



## *Tinea Pedis (Athlete's Foot)*

*Claire J. Carlo, MD  
Patricia MacWilliams Bowe,  
RN, MS*

**T**inea pedis, also called “athlete’s foot”, is a fungal infection of the foot that is very common among homeless populations. Fungi are plant-like organisms that live as parasites or saprophytes (organisms that rely on dead tissue for their nutrition).

Fungi can exist in two forms:

- yeasts, which are unicellular;
- molds, with branched structures called hyphae.

Fungi that cause superficial infections of the skin and nails are called dermatophytes. These fungi infect the keratin of the top layer of the epidermis as well as the nails and are responsible for tinea pedis.

Dermatophytes grow well in moist, occlusive environments. Conditions such as diabetes and HIV/AIDS interfere with the body’s immune function and increase the risk of acquiring dermatophyte infections. These infections are very common among homeless populations, as will be outlined later.

### **Prevalence and Distribution**

Nearly everyone in the population is exposed to the common fungi that cause tinea pedis. Each person’s immune system determines whether infection results from such exposure. As adults age, tiny cracks develop in the skin of the feet, increasing the susceptibility to tinea infections. Once acquired, a fungal infection can linger inactively for years and later become active when a person reaches the age of

60-70. More than 70% of the US population will have tinea pedis at some time in their lives. One third of all patients are estimated to have toenail infections as well. Diabetes is a significant risk factor, as diabetics are 50% more likely to have a fungal infection than non-diabetics.

Limited data is available on the prevalence in the homeless population. One study that examined the prevalence of skin disorders among homeless men staying in a 450-bed shelter in Boston in 1992 found 38% of the residents had tinea pedis, and 15.5% had toenail onychomycosis.

### **Symptoms and Diagnosis**

There are three forms of tinea pedis:

- interdigital - macerated, scaly, fissured skin occurs between the toes, especially in the web space between the 4th and 5th toes;
- plantar (“moccasin foot”) - fine, powdery scale is present on a reddened background of the sole, heel, and sides of the foot;
- vesicular (bullous) - an acute inflammatory reaction consisting of vesicles and pustules.

Individuals may be asymptomatic or may experience burning, itching, or stinging.

---

*Severe Tinea Pedis. This gentleman lives on Boston’s streets and came to McInnis House with this burning and painful rash of both feet. Note the prominent scaling on the reddened soles of his feet.  
Photo by James O’Connell MD*

*Tinea Pedis of the Soles and Toes. The webs of the toes are macerated with prominent scaling. Photo by James O'Connell MD*



The diagnosis of tinea pedis is usually made clinically and based upon the examination of the affected area. Definitive diagnosis may be made by scraping the skin for a KOH preparation, a skin biopsy, or culture of the affected skin. The KOH preparation is less likely to be positive in severe cases with maceration of the skin. In mild cases the fungus can usually be recovered in a scraping. In severe cases it is recovered less than half the time.

In the evaluation and diagnosis of tinea pedis, clinicians should keep in mind that superinfection with bacteria can occur.

Toenails infected with tinea pedis appear thickened, discolored, and dystrophic.

### **Treatment and Complications**

Treatment modalities come in several forms. Topical agents include creams, powders, and sprays. The creams and sprays are more effective than powders.

Topical agents are generally effective in mild forms of interdigital tinea pedis. Non-prescription, over-the-counter (OTC) topical agents work moderately well. The less expensive OTC creams, such as clotrimazole (Lotrimin™, Mycelex™) and miconazole (Monistat™, Micatin™), work as well as the more expensive OTC cream terbinafine (Lamisil™), but they require 4 weeks of treatment

compared to 1-2 weeks of treatment with terbinafine cream. In our clinical practices, the first choice of treatment is usually an OTC cream. If the tinea pedis is extensive, a prescription topical antifungal would be used. Prescription topical antifungal creams, such as econazole (Spectazole™) and nystatin (Mycostatin™), are fungicidal and achieve a cure in a shorter time. In more extensive tinea pedis or with failure of topical agents, oral medications available by prescription can be used.

The length of treatment with topical agents may be as long as 4 weeks depending on the cream chosen. Duration of therapy with oral agents can be 1-2 weeks depending on the medication used. In cases of tinea pedis with inflammatory signs and symptoms (including erythema, pruritis, and burning), a combination steroid/antifungal cream can be used. The steroid is not necessary when signs of inflammation are lacking.

Onychomycosis requires treatment with oral antifungal medication for an extended period of time.

### **Modes of Transmission**

Warm moist areas are fungi friendly. Optimal environments are dark, damp, and warm. Poor hygiene, closed footwear, minor skin or nail injuries, and prolonged moist skin create ideal environments for transmission.

Tinea pedis is contagious and spread through direct contact with people or objects such as showers, shoes, socks, locker rooms, or pool surfaces. Pets can carry the fungus and may also be a source of transmission.

### **Prevention**

Keeping the feet clean and dry is one of the best methods of prevention. Other methods are well-ventilated shoes that fit properly and are not tight. Alternating shoes daily will allow shoes to dry thoroughly in between wearing. Socks should be dry and changed frequently. Wool socks draw moisture away from feet and are highly recommended. Wearing sandals or flip-flops in public showers or pool areas may also help prevent tinea pedis. The use of foot powders is controversial but may be helpful for persons susceptible to tinea pedis who have frequent exposures to areas where the fungus is suspected.

### **Special Considerations for Homeless Populations**

Regular and thorough skin examinations with emphasis on the feet should be conducted

by clinicians caring for homeless persons. Good patient education, with simple instructions as to the importance of good foot hygiene, can help prevent and minimize the progression of tinea pedis. Good education consists of proper hygiene instructions, emphasizing the importance of drying the feet, practicing good nail care, and wearing properly fitting shoes with clean dry socks. Patients should be shown the correct use of any necessary topical or oral treatments.

Clinicians should be vigilant to treat other predisposing factors to tinea pedis that occur in homeless and other populations, including peripheral vascular disease, peripheral neuropathy, alcoholism, and the use of vasoconstrictive drugs such as cocaine.

### Summary

Tinea pedis is commonly called “athlete’s foot.” A fungus that grows predominantly in warm moist environments causes this infection that involves the feet and toes. Shoes, showers, and pool or locker room areas are frequent culprits that foster and spread tinea pedis infections. Nearly everyone is exposed to this fungus, but one’s immune system determines whether an individual will develop infection. For example, diabetics are 50% more likely to have tinea pedis.



*Standing in interminable lines is a daily routine for homeless persons, often exposed to the extremes of temperature and weather. These men are waiting for the doors of a local shelter to open in the late afternoon.*

*Photo by  
Melissa Shook*

Tinea pedis may present between the digits of the toes (interdigital), on the plantar surface (plantar), or as vesicles (vesicular). Patients may be asymptomatic or experience burning, stinging, or itching. Bacterial superinfection, including cellulitis of the lower extremity, is a complication of tinea pedis.

Prevention is the best measure, especially wearing dry shoes and socks, properly fitting shoes, and sandals or flip-flops in the shower areas. Treatment may be a cream, spray, or powder. If the case is extensive or involves the nails (onychomycosis), oral agents may be necessary.

Regular foot exams should be a routine aspect of health care for homeless persons. Clean and dry socks, as well as shoes that are dry and fit properly,



*Tinea Pedis of the Toes.  
An example of the typical fissured skin and scaling between the toes in tinea pedis.  
Photo courtesy of the CDC*

are all important for the prevention and treatment of tinea pedis. However, access to socks and shoes is often limited to the majority of homeless persons living in shelters and on the streets. Clinicians

should screen carefully for other predisposing factors, such as peripheral vascular disease, peripheral neuropathy, and diabetes. Education about good foot care benefits all involved. ■■

Tinea Pedis Medication List		
Generic	Brand	Cost
<b>Oral agents</b>		
fluconazole	Diflucan	\$\$\$\$
griseofulvin	Fulvicin, Grifulvin, Grisactin	\$\$
itraconazole	Sporanox	\$\$\$\$\$
ketoconazole	Nizoral	\$\$\$\$
nystatin	Mycostatin	\$
terbinafine	Lamisil	\$\$\$\$\$
<b>Topical agents</b>		
clotrimazole	Lotrimin, Mycelex	\$
econazole	Spectazole	\$\$
ketoconazole	Nizoral	\$
miconazole	Micatin, Monistat	\$
naftifine	Naftin	\$\$
nystatin	Mycostatin	\$
terbinafine	Lamisil	\$\$\$
tolnaftate	Tinactin	\$

## References

- Crawford F, Hart R, Bell-Syer S, Torgerson D, Young P, Russel I. Athlete's foot and fungally infected toenails. *British Medical Journal* 2001;322(7281):288-289.
- Markova T. What is the most effective treatment for tinea pedis (athletes's foot)? *Journal of Family Practice* 2002;51(1):21.
- Stratigos A, Stern R, Gonzales E, et al. Prevalence of skin disease in a cohort of shelter-based homeless men. *Journal of the American Academy of Dermatology* 1999;41(2 Pt 1):197-202.
- Weinstein A, Berman B. Topical treatment of common superficial tinea infections. *American Family Physician* 2002;65(10):2095-2102.