

Athlete's Foot (Adapted from PRODIGY website www.prodigy.nhs.uk)

Background Information

Dermatophytes are fungi that can cause infections of the skin, hair, and nails. The most common dermatophyte infections are caused by *Trichophyton*, *Microsporum*, and *Epidermophyton* species, which have an affinity for the keratinized tissues of the hair, skin, and nails.

Dermatophyte skin infections occur at a variety of sites:

- **Athlete's foot (tinea pedis)** - most commonly due to *T. rubrum*, but also caused by *T. interdigitale*.
- **Groin infection (tinea cruris or 'jock itch')** - most commonly caused by *T. rubrum* or *E. floccosum*.
- **Ringworm of the skin (tinea corporis)** - commonly caused by *T. rubrum*, *M. canis*, *T. tonsurans*, or *T. verrucosum*.
- **Scalp ringworm (tinea capitis)** - commonly caused by *T. tonsurans*, which has now replaced *M. canis* as the predominant pathogen, accounting for more than 90% of cases in the UK.

How common is it and how is it transmitted?

Athlete's foot is the most common dermatophyte infection:

- Athlete's foot was identified in 17% of adult attendees at a public swimming pool in a 1973 survey
- It is usually seen in adolescents or young adults, and is more common in males.

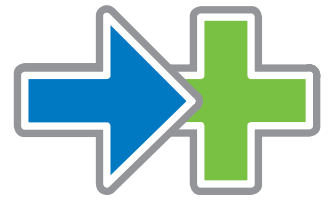
Athlete's foot is thought to be commonly acquired from contact with fungal spores that have become scattered on floor surfaces in communal places such as public swimming pools and changing rooms.

How do I know my patient has it?

Clinical features depend on the location of infection, the fungal species involved, and the host's immune response. Common symptoms include itching, burning, pain, or irritation over the site of infection. Infection may present atypically in people who are immunocompromised (e.g. due to immunosuppressant drugs, AIDS) - lesions may be more widespread and atypical in appearance. Athlete's foot commonly causes skin scaling, maceration, and fissuring. It mainly affects the interdigital web space between the fourth and fifth toes. It may spread to the skin of the plantar surface of the foot, the dorsum of the foot, and between the other toes.

Moccasin-type (dry-type) athlete's foot is less common, and presents as diffuse erythema and dry, thick scaling (hyperkeratosis) over the sole, often extending to the lateral borders of the foot.

A more unusual inflammatory variant of athlete's foot presents with vesicles or bullous lesions on the instep of one foot or both feet.



What else might it be?

Some of the more common differential diagnoses of fungal skin infections:

Bacterial infection
Candidal infection
Eczema
Impetigo
Lichen planus
Pediculosis
Psoriasis
Discoid eczema
Drug eruption
Psoriasis
Erythema multiforme
Erythema nodosum (if there are nodular lesions on the legs)
Granuloma annulare
Pityriasis rosea
Pityriasis versicolor
Candidal infection (intertrigo - often have satellite lesions and scrotal involvement)
Erythrasma (uniform scaling without a margin).

Risk factors?

There are a number of risk factors that predispose people to fungal skin infections or that exacerbate an acute episode:

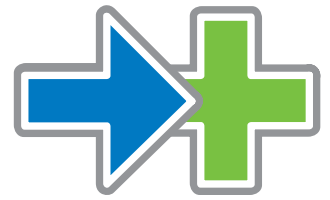
- Past history of fungal skin infection
- Afro-Caribbean origin (scalp infections)
- Extremes of age (children are especially prone to scalp infections)
- Diabetes mellitus
- Immunocompromised status (e.g. malignancy, AIDS, long-term corticosteroid use)
- Obesity
- Peripheral vascular disease
- Venous insufficiency.

Various factors may disrupt the epithelial barrier or increase the risk of transmission:

- Skin trauma
- Skin moisture, sweating, friction and maceration, e.g. in hot, humid climates, contact sports
- Skin occlusion (by footwear, clothing, dressings, casts)
- Shared communal facilities, e.g. gymnasiums, swimming pools, communal changing rooms, showers
- Overcrowded living conditions
- Occupations involving prolonged hand-wetting (e.g. kitchen workers, laundry staff, beauticians) or contact with soil or infected animals (e.g. gardeners, farm-workers).

Most of the potential complications of fungal skin infections are relatively minor:

- **Spread to other sites.** In one study, for example, athlete's foot was associated with fungal invasion of the toenails in 20-30% of people. This can then be a source of reinfection of the skin



- **Secondary bacterial infection** (especially if cracked skin acts as a portal of entry)
- **Candidal superinfection** of dermatophyte skin infections can occur, particularly in the groin area
- **Dermatophyte id reaction**, where a generalized eruption of itchy papules occurs at distant sites, typically on the face, neck, or upper chest
 - The exact incidence of id reactions is unknown. In the US, it is estimated that that 4-5% of people with dermatophyte infections develop an id reaction.
 - It is thought to be due to an immune response to the dermatophyte.
 - It may be triggered by treatment with an oral antifungal, however treatment should not be stopped as the reaction usually resolves after treatment of the primary infection.
- **Transmission to other people**, the frequency of this is not widely quoted in the literature.

Occasionally, more severe, serious complications can occur:

- **Cellulitis** (secondary bacterial skin infection involving subcutaneous tissues)
- **Invasive, systemic spread**, particularly in people who are immunocompromised, when fungi invade subcutaneous tissue via the lymphatics, and can cause granulomas, abscesses, and lymphoedema.

Management recommendations

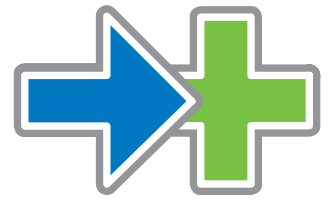
People should be given advice regarding general hygiene measures in order to improve healing and reduce the risk of spread of infection to others. Most minor localized fungal skin infections can be treated successfully with topical antifungal agents:

- Use imidazoles (such as clotrimazole, econazole, ketoconazole, miconazole, and sulconazole) or terbinafine as first-line treatment
- Combination preparations of a topical antifungal with corticosteroid are generally not recommended, and should be restricted to severely inflamed and irritative infections.

Oral antifungal agents are required when treating scalp infections or severe or extensive disease (e.g. moccasin-type athlete's foot), or when topical therapy has failed. There is no need for infected children to miss school or to stop sports activities, but care should be taken to avoid transmission to others by careful hygiene and appropriate treatment. There is limited evidence that hygiene measures can cure fungal skin infections beyond possibly reducing the risk of transmission.

General hygiene measures include the following recommendations:

- Wash the affected skin daily, and dry thoroughly afterwards, particularly in skin folds and between the toes
- Do not share towels, and wash towels frequently
- Avoid scratching affected skin as this may spread infection to other sites
- Wear non-occlusive footwear to minimize foot perspiration, and alternate different shoes every 2 or 3 days to allow them to dry out
- Wear cotton socks and change these daily
- Use protective footwear such as flip-flops or plastic shoes in communal changing areas or shower rooms.



When should I refer?

Consider referral in the following situations:

- Uncertain diagnosis
- No response to primary care management
- Severe and/or extensive infection
- Recurrent infections
- Immunocompromised people.

Treatment

- **For athlete's foot**, topical terbinafine should be applied for 1 week, imidazoles for 2-4 weeks, and undecenoates for 2-4 weeks to clear the lesions.
- It is generally recommended to continue treatment with topical antifungals for a further 1-2 weeks after lesions have cleared, although there is no evidence to support this.
- **Topical combination preparations containing hydrocortisone are not routinely recommended.**

Note: this information has been adapted from the PRODIGY website, Sowerby Centre for Health Informatics at Newcastle Ltd. (SCHIN). Updated information is available at: http://www.prodigy.nhs.uk/fungal_dermatophyte_skin_infections (Accessed: September 2006).



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