

# Culture Results of Tinea Pedis and Onychomycosis During 1995-2003

## 1995-2003 YILLARI ARASINDA TİNEA PEDİS VE ONİKOMİKOZİS KÜLTÜR SONUÇLARI

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### Abstract

**Objective:** Among superficial fungus infections, tinea pedis and onychomycosis are worldwide in distribution. In various studies, *Tricophyton rubrum* has been reported as the most common among tinea pedis and onychomycosis agents. The prevalence of the agents isolating in the mycologic culture from the lesions was investigated.

**Material and Methods:** In this study, culture results of 3289 patients who were diagnosed as tinea pedis and onychomycosis were evaluated retrospectively.

**Results:** 1685 (51.2%) of the 3289 patients had tinea pedis and 1604 (48.8%) had onychomycosis. In 1026 (60.8%) of the tinea pedis patients were isolated *Tricophyton rubrum* in their mycologic culture, 611 (36.2%) *Candida albicans*, 24 (1.42%) *Tricophyton mentagrophytes*, 7 (0.4%) *Tricophyton violaceum*, 13 (0.7%) *Candida parapsilosis*, 1 (0.05%) *Candida cruseii* and 3 (0.17%) *Candida tropicalis*. A total of 1604 onychomycosis patients, 1299 were toenails and 305 were fingernails. Toenails were infected by *Tricophyton rubrum* in 640 (49.2%), *Candida albicans* in 610 (47%), *Tricophyton mentagrophytes* in 28 (2.2%), *Tricophyton violaceum* in 12 (0.9%), *Candida parapsilosis* in 9 (0.7%). Fingernails were infected by *Tricophyton rubrum* in 136 (44.5%), *Candida albicans* in 166 (54.5%), *Candida parapsilosis* in 2 (0.7%) and *Tricophyton violaceum* in 1 (0.3%).

**Conclusion:** *Tricophyton rubrum* was isolated in high prevalence in tinea pedis and onychomycosis. The higher isolation rate of *Candida albicans* in our study can be also related to the mild, temperate climate, high temperatures and high humidity environmental conditions. So we believe that this is a result which needs to be taken into consideration during diagnosis and treatment.

**Key Words:** Onychomycosis, tinea pedis, yeast, dermatophytes, epidemiology

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Tinea pedis and onychomycosis are the most common dermatophyte infections. Dermatophytes account for a considerable part of superficial

### Özet

**Amaç:** Yüzeysel mantar enfeksiyonları arasında tinea pedis ve onikomikoz dünyada yaygın dağılım göstermektedir. Çeşitli çalışmalarda tinea pedis ve onikomikozis etkenleri arasında en sık olarak *Tricophyton rubrum*'a rastlanmaktadır. Bu çalışmada lezyonlardan elde edilen mikolojik kültür sonuçlarına göre etkenlerin prevalansını saptamak amaçlanmıştır.

**Gereç ve Yöntemler:** Bu çalışmada, 3289 tinea pedis ve onikomikozis olarak tanı alan hastanın kültür sonuçları retrospektif olarak değerlendirilmiştir.

**Bulgular:** 3289 hastanın 1685 (%51.2)'i tinea pedis 1604 (%48.8)'ü onikomikozisti. Tinea pedis hastalarının 1026 (%60.8)'sında *Tricophyton rubrum*, 611 (%36.2)'inde *Candida albicans*, 24 (%1.42)'ünde *Tricophyton mentagrophytes*, 7 (%0.4)'sinde *Tricophyton violaceum*, 13 (%0.7)'ünde *Candida parapsilosis*, 1 (%0.05)'inde *Candida cruseii* ve 3 (%0.17)'ünde *Candida tropicalis* mikolojik kültürde izole edilmiştir. Toplam 1604 onikomikozis hastasının, 1299'u ayak tırnağı ve 305'i el tırnağında lokalizedi. Ayak tırnağında *Tricophyton rubrum* 640 (%49.2), *Candida albicans* 610 (%47), *Tricophyton mentagrophytes* 28(2.2%), *Tricophyton violaceum* 12 (%0.9), *Candida parapsilosis* 9(0.7%) oranında saptandı. El tırnağında ise, *Tricophyton rubrum* 136 (44.5%), *Candida albicans* 166 (%54.5), *Candida parapsilosis* 2(0.7%) *Tricophyton violaceum* 1 (%0.3) oranında saptandı.

**Sonuç:** Çalışmamızda tinea pedis ve onikomikoziste etken olarak *Tricophyton rubrum* en sık olarak saptansa da, *Candida albicans*'ın yüksek oranda bulunmasının bölgemizin ılıman iklim, yüksek sıcaklık ve nem gibi çevresel faktörlerin etkisinde olması ile ilişkili olduğu düşünülmektedir. Etkenin saptanması hastaların tanı ve tedavisinin seçiminde göz önünde bulundurulması açısından önemlidir.

**Anahtar Kelimeler:** Onikomikoz, tinea pedis, maya, dermatofit, epidemiyoloji

fungus infections. The dermatophyte flora of countries may vary with factors such as geographical conditions, climate, population density and hygiene, and endemic species may spread with favorable travel conditions and migration as a result of political conflicts and economic crises. Every country has its own particularities of presentation and different regions

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of the same country may present with different levels of incidence. In various studies, *Tricophyton rubrum* has been reported as the most prevalent among tinea pedis and onychomycosis agents.<sup>1-3</sup> In this study, the prevalence of the agents isolating in the mycologic culture from the lesions of 3289 patients who were diagnosed as tinea pedis and onychomycosis at Ege University School of Medicine, Department of Dermatology, was investigated.

### Material and Methods

During the period 1995-2003 prevalence of the fungus isolated from 3289 tinea pedis and onychomycosis patients was investigated at Ege University's Faculty of Medicine, Department of Dermatology. Direct microscopic examination and culture were performed on samples from patients with tinea pedis and onychomycosis. Specimen collection, culture and direct microscopy and the isolation and identification of fungi were carried out using standart procedures.

After the abnormal nails were cleaned with 70% alcohol, samples were collected by vigorously scraping the distal portion of the nail, the underside area, as well as the nail bed. For subjects in whom tinea pedis, a sample from the toe web or the surrounding skin was collected by scraping with a sterile scalpel.

Data for subjects whom the direct examination was positive but culture negative were not included in the calculation.

Direct microscopic examination of scraping was performed after the addition of 1-2 drops 20% potassium hydroxide.

All specimens were cultured on Sabouraud 2% glucose chloramphenicol agar and Sabouraud glucose cycloheximide-chloramphenicol agar. Cycloheximide was added to reduce the growth of contaminating fungi. The cultures incubated at 27 C for three weeks and examined twice a week.

The identification of dermatophytes was based on the macroscopic and microscopic characteristics of the fungi. Chlamydo-spore and germ tube forma-

tion and assimilation tests (Api system tests, Biomerieux, France) were used for yeast identification.

### Results

In the 7-year period, 3289 mycological results were evaluated. Of the 3289 patients, 1797 (54.6%) were male and 1492 (45.4%) female. The age ranges of female patients were 15-60 years old and the males were 25-55 years old. A total of 1685 (51.2%) patients were tinea pedis, 1604 (48.7%) patients were onychomycosis.

Among the 1685 tinea pedis patients, the most frequently isolated fungus was *Tricophyton rubrum* (1026, 60.8%) followed by *Candida albicans* (611, 35.2%), *Trichophyton mentagrophytes* (24, 1.42%), *Candida parapsilosis* (13, 0.7%), *Tricophyton violaceum* (7, 0.4%), *Candida tropicalis* (3, 0.17%), *Candida crusei* (1, 0.05%).

Of the 1604 patients with onychomycosis, 1299 were toenails and 305 were fingernails. The most frequently isolated fungus in the total number of toenail onychomycosis was *Tricophyton rubrum* (640, 49.2%), followed by *Candida albicans* (610, 47%), *Tricophyton mentagrophytes* (28, 2.2%), *Tricophyton violaceum* (12, 0.9%), *Candida parapsilosis* (9, 0.7%).

Among the 305 fingernails onychomycosis, the most frequently isolated fungus was *Candida albicans* (166, 54.5%), followed by *Tricophyton rubrum* (136, 44.5%), *Candida parapsilosis* (2, 0.7%) and *Tricophyton violaceum* (1, 0.3%) (Table 1).

Paronychia was presented in 40% of the patients with candida infection.

*Candida* infection was considered as positive when 5-10 colony forming units formed on the culture medium with positive direct microscopic examination. For the saprophytic molds the direct microscopic and culture results were cautiously interpreted before reporting the final results.

100 (6.2%) patients presented with the toenail and fingernail infection simultaneously.

**Table 1.** Total number and percentages of disease and causative agents.

	<b>T.rubrum</b>	<b>C.albicans</b>	<b>T.mentagro- phytes</b>	<b>T.violaceum</b>	<b>C.para-psilosis</b>	<b>C.cruseii</b>	<b>C.tropicalis</b>
Tineapedis	1026 (60.8)	611 (36.2)	24 (1.42)	7 (0.4)	13 (0.7)	1 (0.05)	3 (0.17)
Fingernail onychomycosis	136 (44.5)	166 (54.5)		1 (0.3)	2 (0.7)		
Toenail onychomycosis	640 (49.2)	610 (47)	28 (2.2)	12 (0.9)	9 (0.7)		

125 (3.8%) patients presented with the tinea pedis and onychomycosis infection simultaneously.

### Discussion

The epidemiological data for organisms involved in nail and skin diseases differ with respect to geographic location, time periods and population differences.<sup>3,4</sup> It is probable that every country has its own characteristics and that regions of the same country and different or similar environmental conditions present different incidences.

In this study in which frequency the agents in common dermatophytoses such as tinea pedis and onychomycosis were investigated. *Tricophyton rubrum* is the most common isolated agent in tinea pedis and toenail onychomycosis, followed by *Candida albicans*. In fingernail onychomycosis, *Candida albicans* was more frequently isolated than *Tricophyton rubrum*.

Tinea pedis is a fungus infection of the skin of the feet. It is more common between the ages 20-50 and among men. Warm and humid weather, tight shoes, excessive sweating, sports activities, frequent washing of the feet, working and living in crowded places, prolonged use of corticosteroids and antibiotics increase the predisposition.<sup>5,6</sup> While *Tricophyton interdigitale* was being isolated until the 1940's, *Tricophyton rubrum* started to be determined as an agent following years. Between 1965 and 1970, Gezen et al. found in Aegean region of Turkey, *Candida* in 23.5% of the tinea pedis cases and dermatophytes in 76.7%. They also reported that 29% of the dermatophytes involved *Tricophyton rubrum* and 25% *Tricophyton mentagrophytes*.<sup>7</sup>

Tumbay et al. reported tinea pedis agents in the Aegean region of Turkey between 1974 and 1978 as 81.4% *T.rubrum* and 17.7% *T.mentagrophytes*.<sup>8</sup>

Aytimur et al. reported *Tricophyton rubrum* as the leading agent (90%) in tinea pedis among all dermatophytes, followed by *Microsporum canis* (5%), *Tricophyton mentagrophytes* (3%), *Tricophyton violaceum* (2%) and *Epidermophyton floccosum* (1%).<sup>1</sup>

Yegenoglu reported in a study that determined 55.07% *Tricophyton rubrum* and 44.92% *Tricophyton mentagrophytes* in tinea pedis; and 51.51% *Tricophyton rubrum* and 48.48% *Tricophyton mentagrophytes* in tinea unguium.<sup>2</sup> Kölemen reported *Tricophyton rubrum* as leading agent in tinea pedis in Ankara between 1976-1978.<sup>9</sup>

According to our results, tinea pedis agents were made up of 60.8% *Tricophyton rubrum*, 36.2% *Candida albicans*, whereas the rate of *Tricophyton mentagrophytes* was only 1.42%.

Onychomycosis is a disease which is chronic and difficult to treat. Patients with onychomycosis experienced psychosocial effects of their disease. Its prevalence differ between 2-5%.<sup>10,11</sup>

Dermatophytes are responsible for most nail infections. However, there were found a much higher prevalence of yeast than anticipated.<sup>12</sup> When we examine the literature, it has been reported that yeasts are mentioned more frequently among onychomycosis agents in certain studies.<sup>3,12-14</sup> Tinea pedis and onychomycosis agents may vary according to geographical regions in the world.

Erbakan et al. reported *Tricophyton rubrum* as the most frequently seen causative agent in a study

they performed on 718 patients with onychomycosis in Turkey.<sup>15</sup>

Segal et al. reported that *Tricophyton rubrum* was the most prevalent species in toenails (97.8%) and *Candida* species were isolated 77% of fingernails in Israel.<sup>13</sup>

In a study from Greece, Rigopoulos et al. found that 52.44% *Candida*, 41.04% dermatophytes, 6.51% molds in patients with onychomycosis. In the same study the most frequently isolated fungus in fingernails was *Candida* (76%), followed by dermatophytes (23%), molds (1%), and toenails were most infected by dermatophytes (71%), *Candida* (13%), molds (16%).<sup>3</sup>

From the results of our study, toenails were more commonly infected with dermatophytes than fingernails, which is similar to some reports.<sup>3,4,16-18</sup>

Zahra et al. reported that *Tricophyton rubrum* was the principal dermatophytes causing tinea pedis and tinea unguium in Malta.<sup>4</sup>

Perea et al reported that etiological agents of tinea unguium were *Tricophyton rubrum* (82.1%), *Tricophyton mentagrophytes* var. *interdigitale* (14.3%) and *Tricophyton tonsurans* (3.5%). In the same study, *Tricophyton rubrum* was the most prevalent agent in tinea pedis in Spain.<sup>18</sup> In Seneczko's study, *Candida* was found in 59.9% of the nail and periungual wall lesions.<sup>19</sup>

In Al-Sogair's study of 634 isolates from Saudi Arabia, *Candida* was found in 90% and in the remaining 10% there were either dermatophytes or mixed infections of *Candida* and dermatophytes.<sup>14</sup> In another study, Kölemen et al found that *Microsporum canis* was the most frequently isolated species of dermatophytic flora in Saudi Arabia.<sup>20</sup>

A study carried out on more than 3000 nails has revealed that 91% of onychomycosis agents are dermatophytes, 6% *Candida* species and 3% non-dermatophytes.<sup>21</sup> In another study, *Tricophyton rubrum* was found to be 44.7% in onychomycosis, while *Candida albicans* were 3.3% and non-*albicans candida* species were reported as 26.3%.<sup>22</sup> Achten in his study from Belgium, found high

preportion of *Candida* (66%) followed by dermatophytes (32%) and molds (2%).<sup>23</sup>

In our study, *Tricophyton rubrum* was determined as the most frequently seen onychomycosis agent in toenails, followed by *Candida albicans*. In fingernail onychomycosis, *Candida albicans* was found in 54.5%. The higher isolation rate of *Candida albicans* in our study can be also related to the mild, temperate climate, high temperatures and high humidity environmental conditions for long periods of the year in our city.

The fact that the rate of *Candida albicans* was close to that of *Tricophyton rubrum* in onychomycosis has been considered from the viewpoint of how to approach the patients. So we believe that this is a result which needs to be taken into consideration during diagnosis and treatment.

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