

Tinea capitis: epidemiological and ecological aspects of cases observed from 1983 to 2003 in the Botucatu Medical School, state of São Paulo-Brazil*

*Tinea capitis: epidemiologia e ecologia dos casos observados entre 1983 e 2003 na Faculdade de Medicina de Botucatu, Estado de São Paulo, Brasil**

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Abstract: BACKGROUND – *Tinea capitis* is an important fungal infection of both pediatric and dermatological interest. In Brazil, its prevalence is unknown, and main causal agents are *Trichophyton tonsurans* in northern and northeastern regions and *Microsporum canis* in southern and southeastern regions of the country. Knowledge on the most prevalent genus and species has sanitary and therapeutic importance.

OBJECTIVE – To identify dermatophyte species causing *tinea capitis*, in a University Hospital that sees patients of the Public Health System (SUS), coming from both urban and rural areas in the interior of State of São Paulo.

METHODS – Samples of clinical cases with suspicion of *tinea capitis*, coming from the area under Botucatu Medical School – Unesp's responsibility, were investigated by means of direct examination and cultivation aimed at identification and isolation of the causal agent.

RESULTS – 594 out of 1,055 suspected cases were confirmed by direct examination, in 364 (61.1%) a causal agent was isolated: *M. canis* in 88.2%, followed by *T. tonsurans* (4.7%), *T. rubrum* (3.3%), *M. gypseum* (1.9%) and *T. mentagrophytes* (1.6%). Males comprised 55.7% of the cases, and the age range of 0 – 5 years was predominant with 62.6% ($p < 0.05$).

CONCLUSIONS – *M. canis* detected prevalence was above the expected for Southeast of Brazil. The frequency of 88.2% may represent an influence of patients coming from the rural areas. These data should be considered for therapeutic decisions.

Keywords: Epidemiology; *Microsporum*; *Tinea capitis*

Resumo: FUNDAMENTOS – *Tinea capitis* é importante infecção fúngica de interesse dermatológico e pediátrico. No Brasil sua prevalência é desconhecida, e os agentes causais principais são o *Trichophyton tonsurans* nas regiões Norte-Nordeste e o *Microsporum canis* no Sul-Sudeste do país. Conhecimento sobre gênero e espécies mais prevalentes tem importância sanitária e terapêutica.

OBJETIVOS – Identificar espécies de dermatófitos, causa de *tinea capitis*, em serviço universitário que atende clientela do Sistema Único de Saúde, de procedência urbana e rural, no interior do Estado de São Paulo.

MÉTODOS – Amostras de casos clínicos suspeitos de *tinea capitis*, procedentes da área de abrangência da Faculdade de Medicina de Botucatu-Unesp, foram investigadas por exame direto e cultivo visando ao diagnóstico e isolamento do agente causal.

RESULTADOS – De 1.055 suspeitas, 594 foram confirmadas por exame direto, em 364 (61,1%) isolou-se o agente: *M. canis* em 88,2%, seguindo-se *T. tonsurans* (4,7%), *T. rubrum* (3,3%), *M. gypseum* (1,9%), *T. mentagrophytes* (1,6%). O sexo masculino correspondeu a 55,7% dos casos, e a faixa etária entre 0-5 anos predominou com 62,6% ($p < 0,05$).

CONCLUSÕES – A prevalência detectada do *M. canis* superou o esperado para a Região Sudeste do Brasil. A frequência de 88,2% pode estar influenciada por pacientes procedentes da zona rural. Esse dado deve ser considerado quando de decisão terapêutica.

Palavras-chave: Epidemiologia; *Microsporum*; *Tinea capitis*

INTRODUCTION

Tinea capitis is a specific disease of the childhood, with an evolution ranging from acute to chronic, and caused by different dermatophyte fungal species. Knowledge of the epidemiology and ecology of *tinea capitis*, regarding a country or its regions, is

important for the didactic and sanitary meaning of the information, because of guidance as to screening infectious foci, adoption of preventive measures and for possible infectious agent-dependent therapeutic implications. Prevalence in the general population is

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theoretically unknown, with reported values that go from 0.52% in Spanish school population,¹ 2.5% in England² and even 13%, including subclinical infections, in students from Cleveland, USA. Contagious source of *tinea capitis* is variable – it can be acquired from other patients or from fomites, in the case of anthropophilic fungi; from animals when infection is caused by zoophilic fungi and, more seldom, from contact with geophilic fungi. The more prevalent infecting species undergo variations from times to times, country to country or even within the regions of a same country, which depends on environmental and ethnical factors, socioeconomic level and population density.⁴ In Europe, different surveys have shown *Microsporum canis* to be the most prevailing species, particularly in Spain, Italy and Greece.⁵ Anthropophilic species predominate in certain regions of France, England and Sweden.^{4,6} One of the reasons for this variability in the epidemiological profile observed in Europe could be related to the ethnical composition of the studied population, whose migratory flows coming from Sub-Saharan and Northern Africa and Caribbean contribute to changes in the profile of prevailing infecting species.^{5,6} In Spain, for instance, occurrence of *tinea capitis* caused by anthropophilic species, such as *Trichophyton tonsurans*, *T. soudanense*, *T. violaceum* and *Microsporum audouinii*, was shown to be statistically higher among immigrant students as compared to natives.¹ In England, *T. tonsurans* was the agent diagnosed in 62 to 91% of instances, depending on the studied population and statistically related to ethnical groups originating from Sub-Saharan Africa or from the Caribbean.^{4,7} In the American Continent, *tinea capitis* varies in prevalence of infecting agents, and is considered to be very important in terms of public health in the US.^{4,8,9} There, *T. tonsurans*, an anthropophilic species, is largely predominant, with increasing incidence and rates that reach 88 to 95% of the isolated fungi.^{4,9} Young African-american males coming from large urban centers, with age between 5 and 18 years, are the most affected, with a relative risk of acquiring *tinea capitis* 29.4 times higher than general population.¹⁰ *T. tonsurans* is also the most prevailing species in Canada, with up to 76% of the isolated species.⁴ *M. canis*, a zoophilic species, is the predominant causal agent in the other American countries, corresponding, for instance, to 80% of the isolated in Mexico¹¹ and 60% in Argentina.¹² In Brazil, various studies, shown in chart 1, have registered a higher frequency of *T. tonsurans* in northern and northeastern states and *M. canis* in southern and southeastern states.^{13,21} *T. schoenleinii* infection, which causes tinea favosa, has been shown to be quite rare in the cited regions and countries.²²

This had the goal of adding up epidemiological data on the matter, based on data obtained at the Dermatology Department at Botucatu Medical School-Unesp (Dermatology-FMB), which sees both urban and rural population coming from the interior of the State of São Paulo.

PATIENTS AND METHODS

In the period comprised between January 1984 and December 2003, data of patients seen at the Dermatology Outpatient Clinic - FMB with clinical suspicion of *tinea capitis* were gathered. Hair, trimmed hair or scale samples from the suspected damaged area were collected and sent to the Medical Mycology Laboratory at the same service. Mycological diagnosis was made by analysis of the biological specimen, treated with 20% KOH and submitted to direct microscopic examination and culture in a cloranphenicol and actidione (Mycosel®)-containing Sabouraud dextrose medium, kept under room temperature for at least 20 days. In positive cultures, morphological features, such as color, surface and back of the colony, were observed. Micromorphological mycelium and conidia features, such as shape, arrangement, distribution and number of internal cells in the macroconidia, were examined under lactophenol cotton blue staining. Whenever necessary, microcultivation in slides or use of potato agar to stimulate sporulation were carried out to confirm genus and species. In vitro hair perforation techniques and urease biochemical assays were also used whenever necessary. Obtained data were analyzed according to relative frequency of the various dermatophyte species, in the set of cases and according to gender and age ranges of the studied cases. Chi-square test was used to verify frequency differences among the various agents, considering 5% as the significance level. Fischer's Exact Test was used for analysis of expected frequencies lower than five.

RESULTS

During the studied period, 1,085 samples corresponding to clinical suspicions of *tinea capitis*, either from children or adults, were sent to the laboratory (Figures 1 and 2). Out of these, 596 (54.9%) were confirmed by means of culture or direct microscopic inspection. In 364 samples (61.1%), cultivation of the etiologic agent was possible. The most frequent dermatophyte species was *M. canis*, corresponding to 88.2% of isolated species (Figures 3 and 4). *M. canis* was predominant in both genders, particularly in males ($p < 0.05$) and in the different studied age ranges, except for those cases of tinea capitis observed in adolescents and adults. *T. tonsurans*, with 4.7% of the isolated species, was the second most frequent,

followed by *T. rubrum* (3.3%), *M. gypseum* (1.9%), *T. mentagrophytes* (1.6%) and *Trychophyton spp.* (0.8%) (Table 1). The majority of cases, n=354 (94.8%) was concentrated in the age range up to 10 years, among which *M. canis* prevailed, with 91.3% of the identified species. In this same age range, males corresponded to 58.2% of the cases (data not shown). In the whole set of patients, those in the age range of 0-5 years, n=228 (62.8%), significantly prevailed in comparison to those above 5 years of age ($p < 0.05$). Frequency of *M. canis* was higher ($p < 0.05$) among patients of 0-5 years of age when compared to those above 5. On the other hand, frequency of *T. rubrum* and *T. mentagrophytes* was statistically higher in those patients over 5 years of age ($p < 0.05$), when compared to frequencies in patients below this age range (Table 3). Patients who were over 20 years old comprised only 7 cases (1.9%), five of which were females, all related to some kind of systemic immunosuppression, particularly that associated with systemic lupus erythematosus (three cases). Agents identified in those case are described on table 2. Relative frequency of *M. canis* increased in every five-year period since 1984, i.e., no decrease relative to *T. tonsurans* was observed.

DISCUSSION

The present paper identifies *tinea capitis* epidemiological profile prevailing in the interior of the State of São Paulo, according to the geographical area under the responsibility of the Botucatu Medical School Hospital-Unesp, which sees patients of the Public Health System (SUS) coming from both rural and urban areas. Besides adding up information to Brazilian *tinea capitis* etiological profile, the importance of the obtained data and their impact reflect not only on therapeutic decision-making, but also on epidemiological and sanitary reasoning at the regional level this study belongs to. As to therapeutics, it can still be said that griseofulvin is the golden standard for the treatment of *tinea capitis*.^{23,24} Used ever since 1958, griseofulvin has been established as a safe and effective drug, when prescribed in doses from 20 to 25 mg per kilogram of body weight. However, not always is it well tolerated, due to possible side effects, such as headaches and gastrointestinal disturbances, or even idiosyncratic ones, such as hypersensitivity. Under such circumstances, terbinafin, itraconazole and even fluconazole are alternatives.²⁵ Nevertheless, when the option is made for a drug other than griseofulvin, reports that suggest a smaller sensitivity of *M.*

CHART 1: Frequency, in percentages, of dermatophyte species, cases of *tinea capitis*. Data from Brazilian regions

Reference	<i>M. canis</i>	<i>T. tonsurans</i>	<i>T. mentagrophytes</i>	<i>T. rubrum</i>	<i>M. gypseum</i>	Other species	Total of cases
Proença & Assunção ¹³ 1989 - S. Paulo	76.6	21.3	2.1	-	-	-	47
Londero & Ramos ¹⁴ 1989 - Sta Maria (RS):							
1960 - 1969	86.7	-	5.9	1.3	1.3	4.6*	151
1970 - 1979	68.2	-	20.6	3.2	6.3	1.6	63
1980 - 1987	76.8	5.8	8.7	2.9	5.8	-	69
Reis et al. ¹⁵ 1992 - DF	40.9	55	2.3	0.5	0.8	0.5	391
Brilhante et al. ¹⁶ 2000 - Fortaleza	16.6	73.9	3.8	5.1	-	0.6	157
Fernandes et al. ¹⁷ 2001 - R. de Janeiro	58.9	24.3	2.6	1.3	-	-	78
Ruiz & Zaitz ¹⁸ 2001 - São Paulo	63.3	31.2	1.4	0.5	3.6	-	218
Chimelli et al. ¹⁹ 2003 - S. Paulo	65	28.3	3.3	1.7	1.7	-	180
Aquino et al. ²⁰ 2003 - J. Pessoa	24.5	28.3	1.9	37.7	-	7.5**	53
Dias et al. ²¹ 2003 - Goiânia	71.3	11	7.9	6.7	3	-	114
Marques et al. Present paper Botucatu (SP)	88.2	4.2	1.6	3.3	1.9	0.8	364

* *T.schoenleinii* = 2,6% e *T.verrucosum* = 2%. ** *T. verrucosum* = 7,5%



FIGURE 1: Erythematous desquamative alopecia in parietocipital region of a child with *tinea capitis*

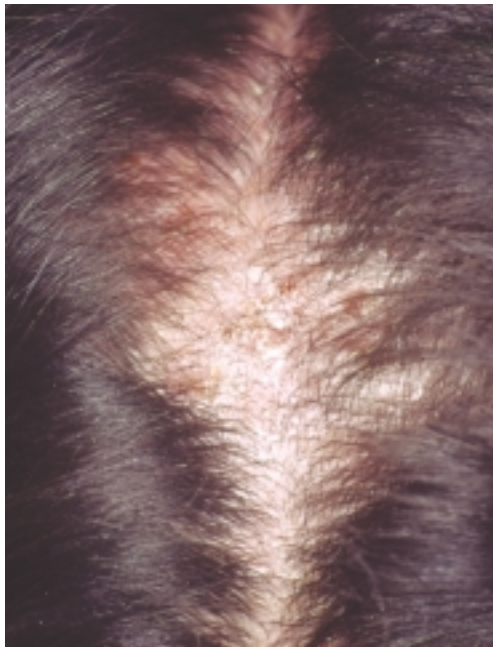


FIGURE 2: Discrete erythematous desquamative alopecia in the sagittal region of an adult female, bearer of systemic lupus erythematosus and *tinea capitis*

canis to treatment with terbinafin^{26,27} have to be considered, that is, when the isolated species is *M. canis*, decision-making regarding treatment should take into account a differentiated usage time or the possible failure in case terbinafin is the chosen drug. The same clinical reasoning applies when the infecting species is not identified, but the patient comes from a region where epidemiological evidence indicate *M. canis* as the prevailing organism. Itraconazole, in the dose of 5 mg per kilogram of body weight, seems to be equally effective, be the isolated fungus *M. canis* or *T. tonsurans*,²⁸ even though there may be restrictions to its use in virtue of its cost or less experience of its use in



FIGURE 3: *Microsporum canis*. Plan, white-cottoned radiated colony, against golden yellow background.

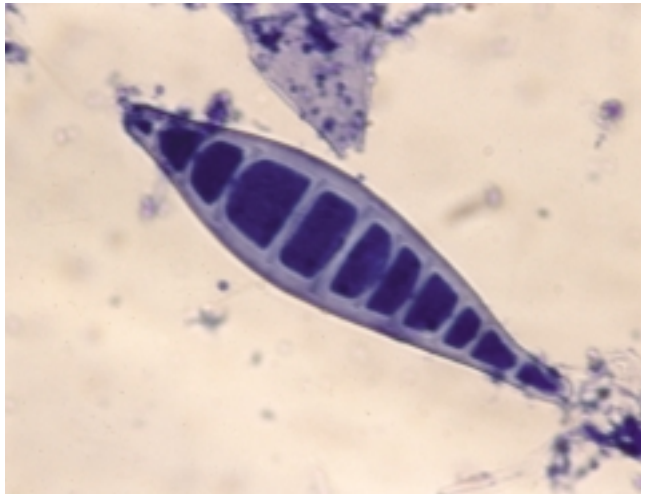


FIGURE 4: *Microsporum canis*. Thick-walled fusiform macroconidium containing 11 internal cells and asymmetrical tapering extremities.

children. From the sanitary point of view, isolation of an anthropophilic or zoophilic species implies in different interventions. In Brazil, when *T. tonsurans* was the isolated fungus, active search among relatives and others coexisting under the same roof as the reference case showed rates up to 18.8% of subclinical infection, consequently the state of a healthy bearer with contagious potential.²⁹ These considerations point towards the great clinical and sanitary importance of routine etiologic diagnosis in cases of clinical suspicion of *tinea capitis*.

In the present study, a large predominance of *M. canis* was identified, repeating, in a larger scale, findings from other institutions in southern and southeastern regions of the country. The number obtained here may have been influenced by a possible demand from rural areas, which are characteristic of this institution, even though patient provenance was

TABLE 1: Distribution of dermatophytes species in 364 isolates of *tinea capitis*, according to gender,* period from 1984 to 2003, Dermatology Mycology Laboratory – Faculdade de Medicina de Botucatu - FMB - UNESP

Dermatophytes	Male	(%)	Female	(%)	Total
<i>M. canis</i>	183	90.2 ^a	138	85.7 ^b	321
<i>M. gypseum</i>	5	2.4 ^a	2	1.2 ^a	7
<i>T. tonsurans</i>	7	3.5 ^a	8	4.9 ^a	15
<i>T. rubrum</i>	5	2.4 ^a	7	4.4 ^a	12
<i>T. mentagrophytes</i>	1	0.5 ^a	5	3.2 ^a	6
<i>Trichophyton spp.</i>	2	1 ^a	1	0.6 ^a	3
Total	203	100	161	100	364

* proportions which are followed by a same letter do not differ at the 5% level according to chi-square or Exact Fischer's test.

TABLE 2: Distribution of dermatophyte species in 364 isolates of *tinea capitis*, according to age range. Period: from 1983 to 2003. Dermatology Mycology Laboratory – Faculdade de Medicina de Botucatu - FMB - UNESP

Dermatophytes	[0-5] years (%)	[6-10] years (%)	[11-20] years (%)	> 20 years (%)	Total (%)
<i>M. canis</i>	210 57,7	105 28.8	4 1.1	2 0,5	321 88.2
<i>M. gypseum</i>	4 1.1	3 0.8	– –	– –	7 1.9
<i>T. tonsurans</i>	9 2.5	6 1.6	– –	– –	15 4.2
<i>T. rubrum</i>	2 0.5	2 0.5	5 1.4	3 0,8	12 3.3
<i>T. mentagrophytes</i>	1 0.3	1 0.3	2 0.5	2 0,5	6 1.6
<i>Trichophyton spp.</i>	2 0.5	– –	1 0.3	– –	3 0.8
Total	228 62.6	117 32	12 3.3	7 1.9	364 100

not an object of this investigation. *M. canis* was predominant, particularly among males and in the age range of 0-5 years of age (Tables 1-3), revealing the intimate contact these children have with pets, potential infecting sources.³⁰ In adult patients, despite the low number of cases, *T. rubrum* was the most common causal agent, as if indicating an underlying state of systemic immunosuppression. The reason why *T. tonsurans* predominates in northern and northeastern states of the country is likewise not clear, having it been suggested to be adapted to the environmental conditions of those regions.¹⁶ However, one should recognize the climatic variability that exists among those regions and even within regions of a single

state, which suggests that this environmental component is not the determining reason. In the U.S., prevalence of *T. tonsurans* is equally highlighted and is correlated to the African-American community of great urban centers, coexisting in conditions of high domiciliary family density and a socioeconomical level that is lower than country average.^{9,10} The same is observed in France, the United Kingdom and Sweden (Stockholm).^{4,7} The nearest reference is that of the city of São Paulo, where *T. tonsurans* has a prevalence of up to 31.2%,^{18,19} which indicates and corroborates the theory that advocates interference of high population densities and presence of immigrant populations in the epidemiological profile of *tinea capitis*.

TABLE 3: Distribution of dermatophyte species in 364 isolates of *tinea capitis*, according to age 0-5 years versus over 5 years*, Period: from 1983 to 2003. Dermatology Mycology Laboratory – Faculdade de Medicina de Botucatu - FMB - UNESP

Dermatophytes	0 – 5 years (%)	> 5 years (%)	Total
<i>M. canis</i>	210 92.1 ^a	111 81.6 ^b	321
<i>M. gypseum</i>	4 1.8 ^a	3 2.2 ^a	7
<i>T. tonsurans</i>	9 3.9 ^a	6 4.4 ^a	15
<i>T. rubrum</i>	2 0.9 ^a	10 7.4 ^b	12
<i>T. mentagrophytes</i>	1 0.4 ^a	5 3.7 ^b	6
<i>Trichophyton spp.</i>	2 0.9 ^a	1 0.7 ^a	3
Total	228 100.0	136 100.0	364

* proportions which are followed by a same letter do not differ at the 5% level according to chi-square or Exact Fischer's test.

CONCLUSIONS

A large predominance of *Microsporium canis* (88.2%) was identified among 364 isolates of *tinea capitis* at the Department of Dermatology at Botucatu Medical School-Unesp, an institution that traditionally has an important demand from patients coming from the rural areas. Predominance of *M. canis* was expressive, independent of gender, increasing in five-year periods considered between 1984 and 2003, period under study. Frequency of *Trichophyton tonsurans* (4.7%) was far lower than expected, even for the

Southeastern region of Brazil, but may express the current epidemiological reality of *tinea capitis* in the interior of the State of São Paulo, data that should be confirmed by similar studies at other institutions. □

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