

8–14 h later with soap and water. Successful treatment of crusted scabies requires preapplication of a keratolytic agent such as 6% salicylic acid and then of scabicides to the scalp, face, and ears. Repeated treatments or the sequential use of several agents may be necessary. Ivermectin has not been approved by the U.S. Food and Drug Administration (FDA) for treatment of any form of scabies, but a single oral dose (200 µg/kg) is effective in otherwise healthy persons; patients with crusted scabies may require two doses separated by an interval of 1–2 weeks. All FDA-approved scabicides are available solely by prescription.

Within 1 day of effective treatment, scabies infestations become noncommunicable, but the pruritic hypersensitivity dermatitis induced by the now-dead mites and their remnant products frequently persists for weeks. Unnecessary re-treatment with topical agents may provoke contact dermatitis. Antihistamines, salicylates, and calamine lotion relieve itching during treatment, and topical glucocorticoids are useful for pruritus that lingers after effective treatment. To prevent reinfestations, bedding and clothing should be washed and dried on high heat or heat-pressed. Close contacts of confirmed cases, even if asymptomatic, should be treated simultaneously.

### CHIGGERS AND OTHER BITING MITES

Chiggers are the larvae of trombiculid (harvest) mites that normally feed on mice in grassy or brush-covered sites in tropical, subtropical, and (less frequently) temperate areas during warm months. They reside on low vegetation and attach themselves to passing mammalian hosts. While feeding, larvae secrete saliva with proteolytic enzymes to create a tube-like invagination in the host's skin; this *stylostome* allows the mite to imbibe tissue fluids. The stylostomal saliva is highly antigenic and causes exceptionally pruritic papular, papulovesicular, or papulourticarial lesions (≤2 cm in diameter). In people previously sensitized to salivary antigens, the papules develop within hours of attachment. While attached, mites appear as tiny red vesicles on the skin. Generally, lesions vesicate and develop a hemorrhagic base. Scratching, however, invariably destroys the body of a mite. Itching and burning often persist for weeks. The rash is common on the ankles and areas where clothing obstructs the further wanderings of the mites. Repellents are useful for preventing chigger bites.

Many kinds of mites that are associated with peridomestic birds and rodents are particularly bothersome when they invade homes and bite people. In North America, the northern fowl mite, chicken mite, tropical rat mite, and house mouse mite normally feed on poultry, various songbirds, and small mammals and are abundant in and around their hosts' nests. After their natural hosts die or leave the nest, these mites frequently invade human habitations. Although the mites are rarely seen because of their small size, their bites can be painful and pruritic. Once confirmed as the cause of irritation, rodent- and bird-associated mites are best eliminated by excluding their hosts, removing the nests, and cleaning and treating the nesting area with appropriate acaricides. *Pyemotes* and other mites that infest grain, straw, cheese, hay, or other products occasionally produce similar episodes of rash and discomfort and may produce a unique dermatologic "comet sign" lesion—a paisley-shaped urticarial plaque.

Diagnosis of mite-induced dermatitides (including those caused by chiggers) relies on confirmation of the mite's identity or elicitation of a history of exposure to the mite's source. Oral antihistamines or topical steroids may suppress mite-induced pruritus temporarily but do not eliminate the mites.

### TICK BITES AND TICK PARALYSIS

Ticks attach superficially to skin and feed painlessly; blood is their only food. Their salivary secretions are biologically active and can produce local reactions, induce fevers, and cause paralysis in addition to transmitting diverse pathogens. The two main families of ticks are the hard (*ixodid*) and soft (*argasid*) ticks. Generally, soft ticks attach for <1 h, leaving red macules after they drop off. Some species in Africa, the western United States, and Mexico produce painful hemorrhagic

lesions. Hard ticks are much more common and transmit most of the tick-borne infections that are familiar to physicians and patients. Hard ticks attach to the host and feed for several days or sometimes for >1 week. At the site of hard-tick bites, small areas of induration, often purpuric, develop and may be surrounded by an erythematous rim. A necrotic eschar, called a *tâche noire*, occasionally develops. Chronic nodules (persistent tick-bite granulomas) can be several centimeters in diameter and may linger for months after the feeding tick has been removed. These granulomas can be treated with injected intralesional glucocorticoids or by surgical excision. Tick-induced fever, unassociated with transmission of any pathogen, is often accompanied by headache, nausea, and malaise but usually resolves ≤36 h after the tick is removed.

Tick paralysis, an acute ascending flaccid paralysis that resembles Guillain-Barré syndrome, is believed to be caused by one or more toxins in tick saliva that block neuromuscular transmission and decrease nerve conduction. This rare complication has followed the bites of more than 60 kinds of ticks, although in the United States dog and wood ticks (*Dermacentor* species) are most commonly involved. Weakness begins symmetrically in the lower extremities ≤6 days after the tick's attachment, ascends symmetrically during several days, and may culminate in complete paralysis of the extremities and cranial nerves. Deep tendon reflexes are diminished or absent, but sensory examination and findings on lumbar puncture are typically normal. Removal of the tick generally leads to rapid improvement within a few hours and complete recovery after several days, although the patient's condition may continue to deteriorate for a full day. Failure to remove the tick may lead to dysarthria, dysphagia, and ultimately death from aspiration or respiratory paralysis. Diagnosis depends on finding the tick, which is often hidden beneath scalp hair. An antiserum to the saliva of *Ixodes holocyclus*, the usual cause of tick paralysis in Australia, effectively reverses paralysis caused by these ticks.

Removal of hard ticks during the first 36 h of attachment nearly always prevents transmission of the agents of Lyme disease, babesiosis, anaplasmosis, and ehrlichiosis, although several tick-borne viruses may be transmitted more quickly. Ticks should be removed by traction with fine-tipped forceps placed firmly around the tick's mouthparts. Careful handling (to avoid rupture of ticks) and use of gloves may avert accidental contamination with pathogens contained in tick fluids. Use of occlusive dressings, heat, or other substances (in an attempt to induce the tick to detach) merely delay tick removal. Afterward, the site of attachment should be disinfected. Tick mouthparts sometimes remain in the skin but generally are shed spontaneously within days without excision. Although somewhat controversial, current guidelines from the Centers for Disease Control and Prevention suggest that, rather than awaiting the onset of erythema migrans, the results of tick testing, or seroconversion to antigens diagnostic for Lyme disease, administering prophylaxis with a single oral dose of doxycycline (200 mg) within 72 h of tick removal is appropriate in adult patients with bites thought to be associated with deer ticks (Fig. 475-1) in Lyme disease–endemic areas from Maryland to Maine and in Wisconsin and Minnesota.

### LOUSE INFESTATION (PEDICULIASIS AND PHTHIRIASIS)

Nymphs and adults of all three kinds of human lice feed at least once a day, ingesting human blood exclusively. Head lice (*Pediculus capitis*) infest mainly the hair of the scalp, body lice (*Pediculus humanus*) the clothing, and crab or pubic lice (*Phthirus pubis*) mainly the hair of the pubis. The saliva of lice produces a pruritic morbilliform or urticarial rash in some sensitized persons. Female head and pubic lice cement their eggs (nits) firmly to hair, whereas female body lice cement their eggs to clothing, particularly to threads along clothing seams. After ~10 days of development within the egg, a nymph hatches. Empty eggs may remain affixed for months thereafter.

In North America, head lice infest ~1% of elementary school-age children. Head lice are transmitted mainly by direct head-to-head contact rather than by fomites such as shared headgear, bed linens, hairbrushes, and other grooming implements. Chronic infestations by head lice tend to be asymptomatic. Pruritus, due mainly to hypersensitivity to the louse's saliva, generally is transient and mild. Head lice