

What's Eating You? Chiggers

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Chigger is the common name for the 6-legged larval form of a trombiculid mite. The larvae suck blood and tissue fluid and may feed on a variety of animal hosts including birds, reptiles, and small mammals. The mite is fairly indiscriminate; human hosts will suffice when the usual host is unavailable. Chiggers also may be referred to as harvest bugs, harvest lice, harvest mites, jiggers, and redbugs (Figure 1). The term jigger also is used for the burrowing chigoe flea, *Tunga penetrans*. Chiggers belong to the family Trombiculidae, order Acari, class Arachnida; many species exist.

Trombiculid mites are oviparous; they deposit their eggs on leaves, blades of grass, or the open ground. After several days, the egg case opens, but the mite remains in a quiescent prelarval stage. After this prelarval stage, the small 6-legged larvae become active and search for a host. During this larval 6-legged stage, the mite typically is found attached to the host. After a prolonged meal, the larvae drop off. Then they mature through the 8-legged free-living nymph and adult stages.

Chiggers can be found throughout the world. In the United States, they are particularly abundant in the southeastern and south central states. The small red larval mites are barely visible to the naked eye and commonly go unnoticed, even after the bites become evident. The larvae cling to grass stems and low foliage in a questing posture, waiting to attach to any animal or human that brushes against them.

Bites are particularly common in the late summer and early autumn.¹ They are intensely pruritic and routinely appear as grouped papules or papulovesicles on the ankles, behind the knees, and between the toes (Figure 2). Bites also generally occur along the borders of undergarments. The mite frequently



Figure 1. Chigger mite.

attaches at sites of constriction caused by clothing, where its forward progress has been impeded. Penile and scrotal lesions are not uncommon and may be mistaken for scabies infestation. Seasonal penile swelling, pruritus, and dysuria in children is referred to as summer penile syndrome. It appears to represent a hypersensitivity response to chigger bites.¹

Treatment of chigger bites is based on anecdotal data. Treatment recommendations reflect my experience. Topical antipruritics containing camphor and menthol can provide some measure of relief from the intense pruritus that often accompanies the bites. Topical anesthetics containing pramoxine also can be helpful. Potent topical corticosteroid preparations can provide effective relief of itching, but the effect is delayed and the bites often must be occluded to provide relief. Occlusion temporarily may increase the itching sensation and patients may have trouble complying with instructions. A helpful technique is to administer the topical steroid, followed by plastic wrap, and then ice on top of the plastic wrap. The cooling effect of the ice allows many patients to use occlusional therapy when it would otherwise be intolerable. Intralesional corticosteroid injections can be effective when topical therapy has failed.

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Figure 2. Chigger bites on the ankle.

I generally recommend concentrations of 2.5 to 5 mg/mL because I have seen atrophy more commonly with higher concentrations.

Counterirritants, such as propylene glycol found in deodorant sticks, often are used by military personnel to relieve the itch of chigger bites. Many soldiers have attested to the symptomatic relief they obtain and the ready availability and transportability of the deodorant sticks during field exercises. This is an off-label use of the product and I am unaware of any controlled data regarding its use. In some cases, excision of the pruritic nodules is the only means of providing relief from unrelenting pruritus.

The best treatment for chigger bites is prevention. Diethyltoluamide (DEET) remains the most widely used repellent for chiggers. Efficacy is improved when it is paired with permethrin-treated clothing. The combination of DEET and permethrin is highly effective against a wide range of biting arthropods.^{2,3} New repellents continually are being evaluated but none have replaced DEET in the marketplace. In a study of 11 new candidate repellents, only DM-165-2 (N,N-diethyl-3-fluorobenzamide) was found to be greatly more effective against chiggers than DEET.⁴

In Asia, chigger mites are important vectors of scrub typhus, an emerging disease in China, Japan, Korea, and the islands of the Indian Ocean. In an endemic area, the presence of an eschar is strong evidence for scrub typhus. The diagnosis can be confirmed by polymerase chain reaction using the scab from the eschar at the site of the trombiculid mite bite.⁵ Scrub typhus is responsive to tetracycline therapy.

In endemic areas, rodents act as hosts for the mites and disease reservoirs.⁶ When trombiculid mite larvae feed, *Orientia tsutsugamushi* organisms escape from salivary gland cells via budding from the cell membrane. During the process, the organism is enveloped in the host cell membrane. The enveloped organisms are injected into the skin with the mite's saliva.⁶ The attach rate is high and transmission is efficient. In a study of transmission of *O tsutsugamushi* to mice by *Leptotrombidium* chiggers, the disease was successfully transmitted by individual chigger bites 75% of the time.⁷

Rodent infestation presents a risk for human transmission of disease. Paradoxically, efforts to control the rodent population may be associated with a transient increase in human bites, as the mites roam in search of a new host. Humans are at risk for chigger bites indoors and outdoors, as the mites and their rodent hosts are common in both locations. In the Shandong Province of China, the major outdoor rodent hosts for chiggers carrying *O tsutsugamushi* are *Apodemus agrarius* (black-striped field mice), and *Rattus norvegicus* (brown rats) are the major indoor hosts.⁸ In the rodent population, the mite burden can be high.⁹ In a new endemic area of scrub typhus infection in Kyoto, Japan, *Leptotrombidium pallidum* mites were found to be the most important disease vector. The mite burden was an average of 190 mites per infested rodent. *O tsutsugamushi* also was found in *Leptotrombidium intermedium*, though previous studies suggest that this mite rarely bites humans.⁹

As scrub typhus continues to emerge in Asia, it is reappearing in areas where it had not been present for decades. During the summer of 2002, an outbreak of 168 cases of symptomatic scrub typhus with 10 deaths occurred in the Maldives in the Indian Ocean. These were the first reported cases there since World War II.¹⁰ The continuing emergence of the organism is a serious public health issue in Asia.

Chiggers also are suspected to be vectors of viral disease, including hemorrhagic fever with renal syndrome and Hantavirus pulmonary syndrome.¹¹ Although the spread of Hantavirus had been thought to be exclusively by rodent excrement and urine, Hantavirus-specific RNA has been identified

in trombiculid mites (chiggers), suggesting they could play some role in disease transmission.¹² *Neotrombicula autumnalis* also may transmit ehrlichiosis, and the mites have demonstrated the capacity for transovarian transmission of *Ehrlichia phagocytophila*.¹³ Although the vector competence of chigger mites for borreliac diseases has not been established, *Borrelia* have been detected by polymerase chain reaction analysis in larvae of *Neotrombicula autumnalis*. If chigger mites are competent vectors for *Borrelia*, the risk of transmission probably is very low. In one study, borreliac DNA was amplified from only 3 of 2300 mites tested.¹⁴

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