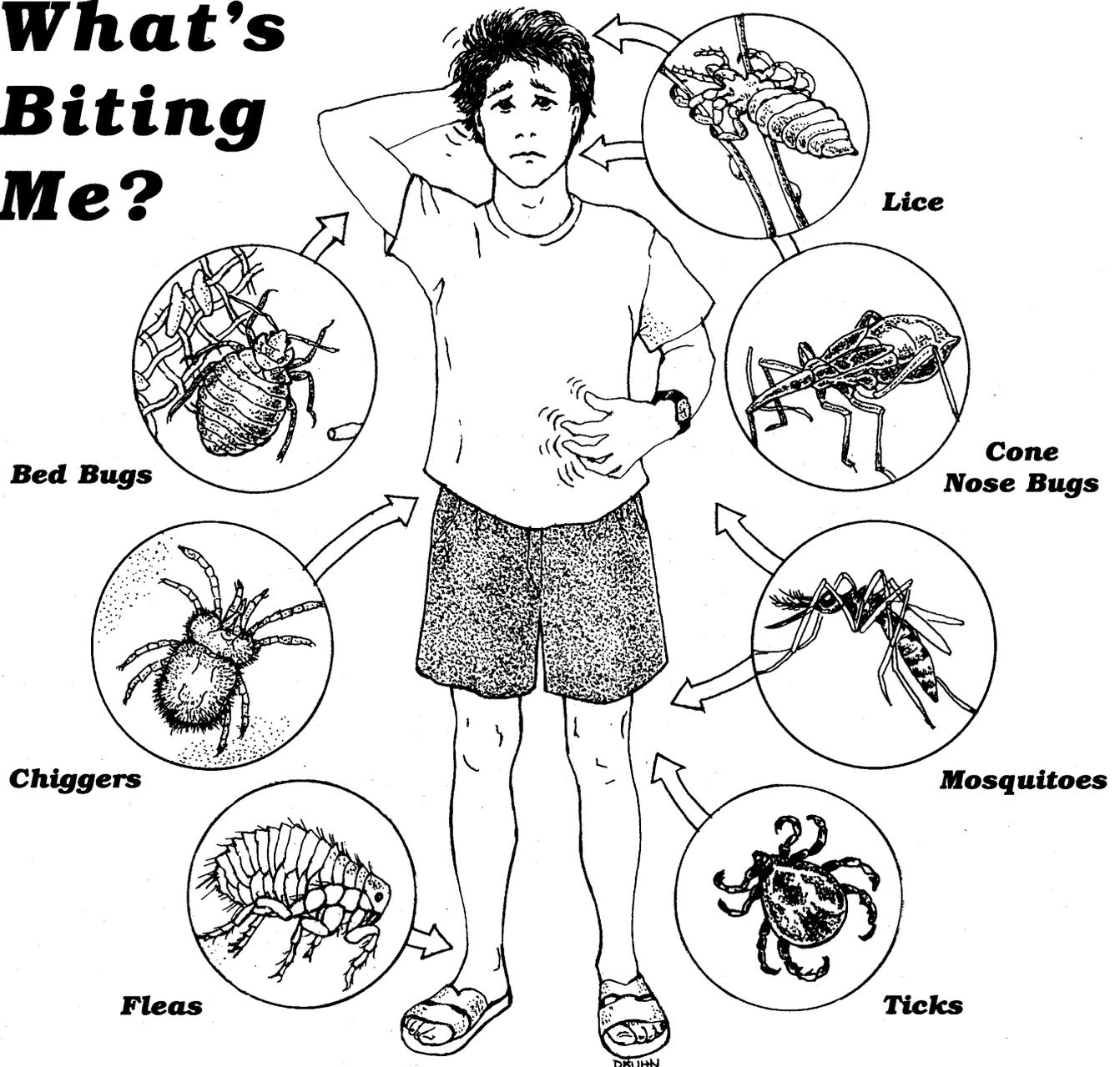


COMMON SENSE PEST CONTROL QUARTERLY

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What's Biting Me?



**Plus: Solutions for Garden Thrips,
Pest Control Forty Years Ago**



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What's Biting Me?

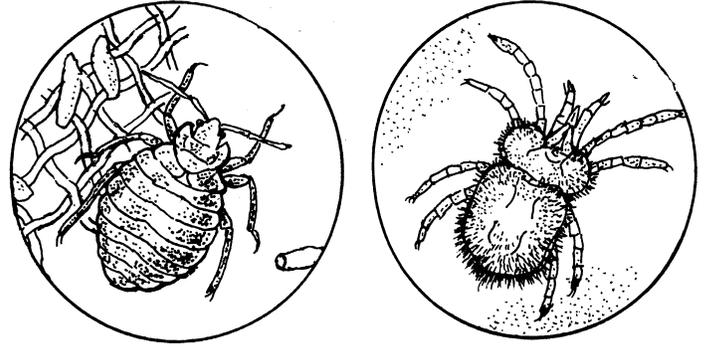
By William Quarles

Throughout history, humans have endured bites of spiders, mites, ticks, and insects, resulting in pain, infection, chronic itching, or disease. The learning process associated with these encounters might be the basis for some of the entomophobia found throughout our society. And when exposure is on a daily basis, either in the home or in the workplace, the experience can be overwhelming. When that happens, the desire for relief has driven many toward foggers or other insecticidal formulations that might be totally unnecessary. For the problem might not be an insect at all, but could be an allergy, dry skin, or some kind of nervous disorder.

If you have a sudden outbreak of mystery bites or a chronic itch, it is extremely important to get a correct diagnosis. Common sense can be very helpful. If you have cats, and see fleas hopping around, it is no mystery if you start feeling flea bites. A cat flea habitat is present, you see fleas, you have flea bites—diagnosis complete. A mosquito is something that everyone understands. We know what they look like, we hear their distinctive noise, we see and feel their distinctive bite.

These characteristic “bites” are puncture wounds produced by skin-piercing mouthparts. Mouthparts may be fangs, or bladelike stylets with sucking tubes. The itching associated with the bite is due to allergic reactions from insect saliva. Biting insects often inject painkillers, proteolytic enzymes, histamine-like substances, and anticoagulants to increase blood flow. For this reason, the bite may not be felt while the insect is biting. For instance, bed bug bites are usually painless (Ebeling 1975). This article is concerned with this kind of itchy bite and will not discuss stinging insects such as yellowjackets and fire ants. We will also discuss only the most common biting insects.

Bites from insects you can see are easy to diagnose. However, if you have bite-like formations on your skin and you itch, and you cannot see what is biting you, the problem is much harder to solve. The problem could still be due to a small, biting arthropod such as a mite. Or the insect could have a secretive life style and be biting, then hiding in cracks and crevices. Or an insect could be causing you to itch without even biting you. Dermestid beetles and other insects can cause allergies when they molt and parts of the exoskeleton become airborne. They can also produce proteins that might trigger an allergic reaction. Thus, cockroaches



and dust mites can cause allergic reactions even though they do not bite (Quarles 1999; Ebeling 1975; Buxton 1988).

Another category of bite-like itch is totally unrelated to arthropods, submicroscopic, secretive, or not. An itch can be triggered by allergens other than those of insects or mites. Itches can also be produced by dry skin, microscopic fibers of glass or paper, or a medical condition such as diabetes (Green 1997).

A final possibility is delusional parasitosis. In this case, professionals cannot find an organic source of the problem, and then conclude that the problem is a delusion. Sometimes, this is a misdiagnosis, as the problem is discovered later. And since treatment with psychoactive drugs brings improvement in only half the cases, there is a lot we do not know about this phenomenon (Green 1997; Ebeling 1975).

Where does it Itch?

To some degree, the creature biting can be deduced from the bite patterns. Although an arthropod is capable of biting any accessible area, certain patterns suggest a possible source. For instance, bed bugs tend to bite on the face, neck, and arms. Flea bites are often found on the ankles. Chiggers attack ankles, crotch, waistline and armpits. Scabies mites cause itching around the armpits, the wrists, the waist, inside the thighs, and the backs of the calves. Lice bites are often on the scalp, in the case of head lice, or in the pubic areas, in the case of pubic lice. Spider bites can occur anywhere, but are found often on the hands. Spiders tend to bite when a hand reaches into their hiding place (Dryden 1997; Snetsinger 1997; Ebeling 1975).

What Should you Do?

If you are being bitten by a common pest that you can see and recognize, a trip to the dermatologist is unnecessary. You can either handle the problem yourself using integrated pest management (IPM), or you can call a pest management professional to help you with it. IPM methods include pest inspection and monitoring, sanitation, exclusion, traps, baits, insect growth regulators, and spot treatments with least-toxic pesticides. Your problem might have also have a solution published in one of the BIRC publications listed at www.birc.org.

If you cannot see the pest, the best thing to do is to make an appointment with a dermatologist and make

sure the problem is not scabies, an allergy, or some other similar malady that can be diagnosed and treated by an experienced practitioner. If the dermatologist says you have an insect bite, then you must try to find the pest and manage it.

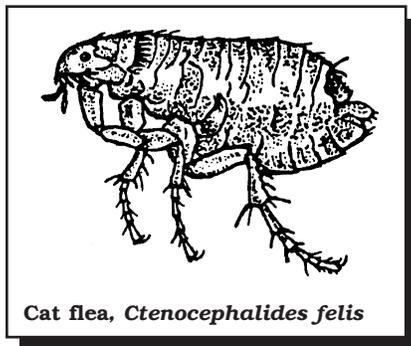
Monitor for the Pest

If you are sure it is an arthropod, but have not been able to detect it, you should start with an inspection of your body and your living space. Concentrate on the source of the problem. If you are being bitten on the head or pubic region, inspect carefully for lice. If the bite pattern on your body does not suggest the culprit, try to determine the part of your house or workplace where you are being attacked. Are the bites only at night? Are you the only victim?

If you are being bitten only in the bedroom, start your inspection there. Bed bugs leave reddish brown excrement in mattress seams. Also inspect cracks and crevices using a strong light source. Bed bugs and other pests tend to hide there. You could buy some sticky traps such as roach motels to see if you can catch whatever it is (see Resources). Do not just use one, use several. Put them along baseboards and in corners. If convenient, put some near where you sleep at night (Olkowski et al. 1991).

What do they Look Like?

Bed bugs are small, 1/8 inch (3 mm) red, oval-shaped bugs. Rat mites or bird mites are about the size



Cat flea, *Ctenocephalides felis*

of a period at the end of a sentence. Adults have 8 legs and may be either red or grayish. You can see them using a hand lens. Scabies mites spend most of their life cycle as parasites underneath the skin. A combination of tunneling and scratching makes characteristic lines on

skin. Head lice are about 1/10 inch long (2.5 mm), and are easily visible with the naked eye. Color ranges from tan to grayish white. Each of the six legs end in a claw that is used to grasp the hair shaft. Small, yellowish lice eggs are laid near the base of the hair. Pubic lice have a distinctive "crablike" shape. They are 1/12 inch (1.5-2.0 mm) long and "look like small, gray specks to the unaided eye." Most everyone is familiar with the appearance of a flea or a tick. Blacklegged ticks, *Ixodes scapularis*, that carry Lyme disease are about the size of a period before they feed. Dog ticks, *Dermacentor variabilis*, are larger, about 1/5 inch (5 mm) long (Ebeling 1975; Mallis 1997).

It is important to protect yourself against these biting insects, because in addition to their nuisance value, ticks, fleas, mosquitoes, conenose bugs and others carry a number of serious diseases (Goddard 2000).

Fleas

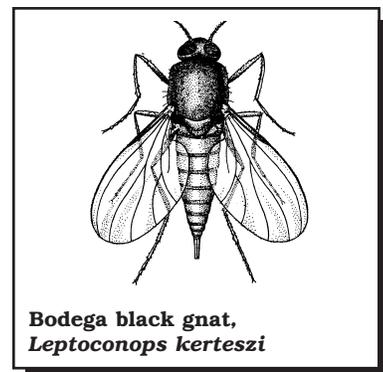
If a flea is biting you, it is probably the cat flea, *Ctenocephalides felis*. The best solution for a flea problem is to break their life cycle. First, kill or remove adult fleas from the pet. One possibility is to treat pets with imidacloprid (Advantage®), fipronil (Frontline®), lufenuron (Program®) or other materials offered by veterinarians (Quarles 1997). A number of new products are available that will be reviewed in a later issue of the Quarterly (McCall et al. 2004; Kwochka et al. 2000; Young et al. 2004).

If you do not want to use chemicals on the pet, then repeated use of a flea comb will do the job (see Resources). Then wash pet bedding and vacuum in areas where the pet resides. This might be enough to stop the problem. To mop up a flea infestation, a vacuum cleaner with a HEPA filter is your best ally. Vacuuming will remove most of the eggs, but not all the larvae. Remaining larvae use their claws to hang onto carpet fibers. The more powerful the vacuum, the better the flea control (Olkowski et al. 1991).

When the larvae emerge as adults, you can mop them up with a flea trap. A flea trap consists of a small light source positioned over a sticky surface. It can be effective in rooms where the trap is not competing with cats or other hosts for the fleas (Donahue 2004). If the infestation is too large to manage in this way, carpets can be treated with the IGR methoprene (Precor®). Methoprene has such low toxicity (LD50 >25,000 mg/kg) to mammals, it is practically non-toxic (Tomlin 1997). This treatment stops fleas from developing into adults. An alternate approach is to clean the carpets with an aqueous solution containing a small amount of a borate, such as Flea Nix® (see Resources). The small residual left in the carpet kills the flea larvae. The residual can be removed later by washing again just with water (Quarles 2001a).

Mosquitoes and Gnats

Mosquitoes and gnats are rarely misidentified as something else. The biting stage of both is a flying insect. Females need bloodmeals to produce eggs. Hypodermic-like mouthparts remove the blood of the host. Important biting species of mosquitoes are in the genera *Culex*, *Anopheles* and *Aedes* (O'Neill 1997). All mosquitoes breed in water, so source reduction and larval control methods are the most effective means of reducing biting populations. Larval control includes treatment with methoprene and *Bacillus thuringiensis israelensis* (Bti)(Olkowski 2001; Quarles 2001b) (see Resources). To reduce mosquito bites, exclude them from your house with good caulking and tight fitting screens. When venturing out-



Bodega black gnat, *Leptoconops kerteszi*

side, mosquito repellents are a good idea. If you do not like DEET, use a repellent based on a botanical. Particularly effective for the *Culex* sp. that carries West Nile encephalitis is Repel® Lemon Eucalyptus (Quarles 2004) (see Resources).

Biting midges (Ceratopogonidae) are dark-colored, small, 1/10 inch (1-3 mm) biting insects. They are vicious biters and are sometimes called no-see-ums, sandflies, or black gnats. These midges often bite underneath clothing, but also bite “at the hairline, on the ears and neck, and around the eyes, frequently causing itching and painful, persistent swellings” (Ebeling 1975). Bites are painful and are usually felt immediately. They are attracted to light and will come through ordinary fly screens. Closing blinds at night or treating flyscreen with a repellent insecticide will help exclude them (Ehmann 1997).

Ticks

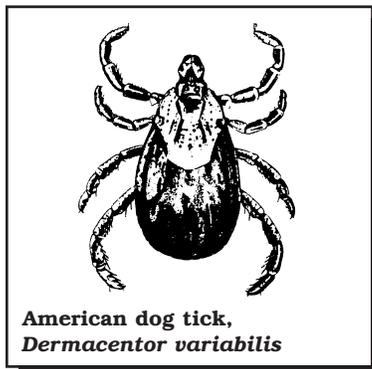
Though most of us know what a tick looks like, sometimes the tick will drop off before we see it. When this happens, we see a mystery bite, and some other creature, such as a spider, might get the blame. Vigilance and eyesight are the best protection against this problem. If you have pets, you should inspect them on a regular basis for ticks. If you have been in the outdoors, you should take a shower and do a careful inspection of your body immediately upon your return. A

change of clothing after a hike is also a good idea.

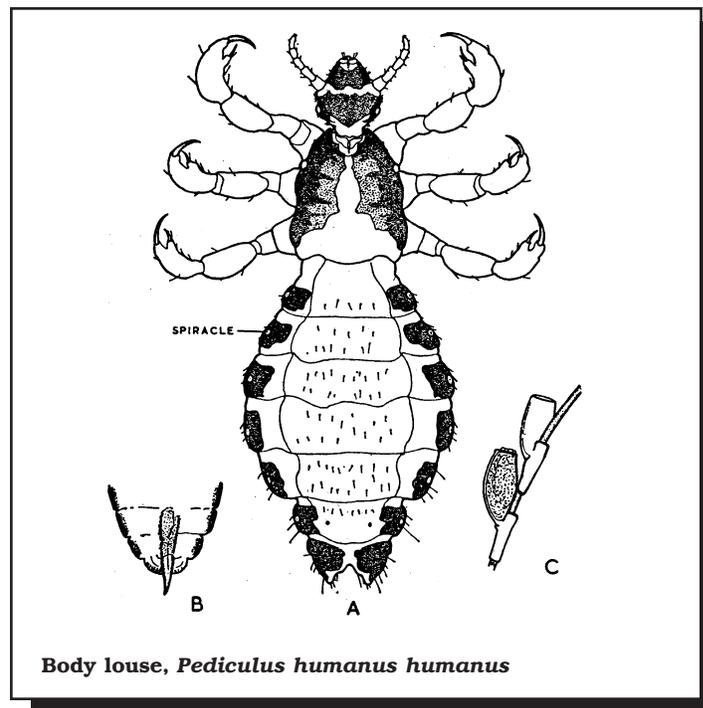
Some tick bites manifest as a bright red spot, surrounded by a purple ring. Bites may be followed by inflammation and lesions. Attached ticks can cause a feeling of prickling, tingling, or creeping on the skin in the lower extremities. The blacklegged tick, *Ixodes scapularis*, and the western blacklegged tick, *I. pacificus*, can leave a characteristic “bullseye” rash that can help with identification (Quarles 2000; Olkowski et al. 1991). The Rocky Mountain wood tick, *Dermacentor andersoni*, can leave a rash that “appears about the second to the fifth day after a bite, on the wrists, ankles and less often on the back, later spreading to all parts of the body” (Ebeling 1975). Tick management and Lyme disease is discussed in Quarles (2000).

Lice

Humans are infested by head lice, *Pediculus humanus capitis*; body lice, *Pediculus humanus humanus*; and pubic lice, *Phthirus pubis*. Body lice are not common except in cases where humans are forced to live closely together, sometimes under unsanitary conditions. Head lice are quite common, and often occur in school children. They are passed from child to



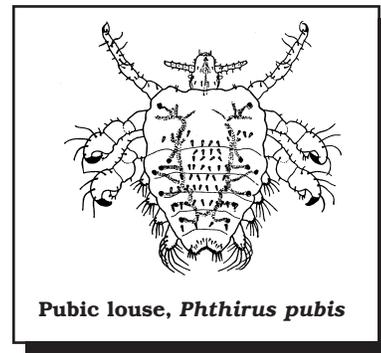
American dog tick,
Dermacentor variabilis



Body louse, *Pediculus humanus humanus*

child by intimate contact. Pubic lice or “crabs” are usually transmitted by sexual activity (Ebeling 1975; Hedges 1997a).

Head lice vary in color from dirty white to gray black. They are about 1/10 inch (3 mm) long, and can thus be easily seen by the naked eye. Females glue yellowish eggs (nits) nearly 1/25th inch (1 mm) long near the bottom of a hair shaft. The best remedy for head lice is a lice comb, because it removes both lice and nits (Drlik and Quarles 1998; Quarles 1998)(see Resources).

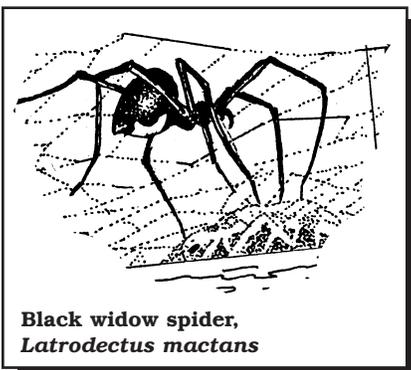


Pubic louse, *Phthirus pubis*

Head or body lice bites can cause severe skin irritation. Red bumps can develop at the site of each bite. Large numbers can produce rashes, headaches, chills and fever. Crab lice may produce “characteristic blue spots about 1/10 to 1 inches (0.2 to 3 cm) in diameter and with an irregular outline” (Ebeling 1975).

Spiders

Spider bites are often associated with pain, “a wheal, and various local tissue reactions, including swelling and edema” (Ebeling 1975). Serious spider bites can be inflicted by the black widow, *Latrodectus mactans*, and the brown recluse spider, *Loxosceles reclusa*. The bite of a black widow leaves two tiny red spots initially, which represent puncture wounds from the fangs. A bite is associated with pain, swelling, neurological and physiological symptoms. The brown



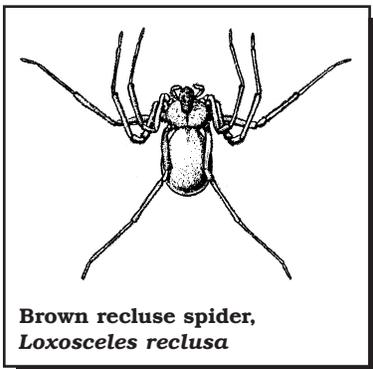
**Black widow spider,
*Latrodectus mactans***

recluse bite has a stinging sensation followed by intense pain. "A small blister usually rises, and a large area around the bite becomes congested and swollen." The wound that results becomes a necrotic sore that is slow to heal (Ebeling 1975). For more information on

these spiders, see Olkowski (2000).

More than 50 spider species are known to bite humans, but bites of other insects are often misidentified as spider bites (Vest 1987). According to Ebeling (1975), "the stings and bites of bees, wasps, mosquitoes, biting flies, fleas, bed bugs, lice, ticks, and mites are far more common than spider bites, and some of these arthropods can produce bulbous lesions that may rupture and ulcerate."

Spider bites do of course exist. There were 2,120 cases of black widow bites, 1,835 cases of brown recluse bites, and 5,381 cases of unknown spider bites reported to poison control centers in the U.S. in 1994 (Lacey 1997).



**Brown recluse spider,
*Loxosceles reclusa***

Ants

Stinging ants such as the fire ant, *Solenopsis* spp., will not be discussed here. A number of ants such as the Argentine ant, *Linepithema humile*; velvety tree ant, *Liometopum occidentale*, and the field ant, *Formica* spp. will inflict nuisance bites. Bites of field ants can be painful because they inject formic acid into the wound (Ebeling 1975; Hedges 1997b). Ant control is discussed in a number of BIRC publications, see www.birc.org.

Bird Mites

The tropical fowl mite, *Ornithonyssus bursa*, or the chicken mite, *Dermanyssus gallinae* will sometimes leave a bird nest and invade human living space. Many wild birds have infestations of one or the other of these mites. In temperate regions, another possibility is the northern fowl mite, *Ornithonyssus sylviarum*.

When wild birds, and especially pigeons build nests on your house, the mites will usually stay in the nest, biting the occupants. When the birds leave, the mites leave and go inside the house looking for food. Initially, most of them will be found in the room near the entry point. After that, they can disperse throughout the structure. In their search for a suitable host, they will

bite humans, although human blood does not support breeding populations. When they bite, they inject saliva that causes an intense itching. They are very small, a little less than the size of a period, so they are very hard to see (St. Aubin 1997).

They will bite any part of the body, but humans do not support an infestation. Most bird mites will die within 3 weeks without a blood meal from a bird. However, some may last up to 4 or 5 months. You can do a number of things to get rid of them. One, remove the bird nests from your building; bag and seal the nest. When the nests are removed, you might spray or have someone spray the adjacent outside area with pyrethrins, to kill any mites that try to get away (Ebeling 1975).

Inside the house, if you have a vacuum cleaner with a HEPA filter, use it. Vacuum areas that are near where the bird nests were. Vacuum cracks and crevices along baseboards. Vacuum around windows if they were near the bird nests. If you do not have a HEPA filter, vacuuming will not do any good. They are so small, the vacuum cleaner will just blow them around the room.

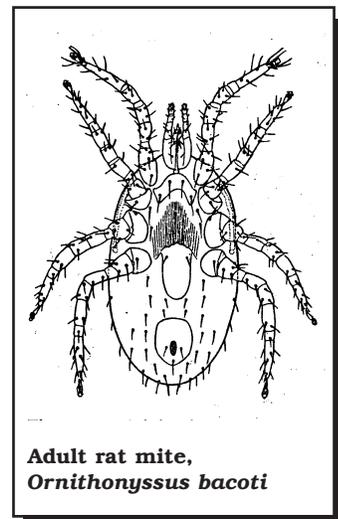
Pest control companies normally will apply a crack-and-crevice treatment of pyrethrins or a pyrethroid. So, if you are chemically sensitive, you might want to be gone while they are doing it. A light dusting of diatomaceous earth in those areas may also be effective. If you want to avoid pesticides altogether, another possibility is to steam clean the rooms where you are being bitten. If they have made it to your bed, wash the covers and the sheets.

Rat Mites

The tropical rat mite, *Ornithonyssus bacoti*, is occasionally a problem. Usually, this comes about when rats abandon their nests, or when they are killed as part of a rat eradication program. Mites associated with the nests then move into human dwellings looking for food. However, rat mites have attacked humans, even when abundant rat hosts are present. For this reason, rat management may be a necessary part of the treatment plan (St. Aubin 1997).

Before you start a treatment program, you should make sure you have identified the pest correctly. Make sure it is mites and not fleas, dry sensitive skin or some other kind of problem. If it is convenient to see a dermatologist, you can exclude a number of medical conditions that are sometimes confused with insect bites. Also, there are mites such as scabies that can only be eliminated with the help of your dermatologist (Olkowski et al. 1991).

Mites are red if they have obtained a bloodmeal. They are also small, about the size of a period at the end of a sentence. When engorged, females are



**Adult rat mite,
*Ornithonyssus bacoti***

about 1/25th inch (1 mm) long, a size that can be seen with the naked eye. You can monitor for them by using clear sticky tape and applying it in areas where you suspect they are accumulating. Rat mites like warm areas. They tend to accumulate in walls, especially if there is a heat source. So check near stoves, floor furnaces, wall furnaces, hot water pipes. Use the clear monitoring tape. You can then look at the tape with a magnifying glass to see if you have gray or red six or eight legged creatures. If so, you probably have rat mites. [Larvae have six legs, adults have eight.] (Ebeling 1975).

The best approach is a concerted effort to both remove your rats and to eliminate the mites. Whether you have rat mites or not, rat control is a good idea. Focus on finding how they are getting in and seal that off. Look for openings around the foundation or at the roof level. Look inside your crawl space for signs of rats. Set traps systematically in the crawl space to try to find if they are there and where. Make repairs of all holes through which they could be entering. Pay special attention to broken vents, and other openings. You might have to use rat baits in your crawl space or attic (Simon and Quarles 2004). However, if you can eliminate them with traps, that is the best way. If you have to, hire an exterminator.

At the same time you are removing the rats, you should be addressing the mite problem. These mites take about 10 days to develop from egg to adult, and they require blood meals to develop. So if you can get rid of the hosts and keep the mites from biting you for 10 days, they will start to die. Especially hardy mites could live for up to 8 weeks (Ebeling 1975). Fortunately, they do not attach to furnishings the way that flea larvae do, so mites and eggs are easy to vacuum up. You should do a lot of vacuuming, especially around warm fixtures and along cracks and crevices (St. Aubin 1997).

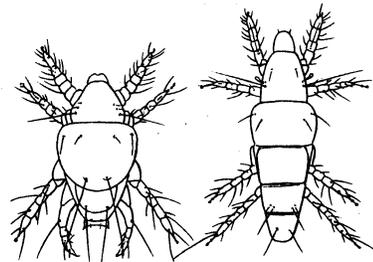
If you get tired of vacuuming all the cracks and crevices, another possibility is treating the wall voids with diatomaceous earth or an amorphous silica gel dust. This treatment should remove any mite harborages inside the walls. Another possibility is a crack-and-crevice treatment with amorphous silica or with an insecticide (St. Aubin 1997). At the hardware store you can find conventional pesticides such as pyrethrins, and there are alternate ones based on mint oil and soap. As the case with bird mites, steam cleaning is also a possibility.

You can protect yourself from bites by using mosquito repellents. Rat mites are repelled by DEET and probably by alternate

mosquito repellents (see Resources). Rat mites usually feed only at night, so that is when repellents are needed. Antihistamines could give symptomatic relief (Olkowski et al. 1991; St. Aubin 1997).

Chiggers

Encounters with chiggers, *Trombicula* spp., usually happen outdoors. Eggs are laid on soil. Larvae are reddish-orange and are very small (1/100th inch; 0.2 mm). Bright red adults are larger. Larvae have six legs, adults have eight. Chiggers congregate in areas "constricted by clothing, such as ankles, crotch, waistline, and armpits" (Ebeling 1975). Chiggers are most abundant during rainy times, and they are found most often in rough, scrub-type vegetation. Since itching is not noted for several hours after the bite, one may mistakenly think the source of the problem is living inside. If you are going to venture into chigger infested areas, wear mosquito repellents and take a shower when you come back from your hike (St. Aubin 1997).



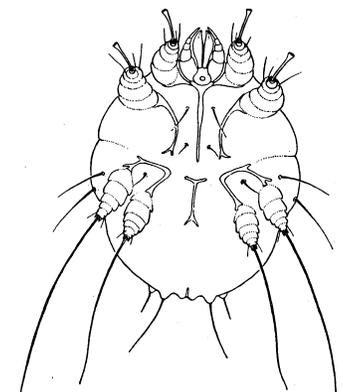
Straw itch mites, *Pyemotes* sp. Male on the left, Female to the right

Straw Itch Mite

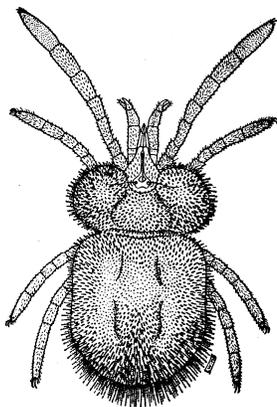
The straw itch mite, *Pyemotes* sp., is nearly invisible to the naked eye. These mites are associated with straw and grain. They are predatory mites, and are associated with a number of pests. Unusual cases of human dermatitis have been associated with straw itch mites preying on woodboring beetles, *Anobium punctatum*, in the floor joists of houses. Normally, these mites are not a problem unless you come into contact with hay, grain, or straw (Ebeling 1975).

Scabies Mite

Scabies mites, *Sarcoptes scabiei*, are "translucent and dirty-white" and so small (1/100th inch; 0.2-0.4 mm) that they cannot easily be seen with the naked eye (Ebeling 1975). Mites



Scabies mite, *Sarcoptes scabiei*



Adult chigger, *Trombicula* sp.

burrow underneath the skin, leaving a red papule, and females lay 40-50 eggs. They are found most often on hands and wrists, and the skin may be marked by characteristic red tunnels. Allergic reactions to these mites brings on symptoms of “the itch” or scabies. The allergic reaction may occur in areas where mites are not present. A rash may develop “around the armpits, the wrists, the waist, inside the thighs, and the backs of the calves.” Within 6 weeks the itching is severe enough to cause a loss of sleep. Within 100 days it is “continuous and almost unbearable” (Ebeling 1975).

Transmission is by intimate human contact. Mites are capable of walking to a host when there is no skin-to-skin contact. Off the host, they can live for two weeks. Treatment is a prescription lotion from a dermatologist, and washing all clothing and bedding in hot water (St. Aubin 1997).

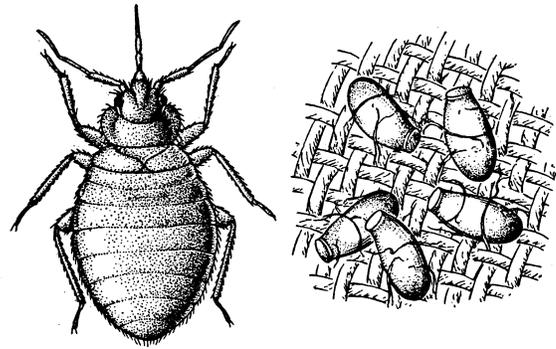
Dust Mites

Dust mites, *Dermatophagoides* sp., do not bite. However, only 2mg [a mg is one-millionth of a gram] of mite proteins and allergens per gram of house dust can cause allergies, including itching (Tovey et al. 1981; Quarles 1999). In one famous case a zoologist developed “itching red papules on scalp, eyes, ears, nostrils, shoulders, under the arms, beneath the breasts, on the chest, both upper and lower back, and occasionally around the umbilicus” (Ebeling 1975). She was diagnosed as delusional, then proved that she had dust mites. However, some entomologists still doubt that dust mites were the problem (Poorbaugh 1993).

Bed Bugs

At one time bed bugs, *Cimex lectularius*, were a significant pest worldwide, recently they have been showing a resurgence. They are usually spread by humans, but they can also be harbored and transmitted by cats (Clark et al. 2002). Bed bugs are one of the oldest human parasites, and some scholars believe we picked them up while we were cave dwellers. Similar bugs still live in caves, and are associated with bats or other vertebrates (Thomas et al. 2004; Ebeling 1975). Before you treat for them, you should make sure you have bed bugs. They are nocturnal, so you usually see them only at night. The adults are red-brown, oval or elliptical in shape and about 1/5 of an inch (5 mm) long. They are flat and thin before feeding, then become plump with blood. They have a beak with mouthparts that saw through the skin, and a proboscis with two tubes. One injects saliva containing anticoagulants and painkillers, the other sucks up the blood (Ebeling 1975).

You might deploy some sticky traps around your bed to see if you can catch them and verify the problem. Another sign is black feces spots, or clusters of white, elongated eggs (Snetsinger 1997). Females lay about 10-50 of these yellow-white (1/25th inch; 1 mm) eggs usually on mattresses or in cracks and crevices. Bed bugs tend to aggregate on rough surfaces, and “prefer wood or paper surfaces to stone, plaster, metal or even textiles” for harborages (Ebeling 1975). Sometimes they leave blood stains on walls, bedding



Female bed bug, *Cimex lectularius*. On the right are eggs.

and curtains. Cast skins are “thin, white, and translucent.” Bites are usually on face, neck, arms or hands. According to Ebeling (1975), “the bite ordinarily produces a lump or swelling with no red spot or other distinguishing characteristics...when many bugs feed on a small area, reddish spots caused by hemorrhage may appear after the swelling has disappeared. Swelling is severe with some highly allergic persons, and may not be confined to the immediate area that was bitten.”

“Bed bugs are transmitted from infested house to uninfested house on furniture, baggage, boxes, in suitcases, packed clothing, and bedding” (Snetsinger 1997). Once you are sure you have bed bugs, you can start an integrated elimination program. Bed bugs come out at night and bite sleeping victims in bed. Make sure that bedding and mattress is not harboring them. A good vacuum cleaner is your friend at this point. Check the seams of the mattress for eggs and feces. Once you are done vacuuming, remove the bag, seal in a plastic bag, and discard outside in the trash. Washing and drying bedding will get rid of eggs. Then, you must make sure they are not hiding in the cracks and crevices of the bed. You can treat cracks and crevices by first vacuuming, then blowing in diatomaceous earth, then sealing with caulk (Olkowski et al. 1991).

Once the bed is decontaminated, to get some relief from biting, you can then isolate the bed from the surroundings. If it is supported by legs, for instance, you can use a sticky tape barrier. Alternately, you can use a barrier of vaseline, but that is somewhat messy (Olkowski et al. 1991).

If the infestation is severe, they may have found their way into the cracks and crevices along the baseboard and intersections of the wall with the floor. Large infestations produce a “bed bug smell.” Bed bugs emit characteristic odors that have been described as “fresh, red raspberries” or “an obnoxious sweetness” (Ebeling 1975).

Bed bugs also hide behind electrical outlets. You can remove the faceplate and use diatomaceous earth (DE) dust to treat those areas. You might have to look behind picture frames and in the cracks and crevices of the frame. Pull up the edges of the carpet and see if

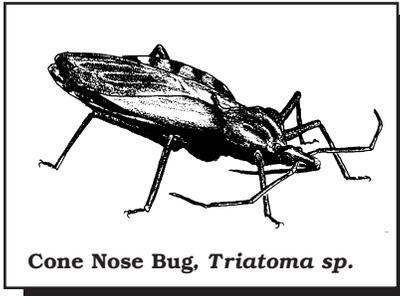
you see signs of them (Snetsinger 1997). When you use diatomaceous earth, use a rubber bulb duster to apply small amounts of it to areas where it can be contained. Do not use large amounts in open areas, because you could contaminate the air of your living space. You want to apply it in out of the way places where it will be undisturbed by air.

If you have a multiunit infestation, you should try to find out how they are getting from apartment to apartment. Check where pipes are going through walls and caulk around those areas. Wall voids might have to be treated with diatomaceous earth or silica gel.

Finally, you should consider treating suspected hiding places with steam. Steam is being used now as a general treatment for bed bugs by professionals. Again, apply steam in cracks, crevices, door and window moldings or other hiding places. Convective heaters, which are used for drywood termite control, have also been used for commercial treatment of bed bug infestations. Rooms are heated a minimum of 3 hrs at 140°F (60°C) (Miller 2002).

Cone Nose Bugs

The cone nose bug, *Triatoma* sp., can bite without causing pain. However, a day or two later, bites start to itch and leave swollen red spots for up to 30 days. They can feed on faces and lips, and are sometimes called kissing bugs. These are large (4/5th inch; 15-20 mm long) dark brown to black bugs. Outside, they are associated with their principal host, the woodrat, *Neotoma* sp. Feeding sometimes causes systemic reactions including dizziness, nausea, itching on the scalp, palms, and soles of the feet. Swelling occurs around the eyes, tongue, larynx, and trachea. Through their excrement they spread trypanosomes that cause Chagas disease. Control is by exclusion from structures (Ebeling 1975; Olkowski et al. 1991).



Cone Nose Bug, *Triatoma* sp.

Itches not Associated with Bites

Allergic dermatitis can produce bite-like symptoms. Sensitizers include plastics, poisonous plants and other materials. Dry skin can cause itching. Paper fragments and small fibers can become airborne in office environments with copy machines, printers, static electricity, and forced air ventilation. Particles can puncture skin, causing bite-like paper cuts. Where structures are tight, the confined air can accumulate contaminants that can cause allergies. In the worst cases, this is called sick building syndrome (Jantunen et al. 1997; Chace 1996; Ott and Roberts 1998; Green 1997).

Perfumes, detergents, and cosmetic chemicals can cause problems. Pollen can cause hay fever or itching skin. Contact dermatitis can occur with poison ivy and

Resources

- Bacillus thuringiensis israelensis* (Bti)—Valent BioSciences, 870 Technology Way, Liberty, IL 60048; 800/323-9597, 847/968-4700, Fax 847/968-4780; www.valentbiosciences.com
- flea comb—Gardens Alive, 5100 Schenley Place, Lawrenceburg, IN 47025; 812/537-8650 or 812/537-8652, Fax 812/537-8660; www.gardensalive.com
- Flea Nix®—The Ecology Works, PO Box 187, Hobe Sound, FL 33475; 888/353-2649, 772/545-7890, Fax 772/545-1268; www.ecologyworks.com
- Flea Traps—Springstar, PO Box 2622, Woodinville, WA 98072; 800/769-1043, 425/487-6011, Fax 425/487-4360
- Lice comb—National Pediculosis Association, 50 Kearney Rd., Needham, MA 02494; 800/446-4672; 888/542-3634, 781/449-6487, Fax 781/449-8129; www.headlice.org
- Methoprene (Altosid®)—Wellmark International, 1501 E. Woodfield Road, Suite 200 West, Schaumburg, IL 60173; 800/248-7763, Fax 800/426-7473; www.zoecon.com
- Methoprene (Mosquito Dunks™)—Summit Chemical Co., 7657 Canton Center Dr., Baltimore, MD 21224-2079; 800/227-8664, 410/282-5200, Fax 410/282-7963; www.summitchemical.com
- Repel® Lemon Eucalyptus Repellent—WPC Brands, 1 Repel Rd., PO Box 198, Jackson, WI 53037; 800/558-6614, 262/677-4121, Fax 262/677-9006
- Sticky traps—Woodstream, 69 N. Locust St., Lititz, PA 17543-0327; 800/800-1819, 717/626-2125, Fax 717/626-1912; www.woodstreampro.com

poison oak. Allergic contact dermatitis can occur with a number of plants, including ragweed, tansy, feverfew and pyrethrum. Allergic reactions and itching have also been reported when skin contacts a pesticide, and pesticide residues indoors take a long time to disperse and degrade (Green 1997; Tomlin 1997; Ott and Roberts 1998).

Side effects of some drugs are skin rashes and itching. Fungus infections such as ringworm or athlete's foot can cause itching, although symptoms may not appear on the skin as a bite. A number of medical conditions, including diabetes, liver disease, chicken pox, shingles, cancer and pregnancy are associated with itching (Green 1997).

Delusional Parasitosis?

Delusional parasitosis is diagnosed when someone believes they have been attacked by an insect or other parasite and physical evidence cannot be found. These delusions are not particularly rare. Estimates range from 12-80 cases/million each year (Trabert 1997; Kushon 1993). Thus, the number of cases could exceed the number of spider bites reported each year (Lacey 1997), and are about 10 times the number of West Nile cases (2470) reported to the CDC in 2004 (CDC 2005). Characteristics include insidious onset and long durations of symptoms.

Sometimes, a parasite is there but just cannot be found or identified by the practitioner. For example, a woman felt "a bug" moving around in her mouth. She was diagnosed as delusional, and later a parasitic worm was removed from her lips and from her gums (Eberhard and Busillo 1999). Also, practitioners are divided on whether some diseases and symptoms are delusional or not. An example is Morgellons disease. Victims report stinging, crawling or biting sensations associated with skin lesions. Some practitioners believe it is delusional. Others think it is caused by a bacterium or a virus. Victims are frequently nurses or teachers (Morgellons 2005).

Delusional parasitosis should probably not be diagnosed when other physiological or organic causes are known to be present. It should be differentiated from similar "bugs crawling under my skin" symptoms associated with drug delirium and alcohol withdrawal. Intense itching from diabetes or leprosy is sometimes mistakenly diagnosed as delusional parasitosis, when it actually has a physiological origin (Bhatia et al. 2000).

Some characteristics of delusional parasitosis have been recorded by Ebeling (1975). The "bugs" are black or white when first noted, and then later may change color. The "bugs" jump. The "bugs" may infest the patient's hair, and can be shaken or combed onto a sheet, towel, or newspaper. "Bites" or papule-like irritations which develop on the skin usually itch, causing the persons to scratch themselves, even to the point of severe tissue damage. The "bugs" may come out of such common household items as toothpaste, vaseline, or cosmetics. The supposed infestation in a home may become so severe as to literally force the person to move to another location. Unfortunately, the "bugs" usually reappear in the new dwelling. The patient may be so positive of the supposed infestation and give such a lucid description that other members of the family will stoutly support the contention, even though they are not afflicted.

Acknowledgement

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Forty Years Ago in Pest Control

by William Quarles

Although some might not agree, we have made progress in finding less harmful ways to manage pests over the last forty years. As an example, we are excerpting some passages from "Controlling Household Pests," USDA Home and Garden Bulletin No. 96, which was written in 1964 and revised in 1969.

The pamphlet gives some good information on sanitation, exclusion and other good practices that are now part of structural IPM, but pesticide recommendations by today's standards are harsh....

Bed bugs

"Household surface sprays containing DDT, lindane, malathion, ronnel, or pyrethrum are usually effective against bed bugs. Sometimes the bugs are resistant to DDT or lindane....Spray the slats, springs, and frames of the bed. Apply enough spray to wet them thoroughly. Cover the mattresses completely with spray, but do not soak them..."

Clothes Moths

"One way to protect fabrics, blankets, and other susceptible items is to spray them with a stainless household insecticide containing DDT, methoxychlor, Perthane or Strobane. In treating woolens, you may hang them on a clothesline and spray them lightly and uniformly with insecticide until their surfaces are moist. Do not soak or saturate them. Excessive spray may cause a white deposit after the fabric dries."

Fleas

"Apply a surface spray containing DDT, methoxychlor, malathion,

ronnel or pyrethrum. Treat baseboards, cracks in the floor, rugs, carpets, furniture, and places where the pet habitually sleeps. You may have to repeat the treatment after about a week."

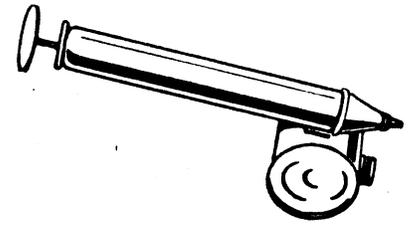
Golden Age of DDT

This pamphlet of about 40 years ago actually marks the end of the Golden Age of DDT. Rachel Carson's *Silent Spring*, which was published in 1962, had already pointed out the problems with DDT, and had started to turn public opinion against it.

DDT had an extensive influence on how the pest control industry developed. It was inexpensive, and it was effective before overuse caused insect resistance and environmental problems. The initial success of DDT promoted a chemical control mentality that is still with us today. "Well, if DDT is too toxic, what can I spray to kill the bugs?"

According to Robert van den Bosch in *The Pesticide Conspiracy* [Doubleday, Garden City, NY, 1978], "DDT catalyzed an explosive expansion of the pesticide industry...The resultant expansion was so rapid and massive that it simply steam rolled pest control technology. Entomologists and other pest control specialists were sucked into the vortex, and for a couple of decades became so engrossed in developing, producing, and assessing the new pesticides that they forgot that pest control is essentially an ecological matter."

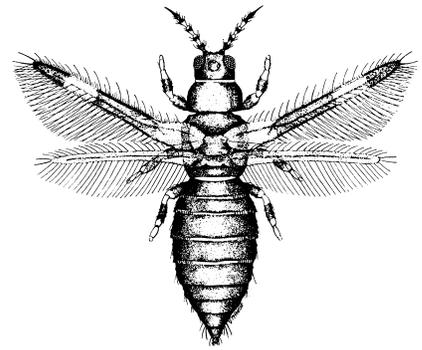
Rachel Carson, Robert van den Bosch and others started the journey back from purely chemical methods toward integrated pest management and a more ecological approach.



However, DDT never really went away. It is still with us. It is in our bodies. Hopefully we have learned something.



IPM for Garden Thrips



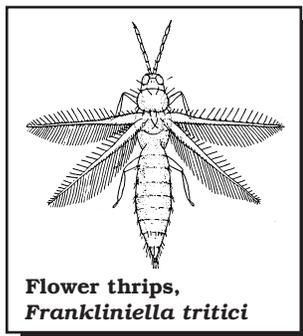
by William Quarles

Adult thrips are very small winged insects, about 1/25 inch long (less than 1.5 mm). Life stages include eggs, larvae, pupae, and adults. Eggs are laid in flowers, on foliage, or inside plant tissue. Hatching larvae feed on foliage, then drop to the ground to pupate. Emerging adults fly back up to the foliage to feed and to mate. Adults and larvae have similar long, thin shapes, except adults have fringed wings, larvae have none. Thrips range in color from translucent white or yellowish to dark brown or blackish, depending on the species and life stage (Olkowski et al. 1991; Dreistadt 2004a).

Thrips feed by scraping the surface of plant tissue and sucking up juices. Heavily infested leaves appear brownish or silver and dried rather than wilted. Thrips attack flowers, leaves, fruit, twigs, or buds. Damaged leaves may be distorted and discolored and may drop prematurely. Feeding by thrips causes tiny scars on leaves and fruit, and they can leave black fecal spots on the leaves that look sooty and dirty (Dreistadt 2004a).

Western flower thrips, *Frankliniella occidentalis*, is the most abundant and widely distributed thrips in the U.S. Adults are yellowish with a dark abdomen. This species, like many thrips, is primarily a pest of herbaceous plants, but can damage flowers on woody plants such as roses. Thrips injure roses by rasping the soft plant tissue and sucking up the plant fluid. Their feeding causes blotches or spots on flower petals or leaves, as well as browning, disfiguring and reducing the lifespan of the buds. If the buds do open, the flowers may have brown edges. White and light-colored roses seem to be more attractive to thrips than those of any other color. Western flower thrips is also a vector of plant viruses that can do considerable damage (Hsu and Quarles 1995; Swiadon and Quarles 2004).

Greenhouse thrips, *Heliothrips haemorrhoidalis*, infests many perennial plants, especially azaleas and rhododendrons, on the underside of leaves. Adults are black with a red-tipped abdomen. Populations spread slowly, so pruning off colonies can be effective if the undersides of leaves on susceptible plants are regularly inspected to allow early detection (Olkowski et al. 1991; Dreistadt 2004).



Flower thrips,
Frankliniella tritici

Monitoring

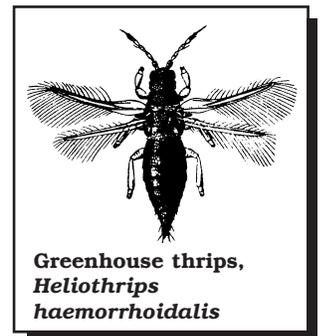
Thrips are most numerous during late spring and midsummer. Monitor for thrips by shaking foliage and flowers onto a sheet of paper. Adults can also be monitored using bright yellow or blue sticky traps (see Resources). Large numbers of thrips in traps or flowers do not necessarily mean that control action is needed. Treatment thresholds will vary with the site and aesthetic expectations. Thresholds are much lower if a virus is suspected. Diagnostic kits can be purchased to analyze for plant viruses (see Resources). Indicator plants such as petunias that are extremely susceptible to viruses can help with detecting plant viruses, such as impatiens necrotic spot virus or tomato spotted wilt virus (Dreistadt 2004; Hsu and Quarles 1995).

Cultural Controls

High thrips populations are frequently a response to drought stress. Water washing, and a thorough soaking of the earth, plus addition of a compost mulch, may solve the problem. Thrips can be knocked off plants with a spray of water. Keep the plants well watered but use nitrogen fertilizer sparingly.

Control of thrips is difficult, as their breeding often takes place outside the garden, and they can hide deep within a blossom. Dead-heading by removing and disposing of old blossoms may help reduce flower thrips. Prune and destroy infested buds and terminals. Do not shear or stimulate new growth. Prune by cutting plants just above branch crotches and nodes instead of shearing off terminals (Dreistadt 2004).

Thrips secrete honeydew, and ants will protect thrips to benefit from these sweet secretions. Controlling ants will also help control thrips. Ant baits, or if possible, sticky barriers to prevent ant access to plants should be used. Since thrips can move into landscape plantings from nearby weedy areas, weed control can help prevent thrips. If the infestation is severe, investigate the availability of resistant cultivars (Olkowski et al. 1991).



Greenhouse thrips,
Heliothrips haemorrhoidalis

Physical Controls

Populations can be monitored with sticky traps that also provide some control. If annual infestations are severe, young plants can be protected by row covers. Apply row covers during planting or before crops emerge. A drip or furrow irrigation system is necessary when using row covers (Olkowski et al. 1991).

Reflective mulches may prevent or delay infestations of aphids, leafhoppers, thrips, and whiteflies. Reflective mulches might be cost effective when viruses are a threat. Reflective mulches cease to repel insects when the plant canopy covers more than about 60% of the soil surface. Silver or gray are the most effective colors for reflective mulch or mesh, but white is also effective (Dreistadt 2004).

Biological Controls

Thrips are eaten by lady beetle and lacewing larvae, and by other predators such as spiders and minute pirate bugs, *Orius insidiosus*. Predatory mites can be applied to foliage and flowers. Commercially available species include *Amblyseius cucumeris* and *A. degenerans*. Beneficial nematodes such as *Steinernema* spp. can kill the pupal stage in soil. To find suppliers of these biocontrols, see the 2005 *Directory of Least Toxic Pest Control Products produced by BIRC*. (Some suppliers are listed in Resources.) Conserving beneficials by insectary plantings and avoiding pesticides will help with biocontrol. Insectary plants produce pollen and nectar that help to feed beneficials (Quarles and Grossman 2002).

Chemical Controls

When monitoring shows there is a problem, neem extracts (Azatin®, Azatrol®, Neemix®), insecticidal soap, or horticultural oil can be applied. Usual concentrations are about 1-2% in water. As much as possible, spray infestations directly. Spray thoroughly, and give attention to the underside of leaves. These materials leave no toxic residuals and conserve biocontrols. Applications are needed every 5 days or so because only larvae and adults are killed. Eggs may be protected within plant tissue and pupae live in the soil.

Sprays of spinosad (Conserve, Bullseye) will also have a low impact on beneficials. Sprays of pyrethrins can help control thrips, if the

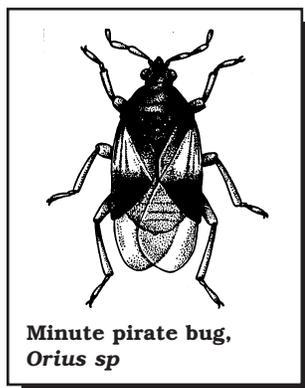
pesticide is applied directly to infestations. Pyrethrins leave a toxic residue, but break down very quickly in the environment.

References

BIRC (Bio-Integral Resource Center). 2005. *Directory of Least-Toxic Pest Control Products*. BIRC, PO Box 7414, Berkeley, CA 94707; www.birc.org; 52 pp.

Resources

- Diagnostic Kits—Neogen Corp., 620 Leshar Place, Lansing, MI 48912; 800/234-5333, 517/372-9200, Fax 517/372-0108; www.neogen.com.
- Neem (Azatrol®)—PBI/Gordon Corp., PO Box 014090, Kansas City, MO 64101; 800/821-7925, 816/421-4070, Fax 816/474-0462; www.pbigordon.com.
- Neemix®, Azatin®—Certis, 9145 Guilford Rd. Suite 175, Columbia, MD 21046; 800/250-5020, 301/604-7340, Fax 301/604-7015; www.certisusa.com.
- Harmony Farm Supply, 3244 Gravenstein Hwy, No. B, Sebastopol, CA 95472; 707/823-9125, Fax 707/823-1734; www.harmonyfarm.com.
- Nematodes—BioLogic, PO Box 177, Willow Hill, PA 17271; 717/349-2789, Fax 801/912-7137; www.bio-ologico.com.
- Natural Insect Control, RR#2, 3737 Netherby Rd., Stevensville, Ontario, CANADA LOS 1S0; 905/382-2904, Fax 905/382-4418; www.natural-insect-control.com
- Predatory Mites—Nature's Control, PO Box 35, Medford, OR 97501; 800/698-6250, 541/245-6033, Fax 541/899-9121; www.naturescontrol.com.
- Rincon-Vitova, PO Box 1555, Ventura, CA 93002; 800/248-2847, 805/643-5407, Fax 805/643-6267; www.rinconvitova.com.
- The Green Spot, Ltd., Dept. of Bio-Ingenuity; 93 Priest Rd., Nottingham, NH 03290; 603/942-8925, Fax 603/942-8932; www.greenmethods.com.
- Pyrethrins, MGK Company, 8810 10th Avenue North, Minneapolis, MN 55427; 888/794-2642, 763/544-0341, Fax 763/544-6437; www.pyganic.com.
- Harmony, see above.
- Row Covers—Harmony see above. Peaceful Valley Farm Supply, PO Box 2209, 125 Clydesdale Court, Grass Valley, CA 95945; 530/272-4769, Fax 530/272-4794; www.groworganic.com.
- Spinosad (Bullseye)—Gardens Alive, 5100 Schenley Place, Lawrenceburg, IN 47025; 812/537-8650 or 812/537-8652, Fax 812/537-8660; www.gardensalive.com.
- Sticky Traps—Nature's Control, PO Box 35, Medford, OR 97501; 800/698-6250, 541/245-6033, Fax 541/899-9121; www.naturescontrol.com.
- Harmony, Peaceful Valley.



Minute pirate bug,
Orius sp

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