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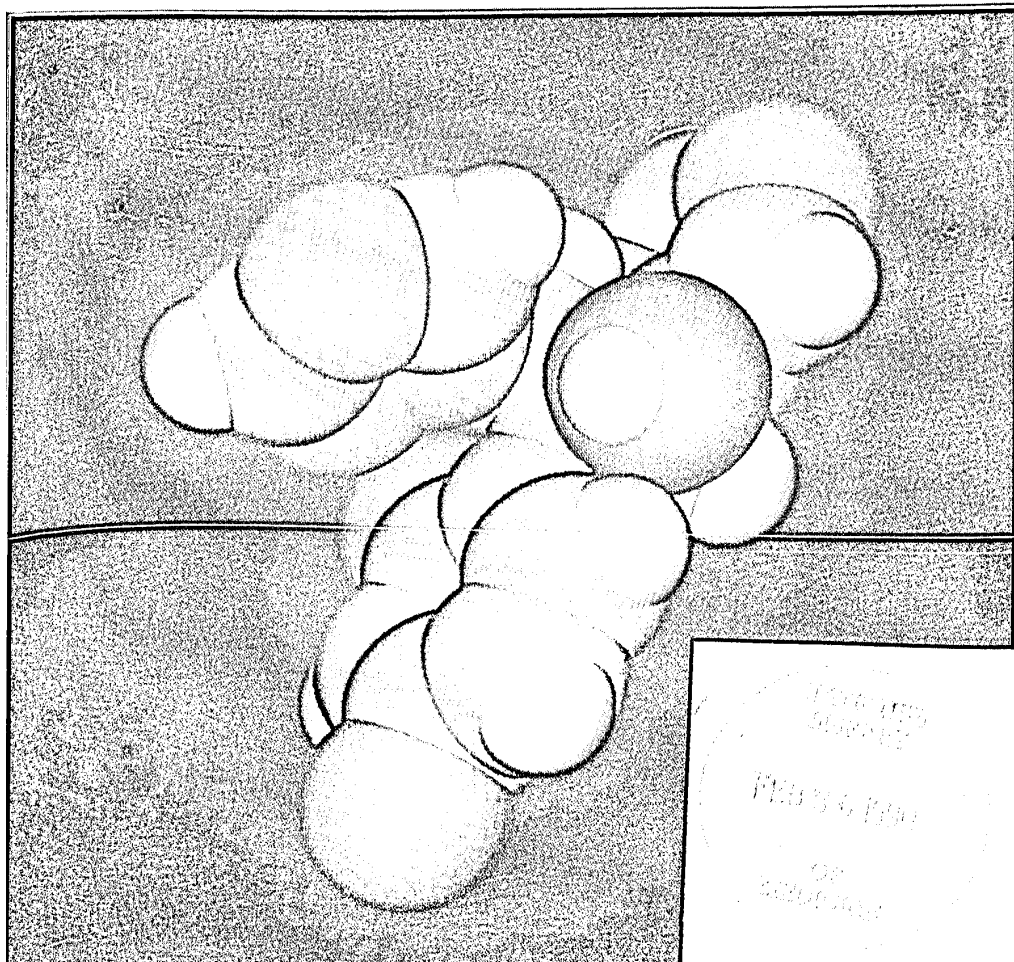
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Onychomycosis, Tinea Pedis and Tinea Manuum Caused by Non-Dermatophytic Filamentous Fungi

Nicht-Dermatophyten-Fadenpilze als Erreger von Onychomykosen, Tinea pedis und Tinea manuum

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Key words: *Aspergillus sydowii* – *Gymnascella dankaliensis* – *Hendersonula toruloidea* – *Scopulariopsis brevicaulis* – *Scytalidium hyalinum* – dermatomycosis – onychomycosis – tinea

Schlüsselwörter: *Aspergillus sydowii* – *Gymnascella dankaliensis* – *Hendersonula toruloidea* – *Scopulariopsis brevicaulis* – *Scytalidium hyalinum* – Dermatomykose – Onychomykose – Tinea

Summary: Over 4000 cases of fungal nail, sole and palm infection recorded during a three-year study period were investigated to determine the prevalence and significance of etiologic agents other than dermatophytes and yeasts. Littman's oxgall agar, which permitted isolation of cycloheximide-sensitive species but restricted overgrowth by fast growing contaminants, was used to promote isolation of these disease agents. Non-dermatophytic filamentous fungi made up 2.3% of the confirmed etiologic agents obtained overall, and constituted 3.3% of the agents obtained from nail infections. The most common species were *Scopulariopsis brevicaulis*, *Hendersonula toruloidea*, and *Aspergillus sydowii*. *Scytalidium hyalinum* was recorded for the first time from Canada, and an instance of nail infection by *Gymnascella dankaliensis* was recorded. Only *H. toruloidea* and *Sc. hyalinum* caused palm and sole infections.

Zusammenfassung: Über 4000 Fälle von Pilzinfektionen der Nägel, Fußsohlen und

reszeitraumes auf das Vorkommen von Nicht-Dermatophyten-Fadenpilzen als Erreger untersucht. Zur Isolierung dieser Pilze wurde Littmans Rindergalle-Agar benutzt, der die Isolierung Cycloheximidempfindlicher Arten erlaubt, jedoch das Überwuchern durch schnellwachsende Kontaminanten verhindert. Nicht-Dermatophyten-Fadenpilze machten 2,3% der nachgewiesenen Gesamterreger und 3,3% der Erreger von Nagelinfektionen aus. Die häufigsten Arten waren *Scopulariopsis brevicaulis*, *Hendersonula toruloidea* und *Aspergillus sydowii*. *Scytalidium hyalinum* wurde dabei zum erstenmal in Canada nachgewiesen, weiterhin wurde eine durch *Gymnascella dankaliensis* verursachte Nagelmykose gefunden. *H. toruloidea* und *Sc. hyalinum* waren bei Palmar- und Plantarinfektionen alleinige Erreger.

Introduction

Over the past three decades, careful work by

lished certain non-dermatophytic filamentous fungi as etiological agents of onychomycosis, tinea pedis and tinea manuum (Rippon 1988, Zaias 1972, Moore 1986). Most prevalent among the non-dermatophytic fungi causing onychomycosis is *Scopulariopsis brevicaulis* (Fischer 1960, Frágner and Belsan 1974, Onsberg 1980), but other confirmed agents include members of the genera *Alternaria* (Ernst 1983), *Aspergillus*, *Acremonium* and *Fusarium* (Rippon 1988), as well as *Hendersonula toruloidea*, *Scytalidium hyalinum* (Campbell and Mulder 1977, Moore 1986), *Cladosporium carrionii* (Barde and Singh 1984), *Pyrenochaeta unguis-hominis* (English 1980) and *Botryodiplodia theobromae* (Restrepo et al. 1976). Besides causing onychomycosis, *H. toruloidea* and *Sc. hyalinum* are also able to cause paronychia as well as infections resembling classic tinea pedis and tinea manuum (Moore 1986; Gentles and Evans 1970; Hay and Moore 1984). One feature possessed by the great majority of filamentous fungi responsible for non-dermatophytic onychomycosis and tinea is a low tolerance of cycloheximide (Fischer 1960, Moore 1986, Restrepo et al. 1976, Gugnani et al. 1986). Although species such as *S. brevicaulis* and *Aspergillus terreus* may grow as restricted colonies on cycloheximide-amended media (Frágner and Belsan 1974, Onsberg et al. 1978), others, such as *H. toruloidea*, *B. theobromae*, and *Sc. hyalinum*, are usually completely inhibited (Moore 1986, Gugnani et al. 1986, Restrepo et al. 1976). Some authors have contradicted others by stating that a large proportion of *S. brevicaulis* isolates are inhibited (e.g., Fischer 1960). Unfortunately, cycloheximide concentrations are not given in most cases, but it appears likely that *S. brevicaulis* reaches a threshold of tolerance within the range of concentrations commonly used by clinical laboratories (100–500 µg/ml.)

To be certain of obtaining all possible non-dermatophytic agents of onychomycosis and tinea, the Ontario Ministry of

duced a policy of inoculating all nail samples and sole and palm skin samples on a cycloheximide-free medium in addition to the normal cycloheximide-supplemented isolation media. Littman's oxgall agar, a general growth medium which restricts fungal colony diameter (Littman 1947), was used as the cycloheximide-free medium. This medium is known to be efficacious for the isolation of pathogenic fungi from various clinical materials (Littman 1948). The purpose of the present study was to determine the frequency and characteristics of non-dermatophyte filamentous fungal nail, palm, and sole infections detected in Ontario by means of this technique. Only isolates that could be definitively linked with nail infections by rigorous criteria were included in the survey.

Materials and Methods

Nail and skin samples were obtained in the routine practice of physicians' offices and inoculated onto Sabouraud's peptone-glucose agar supplemented with cycloheximide (100 µg/ml), chloramphenicol (100 µg/ml) and gentamicin (50 µg/ml). All nail specimens and atypical sole and palm specimens were inoculated on Littman's oxgall medium (Difco Laboratories, Detroit, Mich.) supplemented with chloramphenicol and gentamicin as above. In addition, all nail specimens and those skin specimens positive for fungal microscopic structures were inoculated onto casamino acids-erythritol-albumin agar (CEA), a cycloheximide- and antibacterial-supplemented medium used for inhibiting the growth of common contaminating yeasts and bacteria (Fischer and Kane 1974). Non-dermatophytic isolates were subcultured for identification onto cycloheximide-free Sabouraud's agar and modified Leonian's agar (Malloch 1981). When necessary, slide cultures were grown using cornmeal agar.

Direct microscopy of skin scales and pul-

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