

### Article History

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## Dermatophytosis due to *Trichophyton Verrucosum* in a Six-Month-Old Male Sokoto Red Goat from Dogarawa, Zaria, Nigeria

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### ABSTRACT

Dermatophytosis, despite its global economic importance, has generally been under reported particularly among small ruminants in northern Nigeria. This paper describes the isolation of *Trichophyton verrucosum* from a Sokoto Red goat in Dogarawa, Zaria. A 6-month-old male goat was presented with skin lesions suggestive of dermatophytosis. Skin scrapings including hair pullouts were collected and processed for direct examination and culture. Direct examination was performed by digesting a portion of the sample in a drop of 10% potassium hydroxide on a clean glass slide, covered with a cover slip and examined under a light microscope, using the x40 objective lens. The remaining part of the sample was inoculated onto two plates, each containing Sabouraud's dextrose agar incorporated with chloramphenicol at the rate of 16µg/ml and cycloheximide at 0.5mg/ml. One of the plates was incubated at room temperature for 21 days while the second plate was incubated at 37°C for the same period. A portion of mycelium from each of the plates was stained with lactophenol cotton blue and examined with a light microscope. Direct microscopic examination of the sample showed hyaline septate hyphae in skin scales while chains of large ectothrix spores were seen in hair indicating dermatophyte infection. Microscopic examination of the isolate incubated at room temperature revealed sterile mycelium with broad, irregular hyphae, bearing a single, large microconidium while the isolate incubated at 37°C showed numerous chlamydospores occurring in chains referred to as "chains of pearls" typical of *T. verrucosum*. The ability to grow optimally at 37°C and forming long chains of chlamydoconidia is peculiar to *T. verrucosum* and therefore, diagnostic for this dermatophyte. It was concluded that *T. verrucosum* was the cause of ringworm in a 6-month-old goat.

**Key words:** Dermatophytosis, Goat, *Trichophyton verrucosum*, Zaria

### INTRODUCTION

Dermatophytosis also known as ringworm or tinea, is a contagious zoonotic skin disease caused by a group of pathogenic fungi known as dermatophytes in the Genera *Trichophyton*, *Microsporum* and *Epidermophyton* (Weitzman and Summerbell, 1995; Dalis *et al.*, 2023).

The disease has a world-wide distribution and is transmitted by direct contact between infected and susceptible hosts or indirectly by contact with fomites contaminated with arthrospores (Weitzman and Summerbell, 1995; Dalis *et al.*, 2014). *Trichophyton verrucosum* primarily causes dermatophytosis in cattle, but can also affect other animals including goats, sheep, horses as well as humans. The disease in ruminants is characterized by circumscribed, discrete, grayish-white area of crusting and alopecia, usually involving the face, ears, muzzle and trunk of affected individuals (Dalis *et al.*, 2023). Animals serve as reservoirs of the zoophilic dermatophytes (Chermete *et al.*, 2008; Dalis *et al.*, 2019). *Trichophyton verrucosum* in particular, is characterized by a high zoonotic potential and can remain infective in the environment for long periods of almost (5-7) years

(Ming *et al* 2006; Chermete *et al.*, 2008). Several human outbreaks of *T. verrucosum* infection have been reported (Ming *et al.*, 2006).

In spite of the global significance of dermatophytosis, the disease has not been adequately studied among animals particularly in northern Nigeria. This paper documents the isolation of *T. verrucosum* from ringworm lesions of a 6-month-old male goat in Dogarawa, Zaria.

### Case presentation

A 6-month-old male goat was observed with skin lesions suggestive of dermatophytosis. The animal was in the same pen with four other female goats of the same breed, aged between one to two years. All the animals in the pen were physically examined. However, only the male goat was seen with skin lesion. Skin scrapings including hair pullouts were aseptically collected from the margin of the lesions of the affected animal into a clean envelop for processing.

### Laboratory investigations

The sample was divided into two parts. One part was used for direct examination while the second portion was used for culture. The portion for direct examination was suspended in a drop of 10% KOH on a clean glass slide, covered with a cover slip, heated gently to facilitate digestion of keratinous tissues and examined using light microscope (Kane *et al.*, 1997).

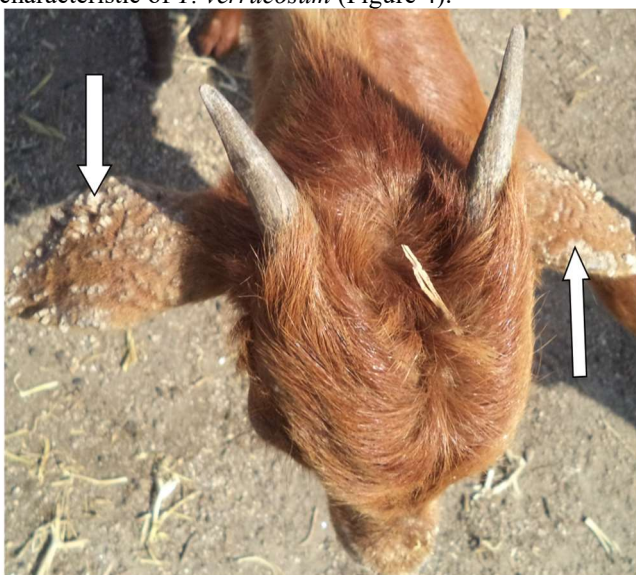
The second part was inoculated onto two plates, each containing Sabouraud's dextrose agar incorporated with chloramphenicol at the rate of 16µg/ml and cycloheximide at 0.5mg/ml. The plates were sealed with masking tape and one of the plates incubated at room temperature for 21 days while the other plate was incubated at 37°C for the same period.

The dermatophyte was identified by removing a portion of mycelium from the colony and emulsified in a drop of lactophenol cotton blue stain on a clean glass slide, covered with a cover slip and examined with a light microscope (Kane *et al.*, 1997).

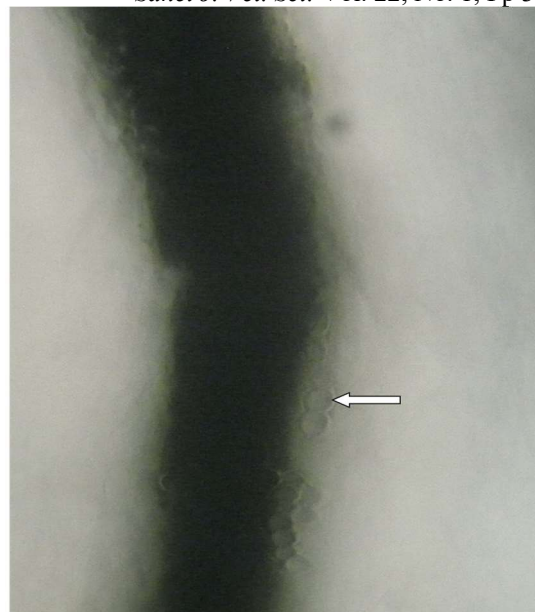
### RESULTS AND MANAGEMENT

Examination of the animal revealed circumscribed, alopecic, grayish-white, raised and thickly-crusts skin lesions on the ears (Figure 1). Direct microscopy showed hyaline septate hyphae in skin scales while chains of large ectothrix spores (approximately 5-10 µm) were seen in hair suggesting *Trichophyton* infection (Figure 2).

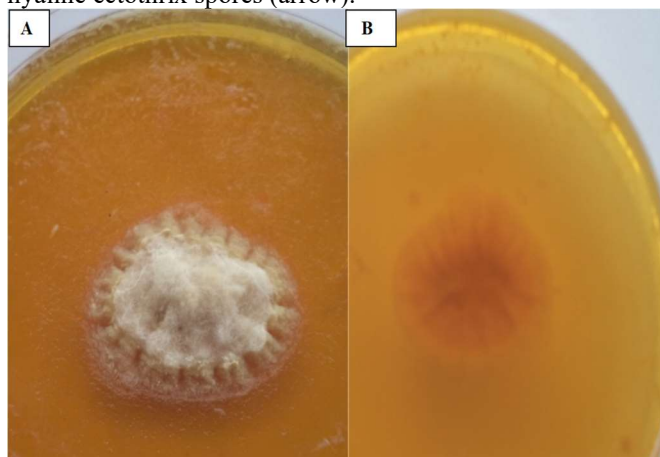
The colonies were slow growing, white, raised at the center and flat periphery (Figure 3). Microscopic examination of the isolate incubated at room temperature revealed sterile mycelium with broad, irregular hyphae, bearing a single, large microconidium while the isolate incubated at 37°C showed numerous chlamydospores occurring in chains referred to as "chains of pearls" characteristic of *T. verrucosum* (Figure 4).



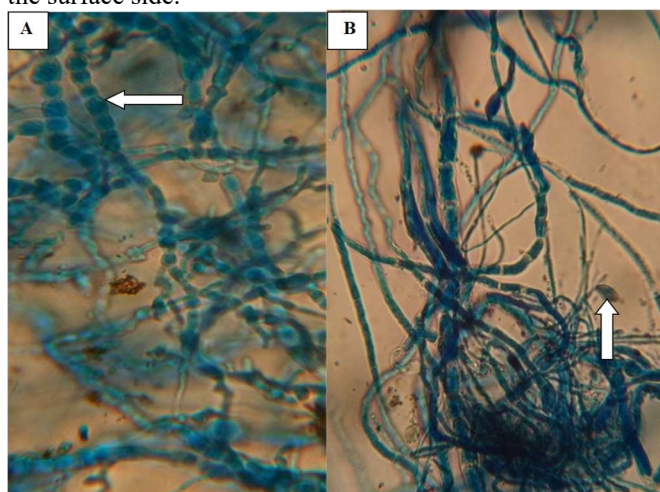
**Figure 1:** *Trichophyton verrucosum* affected goat. Note the circumscribed, grayish-white, raised crusty lesions involving both ears (arrows).



**Figure 2:** Hair infected by *T. verrucosum* on direct microscopic examination (x400). Note the chains of large hyaline ectothrix spores (arrow).



**Figure 3:** Surface (A) and reverse (B) colony sides of a 19-day-old culture of *T. verrucosum* incubated at 37°C. Note the white, heaped at the center and flat periphery of the surface side.



**Figure 4:** Microscopic morphology of *T. verrucosum* (A, culture incubated at 37°C and B: incubated at room temperature) stained with lactophenol cotton blue (x400). Note the chains of chlamydoconidia "chains of pearls" (A; arrow) and the broad hyphae with a single large microconidium (B; arrow).

## DISCUSSION

*Trichophyton verrucosum* was isolated from ringworm lesions in a 6-month-old goat. The diagnosis was based on clinical presentation and laboratory investigations including direct microscopic examination as well as isolation and identification of the etiologic dermatophyte.

The clinical signs in this report are consistent with findings of Biswa *et al.* (2015) and Dalis *et al.* (2023). However, clinical presentation may vary depending on the immune status of the host, the virulence of the infecting dermatophyte as well as the anatomical location of lesions (Chermette *et al.*, 2008). Furthermore, quite often some non-dermatophyte fungi cause skin infections which are clinically indistinguishable from those caused by dermatophytes (Chanyachailert *et al.*, 2023). Hence, diagnosis of dermatophytosis cannot be based on clinical signs alone, therefore, further tests are required for confirmation of diagnosis.

The presence of large (about 10µm) arthroconidia occurring in chains on the surface infected hair observed in this study concurs with report of Spanamberg *et al.*, (2023) who in a study of bovine ringworm, found that *T. verrucosum* formed large (12 µm) ectothrix arthroconidia. The size and disposition of arthroconidia differ depending on infecting dermatophyte species. While *Microsporum canis* form cluster of small (2–4 µm) ectothrix arthroconidia; *T. mentagrophytes* produces chains of small (2-3µm) ectothrix arthroconidia whereas *T. verrucosum* forms large (up to 12 µm) ectothrix spores (Chermette *et al.*, 2008). It is pertinent to mention that anthropophilic dermatophytes such as *T. tonsurans*, *T. violaceum* and *T. soudanense* which in some rare instances can infect animals (Brillhante *et al.*, 2006), also form large (4-8 µm) arthrospores. However, in contrast to *T. verrucosum*, the arthroconidia produce by these organisms occur inside (endothrix) the infected hair shaft (Futastsuya *et al.*, 2023). The presence and arrangement of arthroconidia in this study is highly indicative of a *Trichophyton* infection. Since prophylaxis and treatment of dermatophytosis may differ depending on the species (Dalis *et al.*, 2019), identification of the causative dermatophyte to species level is critical for effective control of the disease (Futastsuya *et al.*, 2023).

The colony morphology of the fungal isolate in this study confirms the report of Abdallah and Osman (2017) who described the colony of *T. verrucosum* isolated from a rabbit as glabrous, folded, heaped, velvety, wrinkled and white. It had been found that colony variations do exist depending on the varieties (Kane *et al.*, 1997; Kim, 2019). For example, the variant *album* has a flat, white to cream color, having an occasional dome, with a glabrous texture while *T. verrucosum* var. *ochraceum* has a flat, yellow, glabrous colony and another variant called *T. verrucosum* var. *discoideus* has a gray-white, flat, and tomentose colony (Kane *et al.*, 1997). However, despite great variability in terms of culture morphology, all *T. verrucosum* isolates were reported to be genotypically almost identical (Kielstein *et al.* (1998), precluding a separate taxonomic position of the three *T. verrucosum* varieties.

In this study, the microscopic feature of *T. verrucosum* isolate incubated at room temperature which was the presence of broad, irregular, almost sterile hyphae, is consistent with the report of Handi *et al.* (2023). Similarly, the abundant chlamydospores occurring in chains ‘chains of pearls’ as seen in culture incubated at 37°C completely concurs with other findings (Kane *et al.*, 1997; Dalis *et al.*, 2014). According to Kane *et al.* (1997), *T. verrucosum* is the only dermatophyte that has optimum growth temperature as high as 37°C and, at this temperature, chlamydospores become thick-walled and found in long chains.

There appears to be a consensus of opinion among researchers (Kane *et al.*, 1997; Dalis *et al.*, 2014; Handi *et al.*, 2023), that of all the pathogenic dermatophytes, the ability to grow optimally at 37°C and forming long chains of chlamydoconidia is peculiar to *T. verrucosum* and therefore, diagnostic for this dermatophyte. It was concluded that *T. verrucosum* was the cause of ringworm in a 6-month-old goat in Dogarawa, Zaria.

## Conflict of Interest

The authors have no conflict of interest to declare.

## Authors Contribution

J.S.D. collected and processed the sample, identified the etiologic dermatophyte and wrote the manuscript. H.M.K. and K. F. C. supervised the work and corrected the manuscript. J.S.D., H.M.K., and K.F.C read and approved the final manuscript.

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