SUPERFICIAL FUNGAL INFECTIONS OF THE NAILS

Superficial fungal infections tend to infect the stratum corneum layer of the skin, the hair or the nails, causing various types of clinical symptoms, which can be very distressful to the patient.

AETIOLOGY AND PREVALENCE

There are many diseases that can affect the nails causing them to become unsightly. Of those diseases, around 50% are due to fungal infections. On average, around 8% of the population will be affected by a fungal infection of the nails, called onychomycosis.

Onychomycosis refers to a fungal infection that affects the nails. These fungi, known as dermatophytes, infect the superficial layers of the skin and its appendages. These dermatophytes are divided into three genera: trichophyton, microsporum and the epidermophyton. The most common infective agents are the Trichophyton rubrum and T. mentagrophytes. There are instances where moulds and yeasts can cause infection of the nails, but this occurs less likely and with a slightly different picture.

Toe nails are more frequently involved and can lead to pain, discomfort, paraesthesia and loss of dexterity. The fungus gains access to the nail bed via the hyponychium [this is the area between the nail plate and the distal part of the finger (see Figure 1)]. At times, the infection can also begin from the nail folds. The organism then multiplies and causes damage to the nail plate. At a later stage, total damage to the nail plate ensues.

Figure 1.

Nail plate

hyponychium

Onychomycosis is much more common in adults and can affect up to 80% of the geriatric population. Onychomycosis can persist for years and rarely ever gets cured without treatment. The cure rate is only 48%-75% with the fingernails having the best prognosis. However, most people will have some residual nail changes such as permanent discoloration of the nail plate. One should also be aware that the reinfection rate is as high as 50%, therefore regular check-up is mandatory.

SYMPTOMATOLOGY

Nail fungus is a common condition that begins as a white or yellow spot under the tip of the fingernail or toenail. Later on, there is subungal hyperkeratosis which becomes more prominent and spreads until the entire nail becomes affected.

As the fungal infection continues deeper into the nail, the fungus may trigger the nail to discolour, thicken and become brittle and eventually separated from its bed (referred to as onycholysis) as a result of piling-up of subungal keratin. At this stage, the patient might experience pain in the toes or fingertips and a slightly foul odour may occur. The infection can affect several nails but usually not all of the nails at once. With progression the infection can spread to the other toes and fingernails if left untreated, affecting all the nails in the end, resulting in discomfort and loss of confidence to the patient.

This complaint is not purely a cosmetic problem, but is also a sign of local weakness in the defensive functions in the area affected. Onychomycosis is a potential health hazard for persons suffering from metabolic disorders such as diabetes mellitus or peripheral circulatory disorders.

Figure 2:
Examples of onychomycosis

TOENAILS VS FINGERNAILS

Nail fungus occurs more often in toenails than in fingernails, partly because:
• Toe nails often are confined in a dark, warm, moist environment - inside shoes - where fungi can thrive
• Toes usually have less blood flow than do fingers, making it harder for the body’s immune system to detect and stop infection.

DIAGNOSIS

The diagnosis is made clinically, however, if unsure, there are various methods to detect the presence of the organism. These methods include fungus detection by sending nail clippings to the laboratory, polymerase chain reaction (not widely available) and the use of dermoscopy by dermatologists. Clinical diagnosis is most commonly used, bearing in mind that conditions like malignant melanoma, lichen planus, psoriasis, eczema and trauma also commonly cause changes of the nail plates. One should not rely fully on the final results due to the fact that there is a very high rate of false negative results. If unsure, a biopsy can be performed to differentiate from psoriasis of the nails, eczema or even melanoma.

RISK FACTORS

There are many risk factors that makes a person more prone to developing such infections. Factors that can increase risk of developing nail fungus include:
• Age, owing to reduced blood flow, more years of exposure to fungi and slower growing nails.
• Heavy perspiration.
• Male gender, especially if you have a family history of nail fungal infections.
• Working in a humid or moist environment or in a job where the hands are often wet, such as bartending or housekeeping
• Wearing socks and shoes that hinder ventilation and don’t absorb perspiration
• Use of communal baths
• Living with someone infected with a nail fungus

A cost effective and convenient solution

Product details: Scheduling status Complimentary medicine. Proprietary name (and dosage form) Clearnail™. Registration number (TBC). Composition: 1% Tea Tree Oil, 2% Blue Cypress, 2% Lavender Oil. For full prescribing information, refer to outside carton of product.
• Walking barefoot in damp communal areas, such as swimming pools, gyms and shower rooms
• Athlete’s foot
• Minor skin or nail injuries or a skin condition, such as psoriasis
• Diabetes, circulation problems, a weakened immune system or, in children with Down syndrome.

COMPLICATIONS
A severe case of nail fungus can be painful and may cause permanent damage to the nails. It may also lead to other serious infections that spread beyond the feet if you have a suppressed immune system due to medication, diabetes or other medical underlying conditions.

Diabetic patients may have reduced blood circulation and nerve supply in the feet. They are also at greater risk of cellulitis, therefore any relatively minor injury to the feet - including a nail fungal infection - can lead to a more serious complication.

PREVENTION
Are there any ways to prevent the infection? It is almost impossible to prevent onychomycosis, but one can decrease the chance of getting it. Furthermore, due to the high relapse rate it is very important to be aware of and implement the below habits, to prevent reinfection of the nails:

• Keep hands clean, nails short and dry.
• Wear socks that absorb sweat.
• Use an antifungal spray or powder. Spray or sprinkle your feet and the insides of your shoes.
• Wear rubber gloves. This protects your hands from overexposure to water. Between uses, turn the gloves inside out to dry.
• Don’t trim or pick at the skin around nails. This may give germs access to skin and nails.
• Don’t go barefoot in public places. Wear sandals or shoes around pools, showers, and locker rooms.
• Choose a reputable nail salon. Make sure that manicurists sterilise their instruments. Better yet, bring your own and disinfect them after use.
• Give up nail polish and artificial nails. Although it may be tempting to hide nail fungal infections under a coat of polish, this can trap unwanted moisture and worsen the infection.
• Wash your hands after touching an infected nail. Nail fungus can spread from nail to nail.

TREATMENT
Treating onychomycosis can be challenging as the nails grow slowly, receive very poor blood supply along with the high recurrence rate, which results in the need for a prolonged treatment regime until the regrowth of a healthy nail. The regrowth of a healthy finger nail can take anything from 6-9 months, whereas toenails can take up to 18 months. Most cases are treated with oral antifungals and at times combining oral treatment with topical treatment may increase the chances of cure.

Terbinafine can be taken orally as it distributes into the nail plate within a few weeks and the treatment should be continued for at least three to four months. As for itraconazole, it may be taken in a pulse regimen of 400 mg twice daily for a week once a month. Fingernail treatment should be continued for at least 4-6 months and toe nails may need much longer time period. Published results of clinical studies with oral administration of antimycotic preparations (terbinafin / itraconazol) show that the rates of healing in the case of oral therapy were far short of 100%. After 72 weeks, the success rate with terbinafin was 75% (12-week therapy) and 80% (16-week therapy) respectively. With itraconazol, after three pulse-
therapy cycles only 38%, and after four pulse-therapy cycles only 49% of patients were classified as being healed.

Furthermore, available preparations which have to be applied systemically are relatively expensive, with some of them having considerable side effects.

Thick nails can be chemically removed using urea or surgically avulsed. Laser beams can also penetrate the nail plate and kill the fungus. The Nd:YAG or photodynamic therapy can be used, but more than one treatment is required and these treatment options are costly.

The therapy associated with onychomycosis has been an unresolved problem. Due to the side effect and/or cost implications of systemic and chemical/laser therapy topical treatment options are often considered for the treatment of fungal nail infections. However, the effectiveness of topical solutions is unsure, mainly due to the uncertainty as to how the active ingredients that are applied topically reach the problem site which is located underneath the nail, in the nail bed. Furthermore, some topical solution available on the market are still regarded as expensive and not very convenient to apply, requiring frequently filing or buffing of the nail(s) which could become very uncomfortable or sore if done continuously. Other topical treatments result in much wastage of the product, due to poor product applicators available which results in inconvenient usage and poor patient compliance.

Up to now, the majority of the topical application systems available in the market have all been limited by their greatly inadequate efficacy. The following paragraphs discuss the clinical efficacy of an effective topical treatment solution available.

**CLINICAL EVIDENCE FOR A TOPICAL SOLUTION AVAILABLE**

In a study conducted by Miller in 2001, three known allopathic, antimycotic active substances (i.e. clotrimazole, amorolfine, terbinafine) as well as a product containing plant oils as the active ingredients were tested on 50 patients with onychomycosis, using a newly-developed carrier system (ethyl lactate) as the medium. A customary antimycotic nail varnish (amorolfine) was selected as a comparison preparation. The result of the comparative study shows that the active substances dissolved in the newly-developed carrier system (ethyl lactate) are therapeutically clearly superior compared to the nail varnish. Overall, among the 50 study participants, 176 toenails with onychomycotic changes were treated. The topically applied antimycotic preparations clotrimazole, amorolfine, terbinafine and the Phyto-Combination preparations clotrimazole, amorolfine, terbinafine and the Phyto-Combination (BioEqual carrier system) returned successful results of between 90%-100%. With the use of the comparison substance amorolfine varnish, after 12 weeks only 24 out of 34 toenails, i.e. 70%, were free of mycotic infection.

# SUPERFICIAL FUNGAL INFECTIONS OF THE NAILS

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<th>SURNAME</th>
<th>INITIALS</th>
<th>YOUR HPCSA REGISTRATION NO.</th>
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**1. The three essential oils in Clearnail (Bio-Equal) are…..**
A. Tea tree, Eucalyptus, Blue Cypress
B. Tea tree, Lavender, Blue Cypress
C. Lavender, Eucalyptus, Tea Cypress
D. None of the above

**2. Which one of the following facilitates the absorption of Clearnail (Bio-Equal)?**
A. Ethyl Lactate
B. Amorolfine
C. Terbinafine
D. All of the above

**3. Who was the author of the study entitled Onychomycosis?**
A. Dr W Smith
B. Dr S Gunther
C. Dr W Miller
D. None of the above

**4. Which nails (hands or feet) are predominantly affected by fungal infestation?**
A. Hands 10%/Feet 90%
B. Hands 60%/Feet 40%
C. Hands 20%/Feet 80%
D. Hands 40%/Feet 60%

**5. What is the dosage/directions for use of Clearnail?**
A. Once daily for 3 weeks.
B. Twice daily for 6 months, then once daily.
C. Twice daily for 4 weeks, then once daily.
D. Thrice daily for 4 weeks then twice daily.

**6. Can Clearnail be used by the elderly and athletes?**
A. No
B. Usually
C. Yes
D. Sometimes

**7. On average what is the % rate of people that can be affected by fungal infections?**
A. 10%
B. 14%
C. 8%
D. 6%

**8. What are the risk factors that can lead to nail fungus infection?**
A. Being older, owing to reduce blood flow, and slower growing of the nails
B. Perspiring heavily
C. All of the above
D. None of the above

**9. True or false: A severe case of infection can be painful and cause permanent damage to a nail**
A. False
B. True

**10. The Bio-Equal Carrier System (Clearnail) is safe to use**
A. False
B. True

**INSTRUCTIONS:** 1. Go to www.medicalchronicle.co.za 2. Click the tab labelled ‘CPD Portal’ on the far right tab near the top of the page. 3. Select the relevant questionnaire from the list and complete the form at https://www.medicalchronicle.co.za/???????????????????????????