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TREATMENT AND PREVENTION OF FUNGAL INFECTIONS OF THE FOOT

Abstract

Fungal infections of the foot, also known as *tinea pedis* or athlete's foot, are among the most common dermatological disorders globally. They are caused

by dermatophyte fungi that invade the stratum corneum and thrive in moist, warm environments. The condition often affects individuals who wear occlusive footwear, athletes, and those with poor foot hygiene. The aim of this study is to analyze the etiology, pathogenesis, and current treatment options for fungal foot infections, as well as preventive strategies. Topical antifungal agents such as azoles and allylamines remain the mainstay of therapy, while systemic antifungals are reserved for resistant or extensive cases. Preventive measures include maintaining foot dryness, proper footwear hygiene, and disinfection of socks and shoes. Raising public awareness about personal hygiene plays a crucial role in reducing the prevalence of fungal infections of the foot.

Keywords:

Fungal infection, tinea pedis, antifungal therapy, dermatophytes, hygiene, prevention, athlete's foot.

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ЛЕЧЕНИЕ И ПРОФИЛАКТИКА ГРИБКОВЫХ ЗАБОЛЕВАНИЙ СТОП

Аннотация

Грибковые инфекции стоп, также известные как *tinea pedis* или эпидермофития стоп, являются одними из самых распространенных дерматологических заболеваний во всем мире. Их вызывают грибы-дерматофиты, которые проникают в роговой слой кожи и размножаются во влажной теплой среде. Это состояние часто поражает людей, которые носят окклюзионную обувь, спортсменов и тех, кто не соблюдает гигиену стоп. Целью данного исследования является анализ этиологии, патогенеза и современных вариантов лечения грибковых инфекций стоп, а также профилактических стратегий. Местные противогрибковые препараты, такие как азолы и аллиламины, остаются основой терапии, в то время как системные противогрибковые препараты резервируются для резистентных или

обширных случаев. Профилактические меры включают поддержание сухости стоп, надлежащую гигиену обуви и дезинфекцию носков и обуви. Повышение осведомленности населения о личной гигиене играет решающую роль в снижении распространенности грибковых инфекций стоп.

Ключевые слова

Грибковая инфекция, микоз стоп, противогрибковая терапия, дерматофиты, гигиена, профилактика, микоз стоп.

Aim of the Study

To evaluate the etiology, pathogenesis, and effectiveness of antifungal therapies in the treatment of fungal infections of the foot, and to identify preventive measures to reduce recurrence and transmission.

Introduction

Fungal infections of the foot (*tinea pedis*) represent one of the most frequent superficial mycoses in adults, particularly in warm and humid climates. The disease is primarily caused by dermatophytes, fungi that utilize keratin as a nutrient source. Epidemiological studies report that approximately 15–25% of the global population suffers from some form of foot mycosis [1]. The most affected groups include athletes, miners, military personnel, and individuals wearing tight, non-breathable footwear for extended periods. Transmission occurs through direct contact with contaminated surfaces such as locker room floors, communal showers, or footwear [2]. Although *tinea pedis* is not life-threatening, its chronic and recurrent nature significantly impacts quality of life and predisposes patients to bacterial superinfection. Therefore, proper management and preventive care are essential to minimize complications and recurrence [3].

Treatment

Topical antifungal therapy is the first-line treatment for most cases of tinea pedis (localized/superficial). Systemic therapy is reserved for extensive disease, recalcitrant cases, concurrent onychomycosis, or immunocompromised patients. Combination topical + systemic therapy may be used for faster/mycological cure in select patients [4].

1) Topical therapy (first line)

- First-choice agents (allylamines): terbinafine cream/gel 1% (apply once or twice daily). Allylamines are fungicidal and have faster mycologic cure rates. Typical duration: 1–4 weeks for interdigital forms; 2–6 weeks for moccasin/hyperkeratotic types [5].

- Azoles: clotrimazole, miconazole, ketoconazole (usually twice daily for 2–6 weeks). Azoles are fungistatic; often effective for mild disease [4].

- Other topicals: tolnaftate (OTC), amorolfine, ciclopirox have proven efficacy; choice depends on availability and tolerance [5].

Practical points:

- Apply topical to all affected areas and 1–2 cm beyond the visible margin. Continue treatment for the full recommended duration (don't stop when symptoms improve).

- For interdigital maceration, dry the webs, use drying agents (e.g., 70% ethanol or 2% chlorhexidine where appropriate) briefly before applying antifungal [4].

Adjunct topical measures: keratolytics (10–40% urea) for hyperkeratotic/moccasin types to enhance penetration; antiseptic washes if secondary bacterial infection suspected [5].

2) Systemic therapy (indications & regimens)

Indications: extensive tinea pedis, failure of adequate topical therapy, concurrent onychomycosis, immunosuppression, recurrent disease despite correct topical use [6].

Common regimens:

- Terbinafine 250 mg PO daily for 1–2 weeks (often first-line systemic). Highly effective against dermatophytes [6].

- Itraconazole pulse therapy (200 mg twice daily for 1 week, repeated) or continuous regimens in some cases [6].

- Fluconazole (e.g., 150 mg weekly for 2–6 weeks) alternative where terbinafine/itraconazole contraindicated [6].

Safety: monitor liver function tests for systemic azoles/allylamines if prolonged therapy or preexisting liver disease. Check drug interactions (itraconazole) [6].

3) Recalcitrant / recurrent disease — management principles

- Confirm diagnosis (KOH microscopy, fungal culture) to exclude non-dermatophyte causes or eczema/psoriasis [4].

- Treat coexisting onychomycosis (nails often act as reservoir) — systemic therapy preferred [5].

- Improve compliance and footwear/linen decontamination (see Prevention). Consider combination topical + systemic therapy [5].

4) Special populations and notes

- Diabetics / immunocompromised: lower threshold for systemic therapy and for evaluating secondary bacterial infection [4].

- Pregnancy / lactation: avoid systemic azoles (teratogenic risk); prefer topical agents after risk–benefit discussion [6].

5) Symptomatic care and complication management

- Itch control: short course oral antihistamines (sedating at night) or topical low-potency corticosteroid for severe inflammatory flares (short course to avoid masking infection).

- Secondary bacterial infection: treat with appropriate antibiotics after culture or empiric coverage if severe (e.g., oral dicloxacillin/cephalexin depending on local guidelines) [4].



Figure 1. Chronic dry (hyperkeratotic) tinea pedis — plantar surface.

This figure illustrates the chronic hyperkeratotic form of tinea pedis involving the plantar aspect of the foot. The image shows scaling, dryness, and thickened stratum corneum, especially around the pressure points. Such lesions are often persistent and resistant to topical therapy, requiring systemic antifungal treatment.



Figure 2. Interdigital tinea pedis (athlete's foot) — macerated form.

This clinical image shows interdigital tinea pedis, also known as athlete's foot, affecting the skin between the toes. The area demonstrates marked erythema, maceration, fissuring, and peeling of the epidermis, characteristic of the macerated form of fungal infection. The infection is commonly caused by *Trichophyton rubrum* or *Trichophyton mentagrophytes*, thriving in moist environments such as between the toes.

Prevention

Preventive measures focus on reducing exposure to infectious spores, minimising moist occlusive conditions, and eliminating reservoirs (shoes, socks, communal surfaces). Education and environmental hygiene are cornerstone strategies [8].

1) Personal foot hygiene (daily practices)

- Keep feet clean and dry. Wash daily with soap and water; dry thoroughly between toes (use a clean towel or hair dryer on low).

- Change socks daily (or more often if sweaty). Use moisture-wicking cotton or technical sports socks. Avoid synthetic non-breathable socks where possible.

- Alternate shoes — don't wear the same pair two days in a row; allow shoes to dry and air for 24–48 hours. Use breathable footwear (leather/mesh) [8].

2) Environmental measures & decontamination

- Shoe disinfection: treat insoles and shoe interiors with antifungal sprays/powders (tolnaftate, miconazole sprays) or expose shoes to sunlight and drying. For severe recurrent cases, periodically replace insoles [9].

- Wash socks/linens at high temperature ($\geq 60^{\circ}\text{C}$) or use antifungal laundering additives; dry thoroughly in hot dryer [8].

- Avoid walking barefoot in communal wet areas (locker rooms, pools); use protective sandals/flip-flops [8].

3) Prophylactic / adjunctive products

- Antifungal powders/sprays for shoes or for feet in persons prone to recurrence (applied daily or when sweating). Evidence supports their practical benefit in recurrence reduction [9].

- Topical barrier agents (antiperspirants for hyperhidrosis, absorbent powders) to reduce moist environment that favors fungal growth. For hyperhidrosis, specific antiperspirant regimens or botulinum toxin in recalcitrant cases [5].

Conclusion

Fungal infections of the foot remain one of the most widespread superficial mycoses affecting the general population, especially in individuals with poor hygiene and those exposed to moist environments. Effective treatment requires a combination of topical and systemic antifungal therapy, alongside strict adherence to hygiene and preventive measures. Regular disinfection of footwear, daily washing and drying of the feet, and avoiding shared towels or shoes significantly reduce the risk of reinfection.

Early diagnosis and patient education are key components in preventing chronic and recurrent cases. With proper treatment, most patients achieve complete recovery; however, neglecting preventive care often leads to relapse. Therefore, raising public awareness about personal hygiene, early medical consultation, and regular dermatological check-ups is essential for the successful control and prevention of fungal foot infections.

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