LABORATORY HANDBOOK OF

DERMATOPHYTES

A CLINICAL GUIDE AND LABORATORY HANDBOOK OF DERMATOPHYTES AND OTHER FILAMENTOUS FUNGI FROM SKIN, HAIR, AND NAILS

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CONTENTS

CHAPTER 8

NONDERMATOPHYTIC MOLDS CAUSING DERMATOPHYTOSIS-LIKE NAIL AND SKIN INFECTION

by Richard C. Summerbell

HOW IMPORTANT ARE THEY?

The nondermatophytic fungi which cause tinea-like infections of the nails and skin are often isolated by laboratories performing dermatologic mycology. These diverse nondermatophytic molds pose two kinds of problems. Firstly, correctly identifying which isolates are contaminants and which are agents of an infection may be difficult. Secondly, the species identification of the isolates causing infection is often problematic. Despite these difficulties, some surveys have been done in which nondermatophytic skin- and nail-infecting molds are verified as infectious by conservative standards and then identified to species. Such studies indicate that nondermatophytic molds constitute a substantial proportion of isolates from nails and thickly keratinized skin areas such as soles and palms. A recent North American survey showed that 3.3% of 2,662 filamentous fungi isolated as causal agents of nail infections over a three-year period were nondermatophytic molds.[31] Such molds also caused 0.4–0.8% of sole and palm skin infections. In a British study, 11% of nail infections were caused by these fungi,[34] while in a Colombian study, these fungi caused 4.5% of the examined nail infections at one laboratory and 9.5% at another.[33] In Gabon, Africa, *Scytalidium dimidiatum* (reported under the older name *Hendersonula toruloidea*) alone caused approximately 20% of all cutaneous infections of feet and nails.[14] Nondermatophytic nail- and skin-infecting fungi comprise an important part of the workload of diagnostic medical mycology laboratories worldwide.

WHAT KINDS OF INFECTIONS DO THEY CAUSE?

Different nondermatophytic molds cause different kinds of skin and nail infections. Two once little known but now increasingly important species cause nail, sole, toe web, and palm infections strongly resembling those caused by *Trichophyton rubrum*. These species are *S. dimidiatum*, better known under its old name of *H. toruloidea* (technically speaking, it was the "*Scytalidium* synanamorph of *H. toruloidea*"), and *S. hyalinum*. *S. dimidiatum* on rare occasions causes other dermatophyte-like infections such as tinea capitis.[11]

Other species primarily cause nail infections, especially toenail infections. Relatively common agents such as *Scopulariopsis brevicaulis*, *Aspergillus sydowii* and other aspergilli, and *Fusarium oxysporum* may cause distal-subungual and lateral-type onychomycoses, in which nails become discolored and thickened and may separate from the nailbed and become brittle.[2] Also, *F. oxysporum*, *Aspergillus terreus*, *Acremonium potronii*, and a small number of other species may cause superficial white onychomycosis (Fig. 1), a disease in which white or yellowish, infected patches appear on the surface of the nail.[35] The nail bed is generally not affected in early stages of the disease. Most of the nondermatophytic molds that cause nail infections, excluding the two *Scytalidium* species mentioned above, are much more likely to infect persons over the age of 60 than younger persons.[34]

Various molds are capable of causing unusual skin infections—a well known example is *Phaeoannellomyces werneckii*, the causative agent of tinea nigra. Because the infections caused by these molds do not resemble dermatophytosis, they fall outside the scope of this book.

HOW CAN INFECTIOUS MOLD ISOLATES BE DISTINGUISHED FROM CONTAMINANTS?

The isolation of a dermatophyte species (i.e. a pathogenic *Trichophyton*, *Microsporum*, or *Epidermophyton* species) from a lesion is presumptive of infection; however, this is not true of most nondermatophytic molds. Many are common contaminants that occasionally cause infection. The means of verifying that a genuine infection exists vary from species to species.

Two nondermatophytes can be treated as if they were dermatophytes from the point of view of verifying infection. These are *S. dimidiatum* and *S. hyalinum*. These species are not isolated as contaminants in temperate areas, and rarely are so isolated in tropical/subtropical areas. Isolation from skin or nails should be considered presumptive of an infection, and this can be verified by showing thick-walled but otherwise dermatophyte-like (or rarely, brown) filaments in direct mounts of the affected areas.

Photos of the infecting filaments of *Scytalidium* and other nondermatophytic agents of onychomycosis are depicted under the individual species. For comparison with dermatophyte filaments, refer to Chapter 3.

With nondermatophytic onychomycosis agents other than *S. dimidiatum* and *S. hyalinum*, the possibility of isolating the fungus as a contaminant rather than as an infectious agent must be considered. Fungi such as *S. brevicaulis* and *A. terreus* may cause nail infection, but they are also common soil and indoor air fungi. Furthermore, their keratinolytic abilities probably give them the ability to live on moist leather, thus possibly making them a part of the normal flora of shoes.

Certainly, for any non-*Scytalidium* mold from nails or skin, finding fungal filaments in the direct mount of the patient's specimen is an absolute prerequisite for considering the possibility of a mold infection. It must be stressed that any true infection by mold fungi will be signalled by the presence of filaments or other fungal structures in tissue. One must, however, always consider the possibility that the filaments seen in direct mounts may be dermatophyte filaments regardless of what kind of fungus is isolated. Sometimes a physician will take a sample from an older portion of the infected area where nonviable dermatophyte filaments are found. In this case, a contaminant growing from the sample may be mistaken for an infectious agent. Potentially misleading, dead dermatophyte filaments may also be found in cases where the patient has already used antifungal agents on the infected area. In other cases, the dermatophyte filaments may be viable; however, an aggressive mold contaminant may overgrow the isolation medium. In these cases, a mistake might easily be made and a mold contaminant reported as an infectious mold.

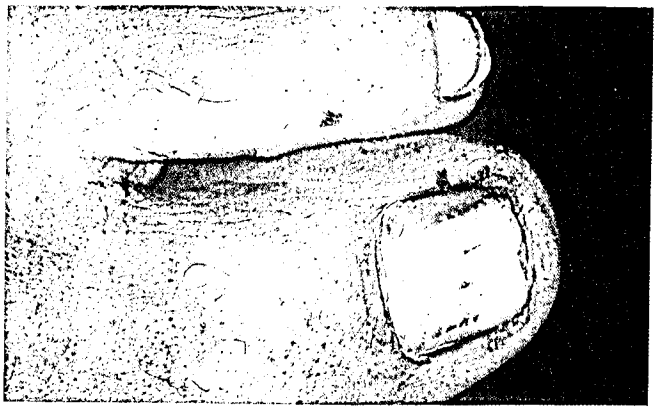

Figure 1. Superficial white onychomycosis attributed to *Scopulariopsis brevicaulis*.

This problem can be resolved in two ways. Firstly, with some mold species, this problem can be resolved the **EASY WAY**. Some molds causing nail infections produce highly distinctive microscopic structures within the infected tissue. These structures can easily be recognized as not having been produced by a dermatophyte. For example, some, but not all, *S. brevicaulis* infections are accompanied by the production of masses of golden-brown, lemon-shaped *Scopulariopsis* conidia in the nail tissue. *Aspergillus sydowii* and *A. versicolor* infections may have whole *Aspergillus* conidial heads associated with the nail tissue along with many interwoven irregular filaments. *Wangiella dermatitidis* infections will show masses of deep brown filaments and yeast cells. Molds

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