

Chapter

5

Skin Infections
and Infestations

FUNGAL INFECTIONS OF SKIN

Most fungi that infect the stratum corneum of skin are called dermatophytes and fall within three main genera: *Epidermophyton*, *Microsporum*, and *Trichophyton*. Most fungi that infect hair are within the *Microsporum* and *Trichophyton* genera. Piedra is a superficial mycosis of the hair shaft. There are two varieties of piedra: black piedra (Figure 5-1), caused by *Piedraia hortae*, and white piedra, caused by *Trichosporon beigelii*. Tinea nigra is a superficial infection of the epidermis caused by *Phaeoanellomyces werneckii* (*Exophiala werneckii*). There are also deep fungal infections of skin that are uncommon except in immunocompromised patients.

The types of superficial fungal infections are outlined in Table 5-1.

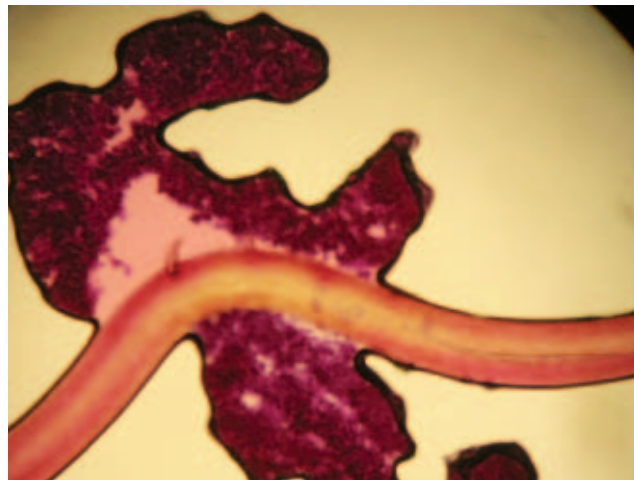


Figure 5-1 • Black piedra. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

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■ TABLE 5-1 Fungal Infections

Tinea capitis	Hair
Onychomycosis	Nails
Tinea manus	Hands
Tinea pedis	Feet
Tinea cruris	Groin
Tinea faciei	Face other than beard area
Tinea barbae	Beard area of face
Tinea corporis	Other areas of skin

Tinea Corporis (Figure 5-2)

Figure 5-2 • Tinea corporis. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

■ **Definition**

- Fungal infection involving trunk or extremities

■ **Etiology**

- Dermatophytes, usually within the genera of *Epidermophyton*, *Microsporum*, and *Trichophyton*

■ **Appearance**

- Plaques with erythema and scale, central clearing

■ **Diagnosis**

- Skin scraping and hyphae seen under microscope

■ **Treatment**

- Topical antifungal such as ketoconazole (Nizoral) usually is sufficient; oral antifungal may be used in severe cases.



Figure 5-3 • Tinea pedis. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

■ **Comment**

Fungal infections usually appear as plaques with erythema and scale and are often in an annular configuration with central clearing (Figures 5-3 and 5-4). Fungi and yeast can be identified by their



Figure 5-4 • Tinea manus. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

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morphology in tissue (skin scrapings), by growth morphology on Sabouraud's agar and other special media, and by responsiveness to certain laboratory tests. In practice, observing hyphae in skin scrapings under the microscope or receiving positive culture results is usually sufficient for treatment. Specific typing is not usually necessary except in persistent or otherwise unusual cases.

Topical antifungals are usually sufficient for treating infections with limited distribution. For more widespread involvement or for infection of hair or nails, oral antifungals may be necessary. If oral antifungals are used, liver functions should be monitored before and during treatment.

YEAST INFECTIONS OF SKIN

Yeast can also infect skin. *Candida albicans* is pathogenic for skin if it gains a foothold. Some of the normally saprophytic species of *Candida* can also cause infection if overgrowth occurs because of erosion, occlusion, and other factors that promote yeast growth.

Pityriasis Versicolor

■ Definition

- Pityriasis versicolor (tinea versicolor): superficial fungal infection

■ Etiology

- Yeast: *Malassezia furfur*
- Most cases occur in moist, warm climates

■ Appearance

- Hypopigmentation or hyperpigmentation, salmon-colored macules and patches with scale
- Most often found on the upper back and upper chest
- Occasionally pruritic (itchy), otherwise asymptomatic

■ Diagnosis

- Scraping and examination with KOH preparation: "spaghetti and meatballs" appearance of short hyphae and round yeast forms

■ Treatment

- 2.5% selenium sulfide lotion (Selsun lotion), or shampoo containing zinc pyrithione (Zincon shampoo) applied for 5 to 10 minutes prior to showering every day for 2 weeks
- Itraconazole 200 or 400 mg orally once or twice a month useful prophylactically

Intertrigo (Figure 5-5)

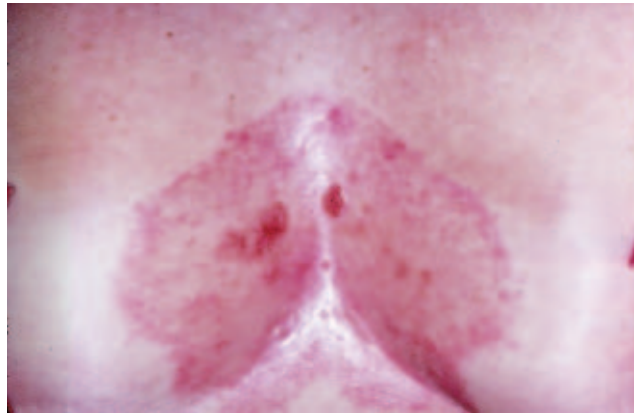


Figure 5-5 • Intertrigo. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

■ Definition

- Irritation of intertriginous areas (buttock creases, groin, between fingers and toes, under breasts)

■ Etiology

- Yeast likes to grow in moist, warm intertriginous areas, especially when the skin is chapped or macerated for any reason.
- Intertrigo can also be caused by bacterial infection, especially if between the fingers and toes. *Corynebacterium* are often the bacterial agents involved.

■ Appearance

- Erythematous plaques and patches in intertriginous areas

■ Diagnosis

- Clinical appearance usually sufficient for diagnosis

■ Treatment

- Antifungal cream such as topical ketoconazole cream.
- Mild corticosteroid can be added if there is much irritation.
Note: Vytone cream, containing both hydrocortisone and iodoquinone (antifungal) is helpful.

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- If bacterial infection is suspected (between fingers and toes), use topical erythromycin ointment 2% bid.

Angular Cheilitis (Figure 5-6)



Figure 5-6 • Angular cheilitis. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

■ **Definition**

- Inflammation of commissures of lips (sides of the mouth)

■ **Etiology**

- Irritation of skin folds can occur from drooling or lip licking.
- Yeast (*Candida*) superinfection can occur.

■ **Appearance**

- Cracks, fissures, and erythema of commissures of lips

■ **Diagnosis**

- Clinical appearance

■ **Treatment**

- Ketoconazole cream to affected areas bid

BACTERIAL INFECTIONS OF SKIN

Impetigo (Figure 5-7)



Figure 5-7 • Impetigo. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

■ Definition

- Skin infection caused by *Staphylococcus* or *Streptococcus* organisms

■ Etiology

- Usually *Staphylococcus aureus* or *Streptococcus pyogenes*.
- A bullous form of impetigo, characterized by vesicles and bullae, can result from certain strains of *S. aureus* (including phage II, group 71, which produces a toxin causing separation in the granular layer of the epidermis).

■ Appearance

- Plaques and erosions, usually with yellowish crust
- Bullae, if bullous form

■ Diagnosis

- Infection is superficial in skin, and diagnosis of impetigo can usually be made on the basis of clinical appearance.

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- Histopathologic examination shows vesicopustule formation just below the stratum corneum.

■ Treatment

- Impetigo is contagious and needs to be treated with antibiotics.
- Oral dicloxacillin (500 mg bid), erythromycin (500 mg bid), or a first-generation cephalosporin such as cephalexin (500 mg bid) will usually clear the lesions.
- If only a few lesions are present, topical mupirocin may be successful in clearing the problem.
- **Caution:** Some strains of *S. pyogenes* that cause impetigo can cause poststreptococcal glomerulonephritis; early treatment is therefore important.

Furuncles (Boils) and Carbuncles**■ Definition**

- Furuncle (boil): deep inflammation and infection of the hair follicle; individual lesion with one follicular orifice
- Carbuncle: coalescing of infection from several adjacent follicles; several follicular orifices

■ Etiology

- Usually staphylococci

■ Appearance

- Furuncle: nodule with pustular formation and inflammation; most commonly on the legs, face, and groin
- Carbuncle: larger than furuncle, larger pustular component, often found on the posterior neck or buttocks

■ Diagnosis

- Culture may be helpful.

■ Treatment

- Incision, drainage, and oral antibiotics

Chancroid**■ Definition**

- Sexually transmitted disease caused by contact with an infected partner

■ Etiology

- *Haemophilus ducreyi*

■ Appearance

- Very painful erosions and ulcers on the penis or genital area, usually with a gray base

■ Diagnosis

- Scraping base of an ulcer and Gram staining the scrapings: microscopic examination will show gram-negative coccobacilli singly or in “schools of fish.”
- Culture of the organism possible, but difficult, as the organism on a swab dies at room temperature within 2 to 4 hours.
- Swabs should be transported quickly to the laboratory or refrigerated.

■ Treatment

- Erythromycin 500 mg po qid for 2 weeks

VIRAL INFECTIONS OF SKIN**Warts (Figure 5-8)****■ Definition**

- Wide variety of slow-growing epithelial lesions caused by papillomaviruses
- Include common warts (hands, feet, other cutaneous surfaces), flat warts (face or legs), anogenital warts, cervical warts, laryngeal warts, and perianal warts (condylomata acuminata) that can form large cauliflower-like (exophytic) masses

■ Etiology

- Infection with HPV.
- Different kinds of warts are caused by different strains of HPV. Warts on hands, feet, and face (flat warts) are caused by HPV types 1 to 4, 10, 28, 29, 37, 41, 48, 60, 63, and 65. Warts in the anogenital, cervical, and pharyngeal areas are caused by types 6, 11, 30, 34, 40, 42 to 44, 55, and 57 to 59.
- Incidence of warts in immunocompromised patients is greatly increased.

■ Appearance

- Rough, scaly papules occurring singly or in clusters on any skin surface

■ Diagnosis

- Paring of warts will reveal thrombosed capillaries that appear like tiny black dots

■ Treatment

- Liquid nitrogen treatment, topical salicylic acid, topical cantharidin (a blistering agent), or other topical wart preparations.

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Figure 5-8 • Warts. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

- Anogenital warts can be treated by painting with podophyllin, which is washed off 6 hours after application. Continued treatment every 2 to 3 weeks is necessary until the wart is completely resolved.
- Immunotherapy using topical immune modulators (e.g., Imiquimod) is useful for treatment of genital warts.
- **Note:** Some papillomaviruses may affect progression to carcinoma in lesions.
 - Verrucous carcinoma: low-grade squamous cell carcinoma

- Epithelioma cuniculatum: verrucous carcinoma on plantar surface of the foot
- Bowenoid papulosis: small papules on the external male and female genitalia infected with HPV type 16; histologically shows cellular atypia
- Warts in the anogenital, cervical, and pharyngeal areas are sometimes caused by “high-risk” types (16, 18, 31, 33, 35, 39, 45, 51, 52, 56) that may be a factor in carcinogenic progression of some lesions.

Herpes Simplex (Figure 5-9)



Figure 5-9 • Herpes simplex. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

■ Definition

- Herpes simplex virus infection causing “fever blisters,” genital lesions, and other skin lesions, often around the mouth or on the buttocks.

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■ Etiology

- Herpesvirus I (mouth, skin) or II (genital lesions, skin)

■ Appearance

- Clusters of vesicles on erythematous base.
- Vesicle superficial with fragile roof, resulting in erosion.
- Lesions painful with prodrome of stinging and burning.
- Lesions tend to recur in the same areas previously infected.
- Lesions usually resolve in 2 to 3 weeks.
- Virus remains dormant, usually within the trigeminal nerve root ganglion.
- Stress, menstrual periods, illness, and sun exposure can reactivate virus.

■ Diagnosis

- Tzanck test: scraping skin from the base of a vesicle, staining with Wright-Giemsa stain, examining for multinucleated “ghost cells” (nuclei of keratinocytes have dissolved)

■ Treatment

- Oral acyclovir, valcyclovir, and famcyclovir can shorten course of active infection.
- For those with frequent recurrences, daily suppressive therapy with these medications can lengthen time between attacks.
- **Note:** Other human herpesvirus that cause infection include varicella zoster virus (shingles), Epstein-Barr virus (Burkitt's lymphoma, infectious mononucleosis), cytomegalovirus (cytomegalovirus inclusion disease), human herpesvirus 6 (exanthem subitum), human herpesvirus 7 (preferentially affects CD4⁺ lymphocytes), and human herpesvirus 8 (Kaposi's sarcoma).

Varicella Zoster (Figure 5-10)**■ Definition**

- Viral infection causing chickenpox and shingles

■ Etiology

- Varicella zoster virus, a member of the human herpesvirus family.
- Primary viral infection causes chickenpox.
- After chickenpox, the virus resides (latent) in the sensory nerve ganglia.
- Later in life the virus can be reactivated by a number of factors to result in shingles.

■ Appearance

- Chickenpox: prodrome of fever, chills, aching joint, and malaise



Figure 5-10 • Varicella zoster. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

- Followed by eruption of widespread erythematous macules and papules that progress to vesicles, then pustules that crust and shed
- Vesicular lesion of chickenpox described as “dewdrop on a rose petal” (Figure 5-11)
- Shingles: painful bullae (large blisters) on an erythematous base in a dermatomal distribution



Figure 5-11 • Chickenpox. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

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■ **Diagnosis**

- Tzanck preparation: Scrape skin from base of vesicle, stain with Wright-Giemsa stain, examine for giant cells (intracytoplasmic edema in keratinocytes).

■ **Treatment**

- Oral acyclovir, valcyclovir, or famcyclovir.
- **Note:** Postherpetic neuralgia is a common, but painful, after effect of shingles. The risk for postherpetic neuralgia may be reduced by early treatment with oral antiviral medications.

Molluscum Contagiosum (Figure 5-12)



Figure 5-12 • Molluscum contagiosum. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

■ **Definition**

- Viral disorder transmitted by contact

■ **Etiology**

- Caused by a poxvirus

■ **Appearance**

- Lesions are pink or flesh-colored papules with central umbilication (indentation).

- Often found on young children on arms, legs, and abdomen after contact with other children.
- Sometimes found on adults, often in the lower abdominal area, after contact with a sexual partner.

■ Diagnosis

- Usually diagnosed by clinical appearance; biopsy if uncertain as to diagnosis

■ Treatment

- Liquid nitrogen, curettage, or application of topical tretinoin (Retin A).
- **Note:** Lesions will eventually resolve on their own. In children with numerous lesions, one option is to not treat, recognizing that additional lesions may occur before resolution occurs.

Insect and Arachnid Bites

■ Definition

- Bites by insects or arachnoids

■ Etiology

- Insects (six legs): mosquitos, bees, fleas, fire ants, lice
- Arachnoids (eight legs): mites, spiders

■ Appearance

- Typically erythematous papule with a central punctum.
- Lesion can occur singly, in groups, or in linear configurations.
- Occasionally vesicles or hemorrhagic bullae are present.
- Lesion can be extensive, as in the bite of a brown recluse spider: urticaria, bullae, severe necrosis of bite site and surrounding area.
- Can cause a variety of symptoms including itching, stinging and burning, edema, and/or erythema.
- Systemic effects including anaphylaxis can sometimes occur.
- Bites can sometimes result in systemic disease.
- Tick bites can be vectors for disease; bites by certain tick species can result in Lyme disease, erlichiosis, or Rocky Mountain spotted fever with systemic symptoms. Tick bites in some cases can also result in tick paralysis, causing ascending paralysis and potential death, unless the tick is removed. Babesiosis, caused by the intracellular red blood cell parasite *Babesia microti*, can also result from tick bites.
- Scorpion bites and black widow spider bites can result in both local and potentially fatal systemic effects. Bites by some species of caterpillars can also result in severe reactions.

■ Diagnosis

- Diagnosis by history; if lice, examine hair for nits (lice eggs).

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■ Treatment

- Bites that itch can be treated with topical corticosteroid applied twice a day.
- Persistent itching with edema and erythema can be treated with oral antihistamines.
- Severe reactions with edema and difficulty breathing are medical emergencies that require subcutaneous epinephrine (1:1000 solution) injection, corticosteroid injection, and other life support measures.
- Epinephrine emergency kits are available for persons with bee allergy.

Rocky Mountain Spotted Fever (Figure 5-13)

■ Definition

- Severe rickettsial disease transmitted by tick bite

■ Etiology

- *Rickettsia rickettsii*; usually transmitted by American dog tick (*Dermacentor variabilis*) in eastern United States or Rocky Mountain wood tick (*Dermacentor andersoni*) in western United States

■ Appearance

- Fever and chills occur first, followed about 4 days later with an erythematous, maculopapular rash that begins around the wrists, hands, and ankles and spreads centrally to the trunk and upper extremities.
- This central type of spread is in contrast to most infectious rashes that usually begin on the neck and trunk and spread peripherally.
- Petechiae and ecchymoses appear, and diffuse vasculitis develops.
- Areas of gangrene occasionally occur.

■ Diagnosis

- Indirect immunofluorescence assay. **Note:** Rocky Mountain spotted fever is a dangerous infection that must be recognized and treated with oral antibiotics. Treatment decisions should be made on clinical and epidemiologic clues and should not be delayed while waiting for confirmation of laboratory results.

■ Treatment

- Tetracycline, tetracycline analogs, or chloramphenicol



Figure 5-13 • Rocky Mountain spotted fever. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

PARASITIC INFESTATIONS

Lice

■ Definition

- Blood-sucking insects that infest hair-bearing areas (head lice, pubic lice) or live in seams of clothes (body lice)

■ Etiology

- *Pediculus humanus capitis*: head louse.

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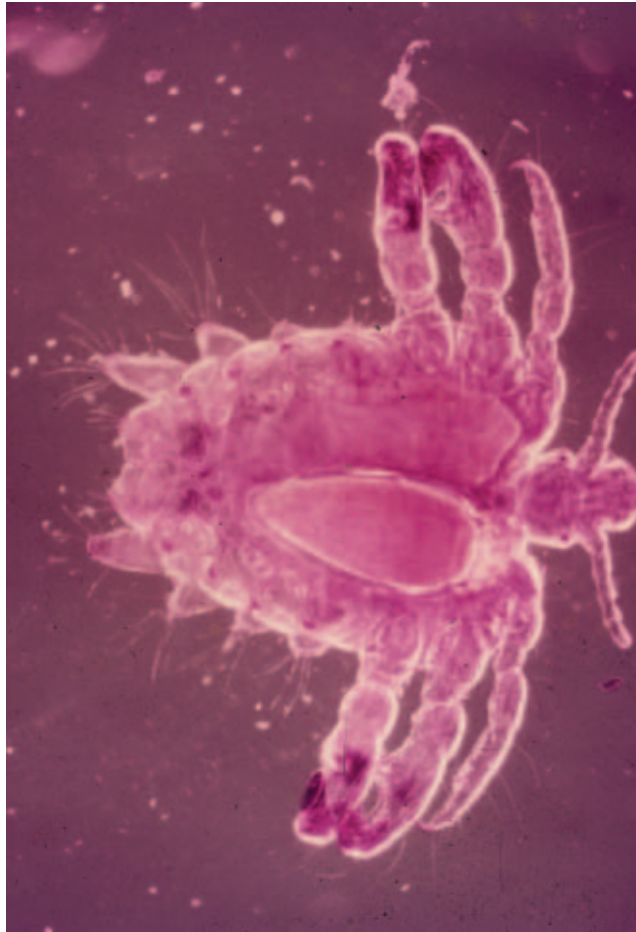


Figure 5-14 • Lice (pubic louse). (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

- *Pthirus pubis*: pubic louse (Figure 5-14).
- *Pediculus humanus corporis*: body louse.
- **Note:** Rarely, lice can transmit epidemic typhus (*Rickettsia prowazekii*), trench fever (*Rickettsia quintana*), and relapsing fever (*Borrelia recurrentis*).

■ **Appearance**

- Erythematous puncta, sometimes with surrounding erythema.
- Bites can be pruritic (itchy) and/or painful.
- There may be only a few lice or hundreds.



Figure 5-15 • Lice (nit). (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

■ **Diagnosis**

- Clinical examination of scalp and clothes for lice
- Examination of scalp for nits (white dots on hair shaft)
- Microscopic examination of nits (eggs glued to hair shafts) (Figure 5-15) to confirm diagnosis

■ **Treatment**

- Lice can be difficult to eradicate.
- For hair-bearing areas infested with lice, use permethrin (Nix) shampoo or pyrethrin (Rid) shampoo.

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- Follow shampoo with vinegar rinse and fine-toothed combing to remove nits.
- For treatment of skin infested with body lice, use lindane (Kwell) or permethrins (Elimite).
- Clothes of patients with body lice should be cleaned and ironed.
- Sulfur (4%–10%) in petrolatum can also be applied to skin or scalp infested with lice.
- **Note:** Lice infestation can quickly spread through a classroom of children, and children with nits should not attend class until treatment has been started. The CDC recommends that an infested child be kept from a child-care setting until 24 hours after treatment has started. Many states and local health departments require that the child be free of nits before readmission to school or child care. Children should be checked daily for evidence of new or continued infection for 10 days after treatment. Retreatment in 7 to 10 days may be necessary.

Scabies (Figure 5-16)



Figure 5-16 • Scabies. (Image courtesy of Dr. Howard Baden, Massachusetts General Hospital/Harvard Medical School, Boston, MA.)

■ Definition

- Scabies mites are arthropods that live, lay eggs within the skin (stratum corneum), and bite.

■ Etiology

- *Sarcoptes scabiei*, variation hominis

■ Appearance

- Scaly papules and excoriations (from scratching) as well as tiny linear or wavy “burrows” in warm areas such as between fingers and toes, in the umbilicus, around the waistline, and on the penile shaft.
- Skin infested with scabies is extremely itchy.

■ Diagnosis

- Microscopic examination of papule, erosion, or burrow for scabies (six-legged) mite, mite eggs, or mite feces

■ Treatment

- Lindane (Kwell) or permethrin (Elimite) applied from the neck down, left on overnight, and washed off the following morning; repeat procedure 1 week later.
- The morning after treatment, launder sheets, bedclothes, and towels.
- Entire family should be treated in confirmed cases.
- Sulfur (4%–10%) in petrolatum can also be used to treat skin infested with scabies.
- **Note:** Infestation with hundreds of mites is called Norwegian scabies and can occur in nursing home patients or otherwise debilitated patients. Oral ivermectin (single dose of 200 µg/kg body weight) alone or combined with topical treatment has been successful in treating patients with Norwegian scabies.