2002): Epidemiological features of dermatophytoses in animals: five years of diagnostic activity (1995-1999). Obiettivi e Documenti Veterinari 23, 51-54.
- HAJSIG, M., T. NAGLIĆ, D. HAJSIG, V. HORVAT, P. LUKMAN, A. ČOVIĆ (1983): Dermatophytoses in rodents. IV. *Trichophyton mentagrophytes* transmission from ringworm rabbits to swine. Vet. arhiv 53, 251-257.
- HAJSIG, M., V. SERTIĆ, T. NAGLIĆ, M. BAUER (1975): First findings of *Microsporum gypseum* and *M. canis* infections in the dog and cat in Zagreb. Vet. arhiv 45, 117-122.
- KRISTENSEN, S., H. VIGGO KROGH (1981): A study of skin diseases in dogs and cats. Nord. Vet. Med. 33, 134-140.
- MANCIANTI, F., S. NARDONI, S. CECCHI, M. CORAZZA, F. TACCINI (2002): Dermatophytes isolated from symptomatic dogs and cats in Tuscany, Italy during a 15-year-period. Mycopathol. 156, 13-18.
- MANCIANTI, F., S. NARDONI, M. CORAZZA, P. D'ACHILLE, C. PONTICELLI (2003): Environmental detection of *Microsporum canis* arthrospores in the households of infected cats and dogs. J. Feline Med. Surg. Sci. Direct. (In press)
- MANTELLI, F., M. SOMMARIVA (1988): Dermatophytoses in dogs and cats. Summa 5, 186-188.
- MEDLEAU, L. (1990): Recently described dermatoses. Vet. Clin. Small Anim. 20, 1623-1632.
- MEDLEAU, L., P. M. RAKICH (1994): *Microsporum canis* pseudomycetomas in a cat. J.A.A.H.A. 30, 573-576.
- PARKER, W. M., J. A. YAGER (1997): *Trichophyton* dermatophytosis – a disease easily confused with pemphigus erythematosus. Can. Vet. J. 38, 502-505.
- PINTER, L., Ž. JURAK, M. UKALOVIĆ, V. SUŠIĆ (1999): Epidemiological and clinical features of dermatophytoses in dogs and cats in Croatia between 1990 and 1998. Vet. arhiv 69, 261-270.
- REBELL, G., D. TAPLIN (1970): Dermatophytes: Their Recognition and Identification. University of Miami Press. Florida.
- SCOTT, D. W., W. H. MILLER, C. E. GRIFFIN (1995): Fungal Skin Diseases. Muller and Kirk's Small Animal Dermatology, 5<sup>th</sup> ed. Philadelphia, W. B. Saunders. pp. 330-389.
- SERTIĆ, V., M. HAJSIG, T. NAGLIĆ (1973): Dermatophytoses in dogs with reference to other skin diseases in carnivores. Vet. arhiv 43, 210-218.

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- SIESENOP, U., M. BUSSE, K. H. BOHM (1996): Die Bedeutung der Dermatophytosen bei Hund und Katze ein Rückblick auf 11 Jahre mykologische Routinediagnostik. Kleintierpraxis 41, 483-491.
- SVOBODA, V., M. SVOBODA (2001): Topical problems associated with zoonotic infections of dogs and cats in the Czech Republic. Folia Vet. 45, Suppl. 52-56.
- SZEMEREDI, G., O. SZENCI (2002): Examination of the aetiology of skin diseases caused by dermatophytos in dogs and cats. Magy. Allatorv. Lapja 124, 663-668.
- TAKASHIO, M. (1977): The *Trichophyton mentagrophytes* complex. In: Recent Advances in Medical and Veterinary Mycology. (Ed. K. Iwata). University of Tokyo Press. Tokyo. pp. 271-276.
- TUTTLE, P. A. (1983): Deep dermatophytosis in a cat. JAVMA 30, 573-576.
- VOKOUN, P., K. KUCERA (1991): Study of dermatomycoses of dogs and cats in urban area. Veterinarstvi 41, 250-254.
- WRIGHT, A. I. (1989): Ringworm in dogs and cats. J. Small Anim. Pract. 30, 242-249.

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**PINTER, LJ., Z. ŠTRITOF: Retrospektivni prikaz trihofitoze u pasa uzrokovane vrstom *Trichophyton mentagrophytes*. Vet. arhiv 74, 251-260, 2004.**

**SAŽETAK**

Tijekom 33 godine (1970.- 2002.) na Zavodu za mikrobiologiju i zarazne bolesti s klinikom Veterinarskog fakulteta Sveučilišta u Zagrebu, pregledano je 3854 pasa s promjenama na koži. Laboratorijskim pretragama uzoraka dlake i materijala s kože izdvojeno je 66 (1,7%) izolata vrste *Trichophyton mentagrophytes* dok je vrsta *Microsporum canis* izdvojena iz 840 pasa (21,8%). Ostale poznate patogene gljivične vrste u pasa rijetko su bile izdvojene. *Microsporum gypseum* izdvojen je iz 38 pasa (1,0%), a *Microsporum persicolor* samo iz dva psa (0,1%). Retrospektivna studija trihofitoze pasa uzrokovane vrstom *T. mentagrophytes* načinjena je obzirom na različitost kliničkih značajki bolesti. Svih 66 pasa s trihofitozom imalo je klinički vidljive promjene koje su svrstane u četiri skupine prema utvrđenim simptomima. Cilj ovog rada bio je prikazati različite oblike trihofitoze pasa uzrokovane vrstom *Trichophyton mentagrophytes* s osobitim naglaskom na različito kliničko očitovanje te bolesti prije svega poradi lakše dijagnostike. Većina pasa (42 ili 63,6%) inficirana vrstom *T. mentagrophytes* imala je lezije tipične za dermatofitozu. Ostala 24 psa (36,4%) bila su slobodna od takvih lezija. Klinički su utvrđene multifokalne do difuzne lezije u 12 pasa (18,2%), jake upalne promjene u 10 pasa (15,2%) ili granulomatozne promjene nalik na pseudomicetome u 2 psa (3,0%). Uzevši u obzir značaj dermatofitoza u veterinarskoj medicini i javnom zdravlju, usredotočili smo se na infekciju vrstom *T. mentagrophytes* zbog raznovrsnosti kliničkih znakova te bolesti, koja otežava ranu dijagnostiku, kao i dužine trajanja bolesti te širenja vrlo otpornih spora u okoliš što pospješuje ponovnu infekciju.

**Ključne riječi:** *Trichophyton mentagrophytes*, pas, kliničke osobitosti

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