

## Rare Fungi Causing Nail Infections

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### Abstract

Nail infections are very common among the people especially in females it is one of the most over looked infections which remain untreated and can lead to destruction of the nail and deformity of the nails. Dermatophytes are the common causes of nail infections amongst people. However other filamentous fungi and even yeasts are also responsible for many cases of nail infections. These will be elaborated in this chapter.

*Context:* Public health importance of non-dermatophyte nail infection.

*Aims:* To enlist the causes and epidemiology of non-dermatophytic fungal nail infections.

*Settings and Design:* Review of existing information about this.

*Methods and Material:* Scientific literature search.

*Statistical Analysis Used:* Nil.

*Results:* Non-dermatophytes are important but neglected causes of nail infections.

*Conclusions:* One should be vigilant about occurrence of these infections.

**Keywords:** Non-Dermatophytic; Nail; Infections.

**Key Messages:** Clinicians, nurses and Microbiologists should be vigilant about occurrence of non-dermatophyte nail infections.

### Abbreviations:

**KOH:** Potassium Hydroxide, **NDM:** Non-Dermatophytemolds, **OIAD:** Onychodystrophy Infectious Agent Detection, **PCR:** Polymerase Chain Reaction, **SDA:** Sabouraud's Dextrose Agar, **WSO:** White Superficial Onychomycosis

### Introduction

Nail infections are very common in the general population. In fact, they can be found in about 10% of the population. Above 70 years of age, they are found in almost 50% of the population. They are commoner in toenails as compared to

finger nails.<sup>1</sup> Common predisposing factors for nail infections are nail surgery, shared nail clippers, immunocompromised states or Diabetes mellitus.

### Materials and Methods

Scientific literature search was carried out for delineating available information about non-dermatophyte onychomycosis.

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Received on: 09.08.2025

Accepted on: 30.10.2025



## Results

Dermatophytes are very common causes of onychomycosis. However other molds and even yeast like fungi can cause nail infections in 2-15% cases. Clinically, fungal nail infections may cause nails to become discoloured, thick, fragile, or cracked. The nail may also become separated from the nail bed.

Other than dermatophytes, non dermatophyte molds like *Aspergillus niger* is also a very common cause of nail infections. In fact, there are reports of this fungus causing nail infections in immunocompromised patients also.<sup>2</sup>

Yeasts can also be causes of nail infections. *Candida albicans* can affect nails especially in immunocompromised hosts.<sup>3</sup> It is the second commonest fungus causing nail infections after dermatophytes.<sup>4</sup>

Non dermatophyte molds like *Scytalidium dimidiatum* (now called *Neoscytalidium dimidiatum*) are also common causes of nail infections. It usually causes distal subungual onychomycosis.<sup>4</sup> *S. dimidiatum* and its hyaline mutant, *S. dimidiatum* var. *Hyalinum* are common causes of nail infections. *Scytalidium* nail infection are common in nails of index finger and thumb in green tea pluckers of North East India.<sup>4</sup> It is characterized also by blackish discolouration of nail plate and appearance of small, opaque black patches on nails, which can be easily scraped away.<sup>5</sup>

Other non dermatophyte molds are also important as causative agents of onychomycosis, like *Acremonium* and *Fusarium* spp. *Fusarium* spp. colonize soil and affect the nails by direct inoculation.<sup>6</sup> *F. solani* is one important species causing onychomycosis, but other species like *F. dimerum* and *F. oxysporum* are also important.<sup>7</sup> *Fusarium* nail infection responds well to Itraconazole.<sup>6</sup> It also usually involves the toenails more than other nails, and presents usually as white superficial lesions. Nail *Fusariosis* can predispose to disseminated fusariosis also later. Among *Acremonium* spp., *A. alabamensis*, *A. falciforme*, *A. kiliense*, *A. roseogriseum*, *A. strictum*, *A. potroni*, and *A. recifei* are important for causing nail and other infections.<sup>8</sup>

The dematiaceous fungus *Alternaria alternata* also causes nail infections rarely. It is the rarest non-dermatophyte mold causing nail infection. It is resistant to Griseofulvin but susceptible to Itraconazole and Ketoconazole.<sup>9</sup>

The hyaline mold *Scopulariopsis brevicaulis* is also a rare cause of nail infection. In fact, *Scopulariopsis*

spp. and *Fusarium* spp. commonly cause proximal subungual onychomycosis or infection of the proximal nail fold.<sup>5</sup>

WSO or White superficial onychomycosis caused by dermatophytes but can also be caused by other molds like *Acremonium strictum* and *Onychocola canadensis*.<sup>10</sup> *Fusarium* and *Aspergillus* may cause deep version of WSO. Among *Aspergillus* species, not only *A. niger* but also *A. terreus* and *A. candidus* can cause WSO. *Candida albicans* can also cause WSO in very small children. Diffuse *Candida*-associated WSO of several fingernails and toenails may be found in premature infants who have been born to mothers having vaginal candidiasis.<sup>5</sup> This entity may also be associated with oral thrush and angular cheilitis.

Nail destruction or onychodystrophy is rarely seen in non-dermatophyte onychomycosis. Most molds are non-keratolytic (except for *Neoscytalidium dimidiatum*). They require the presence of underlying trauma or other nail disorders to penetrate nail tissue and cause infection.<sup>11</sup> Differential diagnosis should include trauma, psoriasis of nails and Lichen planus.<sup>11</sup>

### Laboratory Diagnosis

Clinically one should suspect non-dermatophyte onychomycosis which occurs in specified predispositions and is usually associated with paronychia.<sup>11</sup> A wet mount of nail scrapings with 40% KOH solution can reveal the microscopic morphology of the fungi by dissolving keratin. Culture can be carried out on Sabourauds' Dextrose agar (SDA) and SDA with cycloheximide and Chloramphenicol. *Neoscytalidium dimidiatum* fails to grow on SDA with cycloheximide and Chloramphenicol, but grows on simple SDA as greyish black colonies.<sup>4</sup> It is also characterized by pigmented broad hyphae and thin hyaline hyphae seen together, along with broad pigmented arthroconidia. Recently molecular techniques like PCR have also been employed for diagnosis of non-dermatophyte onychomycosis. Histopathology can also be useful for diagnosis. In fact, the 3 most commonly used methods used for diagnosis of non-dermatophyte mold (NDM) onychomycosis are culture, polymerase chain reaction (PCR) and histopathology. Histopathology can yield an in-situ vision of the nail plate and subungual keratin for presence of fungal elements, thus providing direct evidence of fungal invasion which is not visible via a simple light microscopic examination.<sup>12</sup> Also, interpretation of PCR results can be complicated by the possible presence of contaminant and commensal microorganisms and how to distinguish

them from possible pathologic organisms. As regards PCR is concerned, people have also tried with great success, the Onychodystrophy Infectious Agent Detection (OIAD) assay, a multiplex real time PCR assay which utilizes Taq Man technology for detecting a particular genetic target. Also, one should consider lack of demonstrated viability of the detected microorganism. This is particularly problematic for non-dermatophyte molds (NDM) found in toenails, which can usually or often be regarded as mere environmental contaminants.<sup>12</sup>

**Treatment:** Triazoles like Itraconazole offer better treatment outcomes than Griseofulvin in cases of non-dermatophyte onychomycosis. Fungal nail infections characteristically do not go away on their own. The best treatment is usually prescription antifungal pills taken orally. In severe cases, a healthcare professional might remove the nail completely. It can take many months to a year for the infection to get resolved.

## Discussion

Non dermatophyte fungi are also very important etiological agents behind nail infections in all age groups, but are often neglected as causative agents of onychomycosis. Proper clinical suspicion is needed for diagnosis of these infections. Treatment may also be different from that of dermatophytes causing onychomycosis.

## Conclusion

Non-dermatophyte nail infections are very important in predisposed subjects and need to be managed well.

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