A 9-Month-Old Girl from Iran with Extensive Erythematous Plaques Due to Trichophyton simii, a Zoophilic Dermatophyte

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Abstract The incidence of dermatophytosis due to Trichophyton simii is generally considered to be limited to endemic areas, particularly one area of India. However, the high similarity between the morphological features of atypical T. simii isolates and those of other dermatophytes such as Trichophyton interdigitale and Arthroderma benhamiae may lead to misidentification of the cause of dermatophytosis in many instances. We investigated a rare case of tinea corporis in a 9-month-old female with extensive erythematous lesions. Morphological features of the recovered isolate from the culture resulted in the identification of Trichophyton interdigitale. For accurate identification, the internal transcribed spacer regions (ITS1 and ITS2) of the ribosomal DNA (rDNA) gene were sequenced and the isolate was ultimately identified as T. simii. In conclusion, T. simii, which has been formerly known to be restricted to specific endemic regions, appears to be not infrequent in non-endemic areas but instead simply less well-known and consequently underestimated. To determine its actual prevalence of infection, the application of DNA-based molecular methodologies is required.

Keywords Trichophyton simii · Tinea corporis · Molecular identification · Iran
Introduction

Trichophyton simii Pinoy 1912, previously known as Epidermophyton simii or Trichophyton mentagrophytes, was first recognized in the vesicular skin lesions of a monkey [1]. Subsequently, in 1965, its teleomorph Arthroderma simii was described [2]. According to new taxonomic revisions in the group of dermatophytes, T. simii and its teleomorph state A. simii are defined as distinct species [3, 4].

Trichophyton simii is an exotic zoophilic dermatophyte that is supposedly restricted to the Indian subcontinent, where it causes dermatophytosis lesions on animals such as monkeys, cattle, poultry, guinea baboons (Papio papio), dogs, and cats [1, 5–11]. It has also been isolated sporadically from the soil of some regions in India [12, 13]. T. simii has been reported to be the cause of 1 % of all human dermatophytic diseases in India [14].

In addition to India and Sri Lanka [15], T. simii has been reported in South America [8, 16], North America [17], Europe [9, 18], and the Middle East [19–21]. Of note, this zoophilic fungus is occasionally recovered from patients with tinea capitis [15, 19, 20, 22], tinea corporis [19, 21], tinea inguinalis [19], and tinea unguium [18]. Here, we report the case of a 9-month-old girl with extensive erythematous plaques caused by T. simii in Iran.

Case Report

A 9-month-old female presented at our Medical Mycology Laboratory in December of 2014 with progressive erythematous and scaly plaques on the buttocks extending to the back and trunk. The lesions had started in the previous 4 weeks (Fig. 1). The patient was apart of a family of farmers living in sanitary poor conditions in Yasuj, the capital of a southwestern province of Iran. The patient was immunocompetent and did not have any underlying diseases. However, she was regularly exposed to dirty diapers during daily care cleaning, and there were also signs of indirect contact with animals in the farm. A skin scraping was collected and subjected to direct microscopy and examination of culture.

In direct microscopy with 10 % potassium hydroxide (KOH10 %), hyaline septate hyphae and arthroconidia were observed as typical features (Fig. 2). The colony had relatively slow growth and showed a white or cream color, flat surface that was raised at the center, and powdery characteristics diffused in the margins (Fig. 3a). On the reverse side of plate, the colony first appeared to be straw-colored and, after 2 weeks, turned to pale pinkish purple (Fig. 3b). Microscopic examination of the colony showed copious pyriform microconidia and a high number of smooth, 3–7 septate, cylindrical-to-clavate, and thin-
walled macroconidia, which reduced in subculture (Fig. 3c). The isolate was morphologically identified as *T. interdigitale*.

For accurate identification, the isolate was subjected to molecular analysis. DNA was extracted from a fresh colony using a method described previously [23]. The ITS regions of the rDNA gene were PCR-sequenced using universal fungal primers ITS1 (5'-TCCGTAGGT-GAACCTGCGG-3') and ITS4 (5'-TCTCCGCTTATGATATGC-3') [24]. The obtained sequence was compared with similar sequences in the open-access CBS database of dermatophytes (www.cbs.knaw.nl/dermatophytes). The ITS sequence of the isolate showed 99.2 % identity to the reference sequence for the strain *A. simii* CBS 130943. We deposited our sequences in GenBank under accession number ‘KR632639’.

The minimum inhibitory concentrations (MICs) of the isolate against four antifungal agents (Sigma-Aldrich, St Louis, MO, USA) were determined according to Clinical and Laboratory Standards Institute (CLSI) methodology [25]. *T. mentagrophytes* (ATCC MYA 4439), *Candida parapsilosis* (ATCC 22019), and *Candida krusei* (ATCC 6258) were used as quality controls. The MICs of antifungal drugs terbinafine, itraconazole, griseofulvin, and fluconazole were 0.008, 0.032, 0.5, and 16 μg/ml, respectively. The patient was successfully treated with topical azole twice a day for 4 weeks, which is available in routine clinical practice in Iran (sertaconazole nitrate 2 % cream).

**Discussion**

We detected the presence of extensive erythematous plaques due to zoophilic *T. simii* on the body of a 9-month-old girl from a rural region of the south of Iran.

In general, tinea capitis and tinea corporis are the two most common types of dermatophytosis in children. *Microsporum canis* and *Trichophyton tonsurans* are the most common causative agents of tinea capitis in children, although the prevalence varies by country [26–28]. Unhealthy lifestyle conditions, contact with animals and soil, close contact in schools and day-care-centers, and an immature immune system can be considered as risk factors for the prevalence of dermatophytosis in children [26]. Tinea corporis is the second most frequent type of dermatophytosis in children worldwide [26, 28, 29]. *Trichophyton rubrum* was reported as the main causative agent of tinea corporis [26, 28, 29]. However, one study identified *T. tonsurans* as the main etiologic agent of tinea corporis in an outbreak of dermatophytosis in children [27].

Several studies reported that *T. simii* is an endemic zoophilic species in the Indian region of Asia, but it has also recently been identified in parts of Europe as well [18]. Of note, the majority of patients with *T. simii* were living in rural areas in close contact with infected animals [15]. *T. simii* predominantly infects monkey and poultry [2, 6, 8, 9]; however, the primary host has also been suggested to be ground-dwelling animals and other mammals [7, 10, 11]. Our patient had contact with domestic animals, especially chickens, and was also in contact with soil. Thus, the likely route of infection may have been indirect transmission from domestic animals or soil, because no history of lesions was found when her parents or other members of the family were examined.

Interestingly, in a previous study in Iran, *T. simii* was also reported as a causative agent of tinea corporis
from an adult male working in a poultry farm [21]. However, only macroscopic and microscopic features of the colony were used for identification, which might be reconsidered using molecular approaches.

Importantly, *T. simii* is morphologically similar to *A. benhamiae* and *A. vanbreuseghemii*, which are classified as teleomorph species of the *T. mentagrophytes* complex [30]. However, *T. simii* could be differentiated microscopically from *A. vanbreuseghemii*, since the microconidia of *T. simii* are usually pyriform and those of *A. vanbreuseghemii* are rather round. In addition, a colony of *T. simii* sometimes appears pinkish purple similar to *T. rubrum*, which may cause misidentification [4].

The use of conventional macro- and micromorphological features of the colonies on culture media is a controversial method for accurate discrimination between closely related dermatophyte species [30–32]. For identification of dermatophytes to the species level and determination of the actual prevalence of infection, DNA sequence-based procedures are needed [18]. In a recent study, using ITS sequencing, analysis of six dermatophyte strains newly identified as *T. simii* in a fungal culture collection, were previously identified as *Trichophyton* spp., *T. rubrum*, *T. erinacei*, or *Microsporum* spp [18].

Moreover, the clinical manifestation of this infection must be differentiated from other infective or non-infective complications such as eczema, and laboratory diagnostics are an important tool for significant discrimination of these conditions [33]. There might also be cases with extensive hyperkeratosis due to psoriasis that should be considered as possible misidentification or dermatophytosis [34].

Overall, the present case suggests that zoonotic transmission of dermatophytes due to *T. simii* is a growing pattern in tropical and subtropical regions of Asia. To our knowledge, this case is the first report of *T. simii* infection in an infant less than one-year-old. This report also shows that the incidence of *T. simii* infections is not limited to the Indian subcontinent and expands this potential to other parts of the world.

**Compliance with Ethical Standards**

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### References


