



Ringworm

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Ringworm refers to infections caused by several fungi, commonly called tinea, that can grow on skin, hair, or nails. The descriptive name “ringworm” comes from the characteristic rash that grows outward in the shape of a ring, with worm-like borders and normal skin in the middle.

Each of these fungal infections is named for the part of the body infected. The most common sites are:

- tinea capitis, on the scalp;
- tinea corporis, on the body, excluding the groin, feet, hands, beard region, and scalp;
- tinea pedis (“athlete’s foot”) and manus, on the feet and hands;
- tinea unguium, under the nails;
- tinea cruris (“jock itch”), on the groin area.

Infection of the scalp is especially troublesome, as it may cause permanent hair loss when untreated. Ringworm infection of the nails can be difficult to eradicate and can cause severe damage to the fingernails and toenails.

Tinea pedis is very common among homeless persons living in shelters and on the streets. A separate chapter has been devoted to this particular form of ringworm. For more information please see the Tinea Pedis chapter.

Prevalence and Distribution

In the USA fungal infections are the second

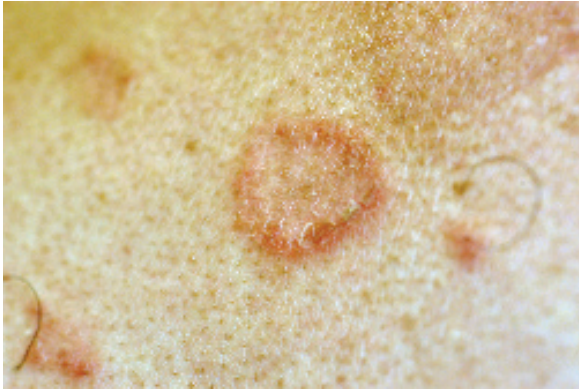
most commonly reported skin disorder. Acne is the most common. Approximately one out of every five people will eventually develop a tinea infection.

The site of tinea fungal infections varies widely among different age groups:

- fungal infections of the scalp and skin (tinea capitis or tinea corporis) are common in young children, while infections of the feet and toes are not. Approximately 3-8% of children in the USA are infected with tinea capitis. Some people are “carriers” of tinea capitis but are themselves not symptomatic. These “carriers” often unknowingly infect and reinfect other people in their homes and therefore pose a challenge to treatment;
- fungal infection under the nails (tinea unguium) is more common in adult and elderly populations;
- “athlete’s foot” (tinea pedis) is common in adolescents and adults and spreads easily within families and institutions;

Tinea Corporis.
This young boy has an itchy ring-like rash involving the face and ear. The borders are clearly marked, the central area is clear, and there is prominent scaling of the skin.
Photo courtesy of the CDC

(top)
Tinea Corporis.
This gentleman
at McInnis House
complained of this
itchy rash of the
chest. Note the
raised, clearly marked
borders, along with
the central area of
clearing.
Photo by
James O'Connell MD



(bottom)
Tinea Corporis.
This fungal infection
involved the skin
of the upper arm
and back, and the
appearance of these
ring-like lesions with
sharp borders and
central clearing is
again very typical
of this infection.
Photo by
Howard Koh MD



- fungal infection of the groin (tinea cruris), commonly called “jock itch”, typically occurs in young adult men, especially those who wear athletic equipment.

The prevalence of fungal infections has racial variations as well. Fungal infection on the scalp and head (tinea capitis) is more common in African-American children than in Caucasian children.

Fungal infections are more common in people with weak immune systems. Since fungal infections can promote the growth of other bacteria on the skin, clinicians should closely monitor the progress of fungal infections in those who are immunocompromised.

Transmission

Ringworm infection occurs most often through direct contact with an infected person, animal, or surface. Broken or irritated skin promotes transmission, as does warmth and humidity for some fungi. Damp places such as bathroom floors, shower stalls, and rugs often provide ideal opportunities for transmission of the fungi that cause ringworm:

- walking barefoot on an infected surface can result in fungal infection of the feet and toes;
- combs, hats, and barber's instruments can spread ringworm to the scalp and skin;

- sharing clothes and contact with infected pets, including dogs, cats, and guinea pigs, are additional ways that fungi can be spread to the skin.

Some types of fungal infections can spread from one part of the body to another. Most people who have tinea cruris also have tinea pedis. Fungal infection of the toes can spread to the toenails, resulting in tinea unguium.

Persons with ringworm are infectious for as long as the cultures of the lesions show the presence of fungus or as long as the skin lesions persist.

Diagnosis

Clinical

The term ringworm describes the appearance of ring-shaped lesions with raised (worm-like) edges. Ringworm typically refers to tinea corporis, the skin lesions. The raised borders are red, often with clear or normal appearing skin in the center of the “ring”. The rash is often mildly itchy.

Scalp infection (tinea capitis) can be inflammatory or non-inflammatory. Sore, boggy pustules and hair loss characterize inflammatory infections. Inflammation of the hair follicles causes the hair to break off and the scalp to become scaled and red. The infection may spread locally, creating a larger circle of lost hair, or may be diffuse over the entire scalp. Non-inflammatory tinea capitis produces little scaling, redness, or pustules. The hair shaft can break at the scalp causing a “black dot” appearance.

Fungal infection of the hands and feet (tinea manus and pedis) frequently involves the webbed area between the fingers and the toes, where the skin may become red, cracked, and eroded. Dryness and fine white scaling on the palms of the hands or bottom of the feet can also be evidence of fungal infection. Due to the breakdown of the skin barrier, secondary bacterial infections of the feet may occur. This often leads to pain and swelling of the feet.

Nails infected with fungus (tinea unguium) will generally thicken, become brittle, ridged, and finally split. Caseation produced by the infection causes a tan to brown discoloration of the nail plate. The infection may make the nail very difficult to cut.

“Jock itch” (tinea cruris) is characterized by the scaling of skin and itchy, red irritation of the groin and inner thighs that extends symmetrically to the front of the thighs. The rash usually spares the penis and scrotum. The appearance of the rash can be confused with candida (yeast) infections, which typically have small “satellite” lesions outside the border of the rash.



Tinea Versicolor.
This chronic, asymptomatic fungal infection of the skin is marked by areas of hypopigmentation which become especially prominent during exposure to sunlight.
Photo by
Howard Koh MD

Laboratory

To confirm the diagnosis, a piece of hair, nail, or skin from an active border of the rash may be scraped or clipped off and examined under a microscope. The specimen should first be dissolved in potassium hydroxide preparation (KOH). Since microscopic exams are often negative, a culture using a special medium (Sabouraud's agar) may be necessary. Fungi grow slowly so these results may take weeks.

Examination of the scalp with a Wood's light to demonstrate fungal infection is of limited use. Some fungi will appear bright green under such a light. However, the fungus which most commonly causes tinea capitis in the USA does not fluoresce under this light.

Treatment

Fungal infections are treated by two primary routes: topical or systemic medications. Topical antifungal medication is appropriate initial treatment for skin infections (tinea corporis, pedis, manus, and cruris), unless the infection involves an extensive area. Oral or systemic treatment with antifungal medications is required for all infections involving the scalp or nails (tinea capitis and unguium) and for fungal skin infections that do not respond to topical treatment.

Topical treatment is typically with an antifungal

cream, such as clotrimazole (Lotrimin™ 1% cream or lotion), terbinafine (Lamisil™), ketoconazole (Nizoral™), or one of many others. These lotions or creams should be applied once or twice a day to the entire rash and at least 2 centimeters beyond the borders of the rash for a minimum of four weeks. Treatment should generally be continued for one week after resolution of rash.

Systemic antifungal therapy for tinea capitis or other skin infection resistant to topical treatment is typically with griseofulvin, once a day for 4-8 weeks or until 2 weeks after resolution of symptoms. In adults, tinea capitis may be treated with oral terbinafine as a first line medication. There is some evidence that oral terbinafine is a better first line medication for children as well, though current recommendations are for the use of griseofulvin.

Griseofulvin may cause headaches and gastrointestinal disturbances and should always be taken with fatty foods. Griseofulvin can also temporarily interfere with normal liver enzymes, necessitating frequent tests to monitor liver function, especially when treating refractory cases for prolonged periods or using doses of 20 mg/kg or higher.

Nail infections (tinea unguium) are very difficult to treat and are frequently resistant to treatment with oral griseofulvin. Improved cure rates have been seen with the use of oral terbinafine and itraconazole for the treatment of fungal nail infection. Treatment with terbinafine is for a minimum of 6 weeks,

and treatment with itraconazole (Sporanox™) is for a minimum of 3 months. These medications may have side effects on the gastrointestinal system, especially the liver. In resistant fungal nail infections, removal of the nail bed may be necessary.

An anti-dandruff shampoo containing selenium sulfide, such as Selsun™ (1% available over the counter or 2.5% by prescription), can eliminate some of the spores in the scalp and can also be applied to the body to help prevent spread of the infection to others. Infected people do not need to wear a cap during treatment.

Prevention and Control

Persons who have had close contact with an individual infected with ringworm should be informed of the signs of this fungal infection and instructed to see a health care provider should any of these appear on the skin, scalp, feet, hands, or nails.

When a case of ringworm occurs in a shelter, staff and guests should be reminded of the need for contact precautions. Guests should avoid walking barefoot and also avoid sharing clothes, hats, hair combs, or brushes. After showering, guests with tinea pedis should dry the body first and the feet last in an attempt to prevent spread of the fungus to the groin or body.

Most fungal infections thrive in warm, damp environments. Clean and dry cotton clothes should be worn, and tight fitting shoes and clothing should be avoided. The prevention and control of ringworm depends upon appropriate treatment and follow-up.

Summary

“Ringworm” refers to several diseases caused by fungi that can invade the skin, scalp, and nails. Depending on the location of the infection, mild to moderate inflammation can occur. Complications include loss of hair and damage to the toenails and fingernails. While seldom life threatening, fungal infections may lead to local bacterial infections of the skin, especially in people with poor immune systems.

Ringworm spreads by direct contact with infected areas on the skin, scalp, or nails. Ringworm may be spread by contact with contaminated bathroom floors, shower stalls, tubs, benches, combs, and brushes. Treatment generally involves either antifungal pills or antifungal cream, depending on the area infected and the severity of the infection.



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Ringworm Medication List

Generic	Brand Name	Cost
clotrimazole	Lotrimin	\$
griseofulvin	Fulvicin-u/f, Grifulvin-V, Grisactin 500	\$\$
ketoconazole	Nizoral	\$
selenium sulfide	Selsun	\$
terbinafine	Lamisil	\$\$\$
Itraconazole	Sporanox	\$\$\$\$\$

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