

Fungal Infections of the Feet in Travellers

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Global travellers visit exotic destinations, with hot, humid climates and under-developed countries with low hygiene standards. They frequent swimming pools and beaches where foot infection, spread by local residents, may be rife. They paddle in contaminated water, don infected footwear and protective swim-wear when snorkelling, sub aqua diving, sailing and speed boating. They use infected towels when drying off and expose themselves to infections of the foot extremities, and flexures. These are usually simple, but sometimes intractable problems to treat. Sweating in the tropics and jungles, with associated skin abrasions from sea-side rocks and jungle vegetation, encourages tinea skin invasion. World travellers return with mild tinea infections which can become chronic. They visit the pharmacist or practice nurse and are sometimes given a steroid cream which makes the condition worse. Some return with florid, skin lesions which need prompt appropriate anti-fungal treatment.

Fungus infections of the skin, scalp and the nails are caused by the dermatophyte fungus species of *microsporum trychophyton* and *epidermophyton*. They also infect animals which can be a source of infection. Spread by direct contact, or from infected mammals, the lesions may be ring-like and can cause intense itching. The commonest form of ringworm is tinea pedis (athlete's foot) which affects the skin between toes and can spread up the foot and into the nails (tinea unguentum). Ringworm of the scalp (tinea capitis) is often seen in children abroad. The infection can affect the groin and thighs (tinea cruris) - also known as dhobi itch - and the skin under the beard (tinea barbae)

Dermatophyte, or ringworm infections once acquired, can resist treatment and often recur after disappearing for lengthy periods from skin and nails. Effective topical and oral antifungal preparations can now potentially eradicate these infections over time.

Incidence Fungal infections of the feet and toenails are prevalent in the UK population - 15% Of the general public - with the highest incidence of 20% in male swimmers.^{1,2} The incidence is reported to have doubled in recent years and there are estimates that 1.2 million people may currently be affected. One third of people with athletes foot develop fungal nail disease² Swimmers, industrial workers, elderly people, those with psoriasis and diabetics are most likely to be affected.³ Swimmers, adventurers, children, the old and diabetics are most likely to be infected while abroad.⁴ A surveillance study of 25,000 patients with onychogryphosis showed 23%

were over the age of 60 years⁴. Swimming pools saunas, communal changing rooms, hotel showers and pools, - particularly foreign hotel ones - are incriminated in their spread, as is the ubiquitous wearing of trainers. It can be passed between family members who share shoes and towels.

Pathology Clinically, dermatophytes *Trychophyton* and *Epidermophyton* are the most frequent causative agents. Occasionally the problem may be due to monilial (yeast) infection-which may co-exist with the tinea invasion and both can be complicated by secondary bacterial infection. They can affect every nail and spread beyond the foot but are often limited to chronic infection of the web space between 4th and 5th toes. In immune-compromised and diabetic patients the infection can be severe and it is not unusual to find elderly people with several affected and crumbling toe nails. These infections can potentially spread infection to the finger nails of the unwary carer. Inattention to hand-washing and instrument sterilisation between patient contacts can spread infection between people. Once acquired and treated, a meticulous regimen has to be observed to prevent reinfection in patient and therapist.

Dermatophytes thrive in a damp humid and warm environment and ideal conditions occur between the smaller toes when occlusive footwear is worn. Tinea pedis typically starts in the 3rd or 4th toe web space and is characterised by skin peeling, maceration, scaling and fissuring, often associated with itching. Toe-nail fungal infection -onychomycosis- usually affects the great toe nail first rather than nearby skin and is often restricted to one foot. The nail plate becomes opaque -onycholysis- and then yellow or brown in colour; with thickening of the nail. Infection usually starts with distal nail bed invasion then proximal spread and later there is unattractive browning and yellowing of the nail. Untreated onychomycosis can lead to in-growing toenail, or onchogryphosis.

Untreated tinea pedis may lead to severe reactive inflammation with painful fissuring of toes and feet often seen in children. Generalised autosensitisation eruptions can occur in response to persistent fungal infection Tinea pedis merits treatment when first discovered even if asymptomatic and merely aesthetically displeasing.

Differential diagnosis-Yeasts such as monilia (*Candida*) and moulds like *aspergillus* also affect the toenails, with the former more common in diabetic patients and the latter often resulting in whitish or

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greenish black appearance to the affected nail. Bacterial infection with pseudomonas may occasionally have to be considered in differential diagnosis. This typically occurs in a nail that has lost its nail bed attachments and the green-black pigmentation is really staining of the underside of the nail.

Psoriasis can cause crumbling of the nail plate and can be confused with fungal infection and sometimes the two co-exist. Usually several nails will be affected in the psoriatic individual. There will be evidence of the pathognomonic pitting of the superficial nail plate when psoriasis is the cause.

Confirmation of Diagnosis In an ideal world, skin and nail fragments, from suspicious lesions would be sent for microscopy. Scrapings from the distal edge of the affected nail, or the soggy skin in a toe-web, can be placed in an envelope and dispatched to the laboratory to confirm identity of causative organism. In reality most lesions are assumed to be tinea, monilia, or bacterial on presentation and treated accordingly. Failure to respond to treatment prompts laboratory investigation of skin and nail clippings with microscopy and culture.

Treatment

Patients often tolerate nail infection and low grade foot infection and continue to spread the contagion in pool and shower areas, with family members most at risk. The majority of people with post-travel tinea infections utilise over the counter preparations in treatment. Only when they fail do they present to practice nurse, family doctor, podiatrist or travel health clinic, with the practitioner rarely seeking supportive mycological evidence of the causative organism. Many recourse to the pharmacy to receive tolnaftate (Tinaderm™), which is often beneficial if applied appropriately three times per day for long enough to clear the lesion. Many discontinue treatment prematurely.

Efficacious topical ointments, lacquers and oral preparations are also available on prescription. Traditionally Whitfield's ointment - a combination of weak fungistatic (benzoic acid 6%) and a keralysalicylic acid 3%) served as an inexpensive treatment. It requires prolonged administration, is messy and may cause mild skin irritation on raw skin. Topical therapy is usually used for glabrous skin lesions. Infection of the nails is treated with oral medication over several months.

A review of randomised control studies found allylamines were effective in curing fungal infections and produced a faster response than azoles but cure rates were similar¹. Tolnaftate was one of the first synthetic chemical agents shown to be an effective

fungicide when applied topically. With the addition of nystatin its use is extended to monilia infections as well. Clotrimazole (Canestan™) miconazole (Daktarin™) and ketoconazole (Nizoral™) all demonstrate anti-fungal properties and have a broad spectrum of activity. They can be used when laboratory mycological investigation is not available. Twice daily application of creams is recommended with treatment continuing for at least two weeks after clinical cure, to prevent relapse. There are few side effects.

Griseofulvin is derived from the penicillium species and is effective against all dermatophytes. Long courses of treatment are necessary for nail infections as nail growth is slow. A third of patients who fully comply with the treatment regimen will respond poorly to the medication. The drug is fungistatic and has to be taken until all the infected tissue is lost through natural turnover.

Terbinafine is fungicidal and kills dermatophytes whereas fungistatics merely inhibit growth. The former need only to be taken for a short time until the fungi are dead. Terbinafine and topical azoles rapidly penetrate the stratum corneum and quickly kill the infection with a high response rate. They should not be used for children. A study has shown that in patients given terbinafine for 12 weeks, there was 76% mycological cure rate after 72 weeks follow up.⁴

Azoles are usually effective for superficial fungal skin infections⁴. Local application of amorolfine paint (loceryl) is reported as curing 65% of limited distal nail infections.⁴ The tendency is to treat empirically without further surveillance.⁵

Pretravel clinic advice. There is a role for travel health clinic personnel in educating potential travellers regarding the sources of tinea infection and its avoidance. Public awareness is poor and there is a tolerance of the infection. This ensures that many people will continue to carry and spread the infection for many years and often over the course of a life time. Patients have to be encouraged to seek and comply with appropriate therapy and maintain it until mycological cure has occurred.

Patient advice

- Protective flip flops and plastic pool-socks should be used in swimming pools, communal saunas, baths, showers and changing rooms.
- Socks should be washed and changed frequently especially in warm, humid climate and after heavy exercise.
- Prolonged wearing of Wellington boots, trainers and plastic shoes should be discouraged.
- Careful drying of feet and web-spaces is

recommended.

- After washing, an application antifungal foot powder is useful .
- Early signs of webspace and nail infection indicate prompt, appropriate treatment.
- An antifungal preparation should be considered for the travellers first aid kit.

Summary

Tineal infections and especially foot and nail infection are wide-spread in many tropical and undeveloped countries. Ointments and oral preparations are effective therapies. Simple precautions, professional advice, appropriate therapy maintained until cure, can help the world traveller avoid infection.

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