






CASE REPORT

Tinea capitis due to *Trichophyton soudanense* and *Microsporum audouinii*: A surprising finding

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Abstract

Tinea capitis is a prevalent dermatophyte infection among German children, primarily caused by *Microsporum canis*, *Trichophyton mentagrophytes* and *Trichophyton benhamiae*. Other pathogens, such as *T. soudanense* and *M. audouinii*, have also been identified in Germany. This case report describes a 10-year-old Angolan girl with chronic osteomyelitis who was brought to Germany for treatment, which was organized by the Friedensdorf International (Peacevillage International). In addition to chronic osteomyelitis of the lower leg, the patient presented with alopecic areas of the scalp with adherent scales, which raised the suspicion of tinea capitis. Fungal cultivation and polymerase chain reaction (PCR) diagnostics revealed a coinfection of *T. soudanense* and *M. audouinii*, which, to the best of our knowledge, has not been previously reported in Europe. After 4 weeks of systemic terbinafine treatment and topical use of ciclopirox solution and clotrimazole cream, there was a marked improvement in the patient's condition. This was confirmed by a negative fungal culture and PCR; no adverse events were reported. This report highlights a rare dual dermatophyte infection caused by *T. soudanense* and *M. audouinii* in Europe, and the successful response to treatment with systemic terbinafine and topical ciclopirox solution as well as clotrimazole cream.

KEYWORDS

alopecia, anti fungal treatment, tinea infection

INTRODUCTION

Tinea capitis is among the most common dermatophyte infections in children in Germany, and even the most common in children up to and including the ninth year

of life.¹ The pathogens *Microsporum canis*, *Trichophyton mentagrophytes* and *Trichophyton benhamiae* are most prevalent in Germany as well as worldwide.^{1,2} As a consequence of globalization, not only the aforementioned pathogens occur in Germany, but also cases of

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dermatophytoses due to *T. soudanense* and *M. audouinii*, which are preferentially found in West Africa, have been described in the past.³⁻⁶ To the best of our knowledge, the occurrence of mixed tinea capitis infections have been reported from involved patients in Uganda but have not been described in Germany in the literature so far.^{7,8}

CASE REPORT

A 10-year-old Angolian female patient had developed chronic osteomyelitis as a result of a lower leg fracture. Since treatment in Angola would have meant amputation of the leg, the patient was brought to Germany in the spring of 2022 by the German humanitarian aid organization 'Friedensdorf International'. Physical examination at the Department of Trauma Surgery at Essen University Hospital also revealed alopecic areas with adherent, thick, yellowish scales on the scalp (see Figure 1a), and dermatology was consulted. Tinea capitis was suspected and scales and hairs of the patient's scalp were collected for fungal cultivation and polymerase chain reaction (PCR) diagnostics. Topical treatment with ciclopirox solution twice daily and clotrimazole cream once daily was started.

A universal fungal PCR examination of the scales with subsequent sequencing of the internal transcribed spacer (ITS) region 1 was performed at the Institute of Medical Microbiology of the University Hospital Essen. In comparison with the GenBank of the National Center for Biotechnology Information in Bethesda, MD, USA (NCBI), the determined gene sequence could be assigned to *T. soudanense*.⁹ Due to the severity of the infection, antifungal oral systemic treatment with terbinafine 125 mg once daily was additionally started immediately upon receiving the ITS-1 sequencing results. Hair and scales of the involved patient were also sent to the Laboratory for Medical Microbiology in Mölbis, Germany, for specific PCR diagnostics which were not available in Essen. Surprisingly, the specific PCR detected genetic components of both *T. soudanense* and *M. audouinii*. These findings were confirmed by the results of fungal cultivation, which are shown in Figure 2.

Four weeks after starting systemic treatment with terbinafine, the patient presented to our outpatient dermatology clinic for follow-up examination. Marked improvement was noted (see Figure 1b). Terbinafine was well tolerated, the laboratory workup showed normal results. Hair and scales were again collected for follow-



FIGURE 1 Clinical course of treatment. (a) Clinical findings before the start of the antifungal therapy. (b) Clinical findings 4 weeks after starting oral systemic treatment with terbinafine 125 mg once daily and topical treatment with ciclopirox solution twice daily as well as clotrimazole cream once daily. (c) Clinical findings 8 weeks later.



FIGURE 2 Findings of fungal cultivation of the collected hairs and scales. (a) Overview. *T. soudanense* with classic yellow and central cerebriform thallus. *M. audouinii* with white fluffy thallus and light purple-red coloration. (b) Close-up images.

up fungal diagnostics. Both topical and systemic treatment were continued.

Another 4 weeks later, the patient visited our clinic for the last time before returning to Angola. The findings had further improved (see Figure 1c) with continued well-tolerated systemic therapy. Due to the excellent treatment results as well as negative fungal culture and PCR diagnostics of the scales and hair collected at the first control examination 4 weeks earlier, systemic therapy with terbinafine was discontinued. The topical treatment was recommended to continue for additional 2 weeks.

DISCUSSION

Our report describes one of the first cases of tinea capitis by dual dermatophyte infection in Europe. The German S-1 guideline for the treatment of tinea capitis in childhood recommends itraconazole for *M. audouinii* infections and terbinafine for infections with *T. soudanense*.² In our patient, systemic terbinafine in combination with topical ciclopirox solution and clotrimazole cream proved to be a very effective and tolerable therapy for the dual dermatophyte infection with *M. audouinii* and *T. soudanense*.

AUTHOR CONTRIBUTIONS

Frederik Krefting, Elisabeth Livingstone, Pietro Nenoff, Christina Polan, Wiebke Sondermann, Dirk Schadendorf, Ulrike Scharmann and Peter Michael Rath analyzed and interpreted patient data. Ulrike Scharmann, Peter Michael Rath, Silke Uhrlaß and Pietro Nenoff performed the laboratory tests. Frederik Krefting, Carl M. Thielmann and

Jan-Malte Placke created the figures. Frederik Krefting, Elisabeth Livingstone and Pietro Nenoff were major contributors in writing the manuscript. All authors read and approved the final manuscript.

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DATA AVAILABILITY STATEMENT

The data of this article are available from the corresponding author (F. K.), upon reasonable request.

ETHICS STATEMENT

The parents/guardians of minor patients have given written informed consent for their child's participation in this case report, as well as for the use of their child's deidentified, anonymized, aggregated data and case details (including photographs) for publication. Ethical approval: not applicable.

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