

CLINICAL REPORT / REPORTE DE CASO

Tinea unguium caused by *Epidermophyton floccosum*Bersy Zúniga¹, Maihly Arita-Ramos¹, Lilia Acevedo-Almendárez¹, Jorge García-Chávez¹, Dylan Ponce-Mejía¹, Gustavo Fontecha², Bryan Ortiz^{2*}

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Abstract: Onychomycosis is believed to be responsible for up to 50% of nail diseases, and its prevalence is estimated to be 10% worldwide. Tinea unguium, often known as onychomycosis, is one of the most essential dermatophytosis, with the genus *Epidermophyton* among the causative agents. Currently, *E. floccosum* is the only representative species of its genus. This fungus has been described as an anthropophilic dermatophyte with a very uneven distribution worldwide. This report presents the case of a 49-year-old patient with Tinea unguium caused by *E. floccosum*. This clinical image represents valuable information for educational purposes, as it can contribute to the knowledge and better understanding of dermatophytoses and promote learning among healthcare personnel. We believe this description would contribute to expanding our understanding of the epidemiology of dermatophytoses, particularly those caused by *E. floccosum*. This is the first molecular characterization of *E. floccosum* as an etiological agent of Tinea unguium in Honduras.

Key words: *Onychomycosis*, *Tinea unguium*, *E. floccosum*, clinical image, epidemiology, dermatophytoses

Introduction

A 49-year-old female patient reports dysmorphic nail lesions of four years of evolution. On physical examination, the lesions extended to the toes of both feet, predominantly in the first toe of the left foot, which presented mild inflammatory changes in the soft tissue of the distal phalanx, accompanied by melanonychia, xanthonychia, without paronychia, and with a thickened nail bed. Distal subungual onychomycosis was diagnosed. The nail of the left foot's first toe was scraped to collect scales, which were then clarified with 20% potassium hydroxide (KOH) for 30 min and were later examined under a microscope. Additionally, the samples were cultured in Sabouraud dextrose agar with chloramphenicol and cycloheximide (Liofilchem, Teramo, Italy) and incubated for 15 days at 28–30 °C. In the direct examination, thin and septate hyphae were observed. The culture showed colonies with a beige velvety appearance after 15 days of incubation. In the microscopic analysis, septate hyaline hyphae were observed, with abundant club-shaped macroconidia, thick walls divided by 2 to 6 septa, and without microconidia. The observed cellular and colonial morphology was compatible with *Epidermophyton floccosum* (Figure 1).

Molecular identification of the fungus was performed by amplifying and sequencing the ribosomal internal transcribed spacer region according to previously published^{1,2} (Figure 2). A 684 nucleotide sequence was edited using the Geneious prime® 2023.1.2 software. BLAST analysis confirmed the identity of *E. floccosum*. The sequence was deposited in GenBank under the accession number OR119955.

Discussion

Dermatophytosis or ringworm is a fungal infection that affects the skin, hair and nails, with a prevalence of approximately 25% worldwide^{3,4}. However, the prevalence of dermatophytes can range from 40 to 60% in some Asian and African nations^{5,6}. Ringworms are caused by keratinophilic fungi known as dermatophytes^{3,4}. Currently, it is known that at least nine genera are associated with dermatophytosis: *Trichophyton*, *Microsporium*, *Epidermophyton*, *Lophophyton*, *Paraphyton*, *Nannizzia*, *Arthroderma*, *Ctenomyces* and *Guarromyces*^{3,7,8}. Tinea unguium, often known as onychomycosis, is one of the most significant dermatophytoses. Onychomycosis is believed to be responsible for up to 50% of nail diseases, and its prevalence is estimated to be 10% worldwide⁹. *Onychomycosis* usually occurs chronically and causes discoloration, onycholysis, and thickening of the nail plate⁹. It occurs most frequently in the toenails, and the most affected area is usually the nail of the first finger, where it can affect any component of the nail anatomy, including the nail bed, nail matrix, and nail plate^{8,10}.

Advanced age, diabetes mellitus, immunosuppression, especially that brought on by the Human Immunodeficiency Virus (HIV), tinea pedis, hyperhidrosis, obesity, peripheral vascular disease, and venous insufficiency are the key risk factors that affect the development of onychomycosis^{10,11}.

Onychomycosis can be treated pharmacologically using three distinct approaches, including topical treatment, which uses formulations designed to be administered to the skin around and beneath the nails as well as the nails

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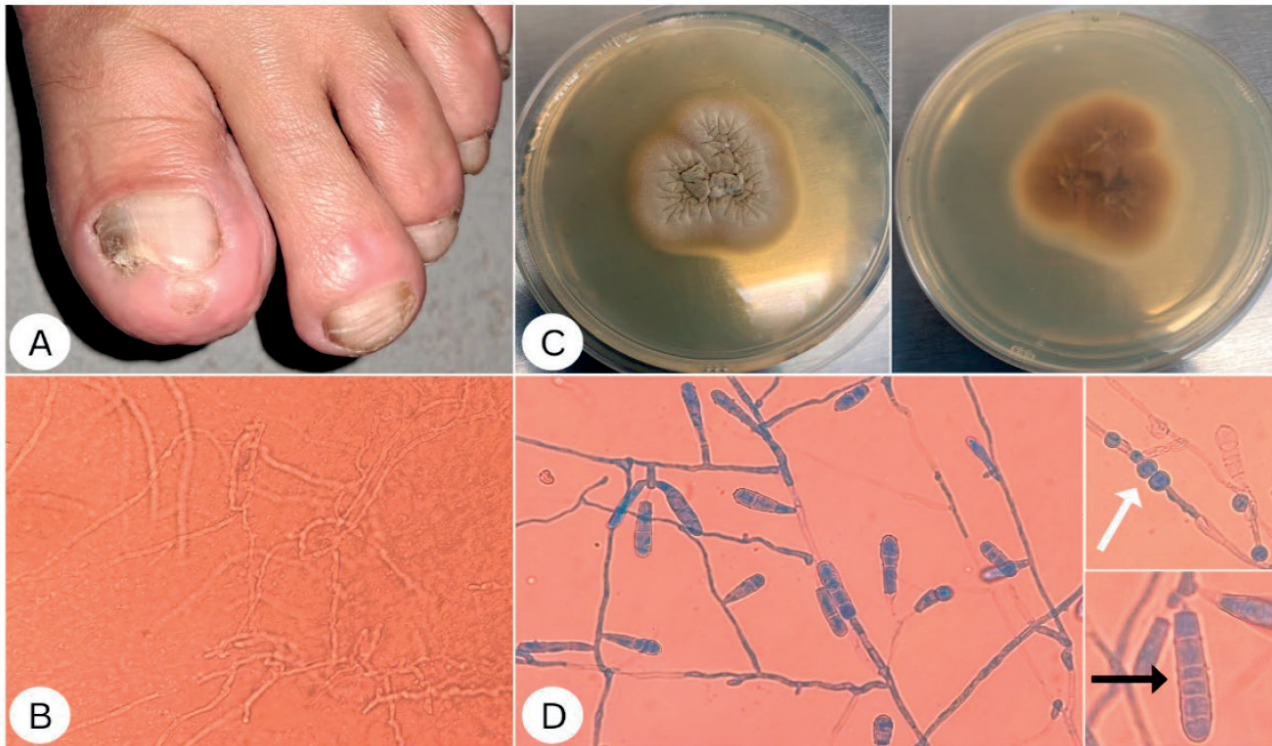


Figure 1. (A) Clinical characteristics of *Epidermophyton floccosum*-induced *tinea unguium*. (B) Direct examination with 20% KOH, where septate hyaline hyphae are observed. (C) Colonial morphology of *E. floccosum* on potato dextrose agar after 15 days of incubation at 28–30 °C. On the right side of Figure 1.C, the generation of yellow pigment is visible. In contrast, the colonies on the left side of the figure have a velvety crateriform appearance and are beige. (D) Microcultures of *E. floccosum* stained with lactophenol cotton blue. The white arrow shows the characteristic chlamydoconidium. The black arrow shows a characteristic club-shaped macroconidium.

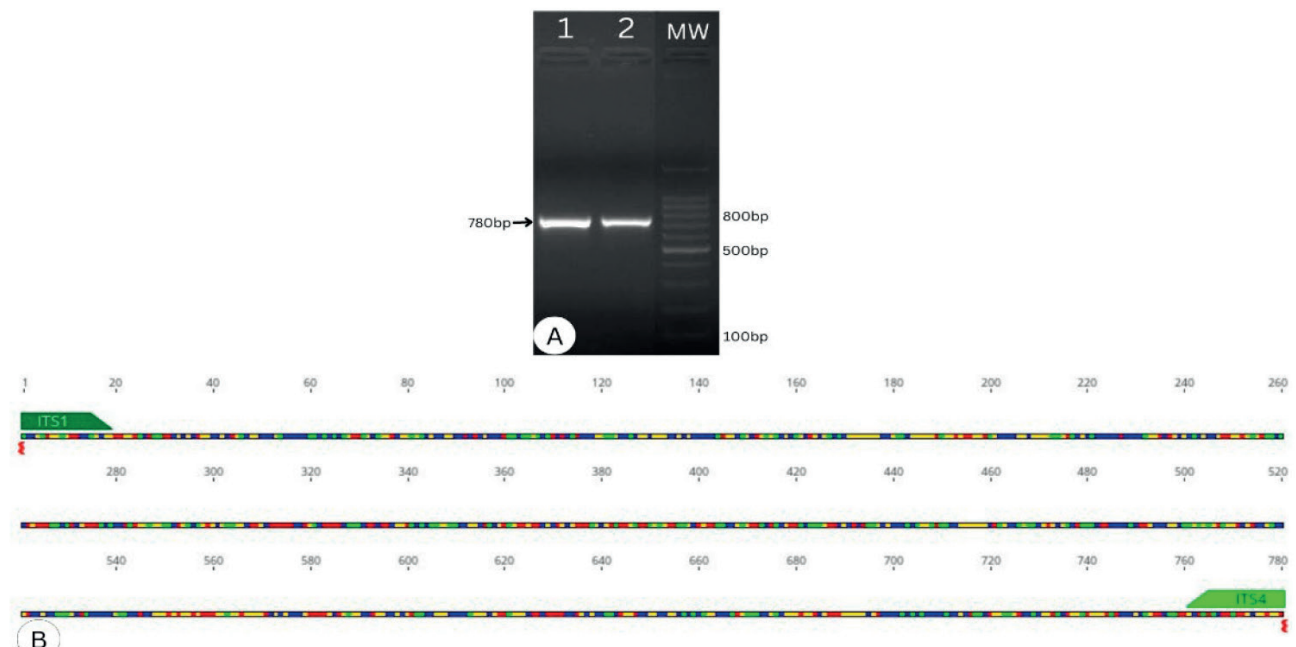


Figure 2. (A) Agarose gel electrophoresis. Lanes 1 and 2 show a 780 bp band due to the amplification of the internal transcribed spacer (ITS) region. The 100 bp molecular weight (MW) marker is shown in the third lane. (B) In silico analysis depicting the target site of primers ITS1 and ITS4 to the ITS region and the expected amplicon size.

themselves. These drugs contain antifungals as an active ingredient, such as 8% ciclopirox, 5% amorolfine, and 10% efinaconazole. Oral antifungals such as terbinafine, itraconazole, and fluconazole are a second treatment choice. Among oral antifungals, terbinafine monotherapy with continuous doses of 250 mg remains the first-line treatment for

these infections. The third treatment option is combination therapy, which combines topical and oral antifungals⁹.

One of the agents that cause onychomycosis is the genus *Epidermophyton*, which was originally reported in 1907¹². Currently, *E. floccosum* is the only representative species of its genus¹². This fungus has been described as anthropophilic

and has a very uneven distribution across the globe^{4,12}. Less than 1% of dermatophytosis is caused by *E. floccosum* in the United States¹³; however, over 14% of dermatophytoses recorded in Canada are caused by *E. floccosum*¹³. According to reports, this fungus is responsible for between 1 to 15% of cases of dermatophytosis on the African continent, with Morocco and the Ivory Coast exhibiting the highest number of cases⁶. In Europe, Ireland reported *E. floccosum* as the fourth causative agent of Tinea unguium, with a prevalence close to 15%¹⁴, while in Greece, the prevalence of this fungus was 2.5%, which represented just a single case of Tinea unguium¹⁵. However, only 0.3% of cases of dermatophytosis were caused by *E. floccosum* in Denmark¹⁶.

In the Latin American region, some studies report that in Brazil, Mexico, and part of Central America, the presence of this fungus is 1%^{17,18}. According to reports, *E. floccosum* cases comprised 1.2% of all dermatophytosis cases in Chile during the 1980s. However, during the 1990s, there was an almost 50% decrease in prevalence. By 2000, this prevalence had further decreased to less than 0.3% of all dermatophytosis cases¹⁹.

Conclusions

This report presents the case of a 49-year-old female patient with Tinea unguium caused by *Epidermophyton floccosum*. There were no severe medical issues or underlying diseases that the patient faced. The extended wearing of closed shoes was the most significant risk factor found. Additionally, no similar occurrences in their families were reported. This clinical image is precious for educational purposes, as it can contribute to the knowledge and better understanding of dermatophytoses and promote learning in health area personnel. We believe this description would contribute to broadening our understanding of the epidemiology of dermatophytosis, particularly those caused by *Epidermophyton floccosum*. This is the first molecular characterization of *Epidermophyton floccosum* as an etiologic agent of Tinea unguium in Honduras.

Supplementary Materials

The following are available in this PDF, Table S1: Composition culture medium, Sheet 1 S2: Total cost, Sheet 2 S2: Stages of production, Sheet 3 S2: Direct and indirect labor, Sheet 4 S2: Culture medium, Sheet 5 S2: IMC, Sheet 6 S2: 6. Assumptions.

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Consent

We have obtained the patient's consent in written form to publish the case report.

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