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Medical Problems and Treatment Considerations for the Red Imported Fire Ant

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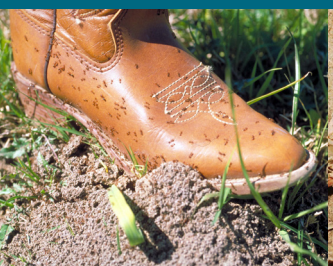
DISCLAIMER: This fact sheet reviews information regarding medical problems caused by the red imported fire ant. It is not intended to provide treatment recommendations for fire ant stings or reactions that may develop as a result of a stinging incident. Readers are encouraged to seek health-related advice and recommendations from their medical doctors, allergists, or other appropriate specialists.

Imported fire ants cause medical problems when sterile female worker ants sting and inject a venom that can cause localized sterile blisters, whole body allergic reactions such as anaphylactic shock, and, occasionally, death. Fire ant species include the red imported fire ant, *Solenopsis invicta* Buren (Hymenoptera: Formicidae); the black imported fire ant, *Solenopsis richteri* Forel; and the hybrid between *S. invicta* and*S. richteri.* In Texas, *S. invicta* is the only imported fire ant, although several species of native fire ants occur in the state. These include the tropical fire ant, *S. geminata* (Fabricius) and the desert fire ant, *S. xyloni* McCook, which are also capable of stinging (see *Texas Pest Ant Identification: An Illustrated Key to Common Pest Ants and Fire Ant Species* for identification keys).

Over 40 million people live in the southeastern United States in areas infested by the red imported fire ant. Each year, an estimated 14 million people are stung. According to the Scripps Howard Texas Poll (March 2000), 79 percent of Texans had been stung by fire ants in the year of the survey, while 20 percent of Texans report not ever having been stung. West Texans were least likely to have been stung by fire ants (61 percent) compared with 90 percent in central, 89 percent in east, 86 percent in gulf, 78 percent in South, and 72 percent in north Texas.

A survey of 1,286 health practitioners in South Carolina estimated that more than 33,000 people (94 per 10,000 population or 0.94 percent) seek medical attention for imported fire ant stings, and of these, 660 people (1.9 per 10,000 population or 0.02 percent) are treated for anaphylaxis (Caldwell et al. 1999). Anaphylaxis occurs in 0.6 to 6 percent of people who are stung, and these reactions have caused more than 80 deaths (deShazo et al. 1999).

In 1998, the average household cost for imported fire ant problems per Texas household in urban





areas was $150.79, with $9.40 spent on medical care costs. The total annual metroplex (Austin, Dallas, Ft. Worth, Houston, and San Antonio) expenditures for medical care costs was 9 percent, or $47.1 million of the $526 million total expenditure cost due to the red imported fire ant (see *Economic Assessments of Red Imported Fire Ant on Texas' Urban and Agricultural Sectors*).

Avoid Being Stung

The best tip for avoiding medical emergencies associated with fire ants is to prevent being stung.

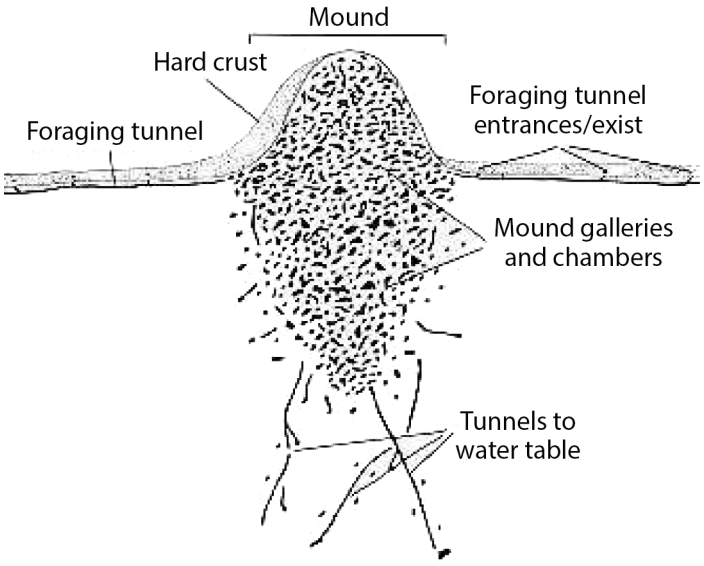
- Learn to recognize threatening situations and control them where they are a potential problem (see *How Can I Tell If I Have Fire Ants?* and publications and fact sheets on the Texas Imported Fire Ant Research and Management Project website).
- Be aware of fire ants and take care to not stand on ant nests or food resources on which they are foraging.
- Teach children and visitors about fire ants and their hazards.
- Wear protective clothing such as boots during outdoor activities and tuck pant legs into your socks.
- Control ants where they occur in areas used most frequently by people or pets. Use insect repellents on clothing or footwear (these treatments can temporarily discourage foraging ants).
- Teach people new to the area about this threat (see *Welcome to Texas: Avoiding the Sting of Fire Ants*).

Avoid High-Risk Situations

Quick defensive reaction. Imported fire ant workers aggressively defend their nests from invaders. When fire ant mounds are disturbed, worker ants quickly rush to the surface and climb up any vertical objects such as grass blades, sticks, or legs of people or animals standing on or near the nest. Under mild to high temperature conditions, this reaction is almost immediate. However, the reaction can be delayed when temperatures are cooler (less than 55˚F, causing cold-blooded ants to move more slowly) or extremely hot (over 95˚F, causing worker ants to reside deeper in the soil). Generally, these ants can begin to sting within 10 to 20 seconds after climbing upon their victims.

Do not disturb ant nests. Although most people avoid large visible ant mounds, they can inadvertently step on smaller mounds or nests with little "worked" soil. Colonies can also form under rocks, wood, or other debris on the ground. Furthermore, stepping on a mound may be almost unavoidable in some areas where there are more than 200 mounds per acre, as found in areas infested with the multiple queen (polygyne) form of the fire ant.

Colonies frequently migrate from one site to another on the surface of the ground or in cracks during dry periods. Ants in migrating colonies are highly defensive and should be avoided. Also, during flooding conditions, colonies can float in clusters or "rafts," posing a threat to anything encountering them (see *What happens to fire ants during a flood?* and *Flooding and Fire Ants: Protecting Yourself and Your Family*).



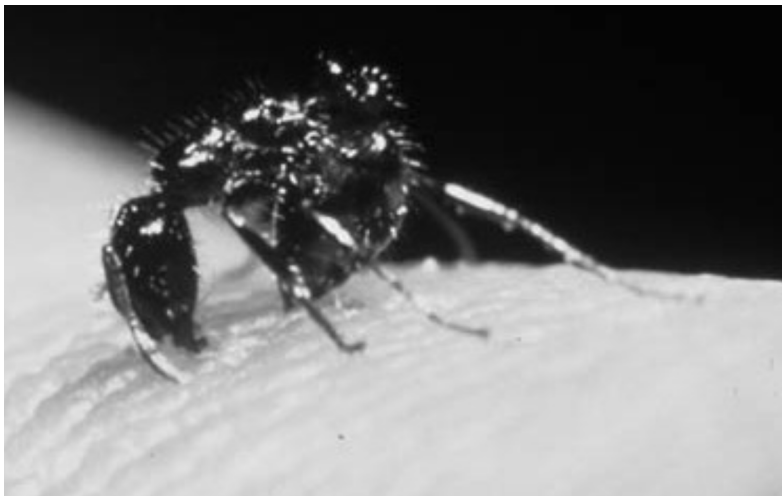
Watch for foraging ants. People weeding in landscape beds or vegetable gardens, or merely walking through tall vegetation can encounter foraging worker ants. These ants will readily sting, particularly when caught underneath clothes or pinched in folds of skin.

In fire ant mounds, worker ants produce subterranean tunnels that lead to openings where foragers emerge. Upon discovering needed resources, foraging ants recruit other worker ants to those sites (see *What do fire ants eat?*). Thus, edges of bodies of water, trash cans, and areas with spilled food or sugary drinks attract large numbers of foraging workers.

Expect indoor invasions. Fire ant workers can easily enter structures through even tiny cracks and crevices. They forage in and around laundry, pet bowls, or other areas where they find food and water resources. Occasionally, entire colonies will migrate into structures and nest in wall voids or other locations. This is particularly common when outdoor conditions become very hot and dry or when flooding occurs in the immediate landscape. During the night, fire ants can move into the beds of children or immobile people. A number of serious multiple stinging incidents have occurred indoors in Texas (Drees 1995) and elsewhere (deShazo et al. 1999). Frequently, samples of ants are not collected when these indoor stinging incidents are discovered, making it impossible to determine if the imported fire ants were foraging from colonies located elsewhere, such as outdoors, or if the ants were from a migrating colony as indicated by the presence of brood (eggs, larvae, and pupae among the adult ants).

The Stinging Incident

Individual worker ants can bite and sting several times. When stinging, the worker attaches to the skin with its chewing mouth parts (mandibles), pulling the skin, pinching it, and raising



it slightly, causing a pricking sensation. Then the ant arches its back, doubles under its abdomen, and forces the stinger into the tissue. After inflicting the first sting, it may remove the stinger and, rotating or pivoting around its head, may sting several more times, leaving a circular pattern of sting sites.

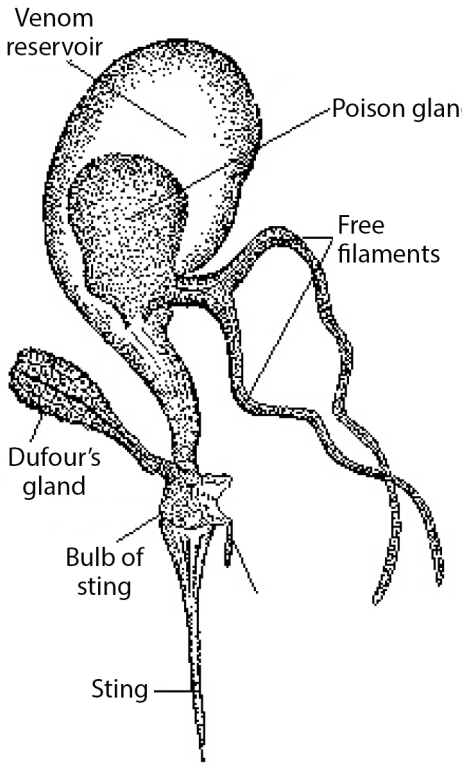
Multiple stinging incidents from many ants. Because large numbers of worker ants are often together, as in a nest, stinging incidents usually involve multiple stings. When a person steps into a mound, hundreds of ants can rapidly crawl (1.6 centimeter per second) up their leg. Within seconds, they begin stinging almost simultaneously. High numbers of stings can lead to severe medical reactions even in people with normal immune systems. The elderly, infants, neurologically compromised people, and otherwise immobile or unaware individuals are at a higher risk of multiple stinging incidents and should be supervised carefully.

Removing Stinging Ants

Because worker ants use their jaws (mandibles) to gain leverage to sting, they are fixed tightly to the skin or clothing. Merely jumping into water or running water from a spigot across the ants will not remove them. The best method is to rub them off briskly by hand or using a cloth.

The Stinger, Poison Gland, and Venom

The "stinger" on worker ants is a modified egg-laying structure (ovipositor). Worker ants are sterile females incapable of producing eggs. A poison gland containing venom is attached to the stinger. Queen and winged reproductive (unmated queen) ants also have a poison gland. However, they do not use their ovipositor as a stinger as do worker ants. Male ants, wasps, and bees do not possess stingers.



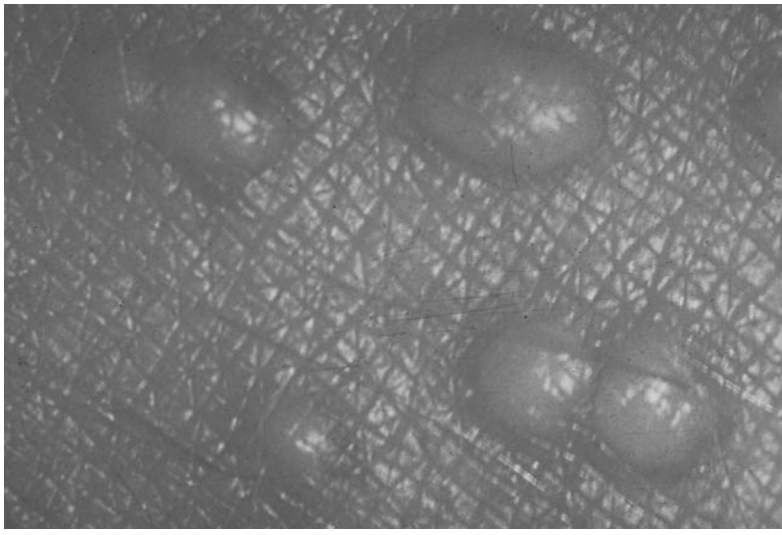
Imported fire ants produce venom in a gland connected to the stinger. The venom contains two major components: alkaloids and proteins. The oily aliphatic substituted alkaloids (i.e., the piperidine alkaloid, Solenopsin A) are toxic to cells and cause a pustule to form by killing cells at the site of the injection. These dead cells attract the body's defensive white blood cells, which accumulate at the venom site and form a pustule. If the skin is broken by scratching, bacteria may enter, causing an infection. The venom also contains a protein component (less than 1 percent), which has little or no effect on most people. However, some people are sensitive to these proteins, and a sting can lead to a major allergic reaction called anaphylactic shock (Vinson and Sorenson 1986; also see Baer et al. 1997, Hoffman et al. 1988).

Reactions to Stings

People vary greatly in their sensitivity to fire ant stings. Some claim to be "resistant" to the venom. Others are hypersensitive to it or may have other medical conditions (such as a heart condition or diabetes) that can result in serious medical problems or even death from a single sting. Secondary bacterial infection can also be a problem and might require longer-term medical attention. While most people can tolerate many stings, severe allergic reactions (anaphylaxis) occur in less than 1 percent of the people stung by fire ants.

Localized skin reaction to venom. The site of the sting hurts for a few minutes and then reddens; then it swells into a bump or hive within 20 minutes. The intense burning sensation that occurs when the venom is injected accounts for the popular name of "fire ant."

Within several hours to a day after being stung, most people develop a white fluid-filled sterile pustule characteristic of the imported fire ant sting. No other Texas ants cause this type



of reaction to the venom. These pustules last for several days and may become infected and require medical attention. For most people, the pustule dries up in several weeks. For some people the pustule may lead to a brown scar that can last for many months or leave a permanent scar. Some people stung (17 to 56 percent) develop venom-specific IgE and experience hard, itching lumps at the site of subsequent stings called late cutaneous allergic reactions (Caro et al. 1957, deShazo et al. 1999). Although stings are not usually life threatening, they can easily become infected if the skin is broken.

Whole body reactions. Symptoms of anaphylaxis can include dizziness, headache, low blood pressure, nausea, shortness of breath, and sweating. If any of these symptoms occur, the person requires immediate medical attention. Anaphylactic shock can lead to death. People who show symptoms of anaphylactic shock should seek advice from an allergist before entering known fire-ant-infested areas. Other syndromes attributed to fire ant stings include seizures, cerebrovascular incidents, neuropathy, and nephrotic syndrome (deShazo et al. 1999).

Texas Allergy, Asthma and Immunology Society Addresses Fire Ant Allergies

According to the Texas Allergy, Asthma and Immunology Society (taais.org/patient-education/fire-ants/), "Fire ants cause severe, life-threatening reactions in people allergic to them. More people have died from allergic reactions to fire ants in Texas than anywhere in the U.S. . . . If you are allergic to fire ants, find out where you can get effective treatment and reduce your risk of a serious reaction to a fire ant sting. . . . Fire ants are the most common cause of allergic reactions to stinging insects in Texas. . . . "Severe allergic reactions (anaphylaxis) occur in 1–6% of people stung by fire ants and occasionally these reactions may be fatal."

Bite and Sting Treatment Options

- For minor stinging incidents, with the only symptoms being pain and the development of pustules, treat stings with over-the-counter products that relieve pain and prevent infection (see Appendix 1).
- For those suffering just pain and the development of pustules, a simple solution of half bleach and half water applied immediately to the area can reduce the pain, itching, and, perhaps, pustule formation. It is essential to apply it quickly (Vinson and Sorenson 1986).
- If a sting causes severe chest pain, loss of breath, nausea, serious swelling, slurred speech, or severe sweating, take the person to an emergency medical facility immediately.

Preventing pustules. If you can remove fire ants as they are biting but before they sting, they will not inject venom and a pustule will not form. Once the venom has been injected, pustules will usually form regardless of treatment: "Topical steroids, diphenylhydrazmine, antibiotics, or epinephrine do not alter the course of pustular reactions" (Caro et al. 1957, Parino et al. 1981). Regardless, take action as soon as possible after the attack to get maximum benefits from treatment.

Medical treatment considerations (for medical doctors)**.** In patients without anaphylaxis, a conservative approach is suggested, similar to that used for small numbers of stings, which, more often than not, are associated with acute itching and burning followed by the development of sterile pustules. In such cases, remove the ants by washing the affected area with an antiseptic soap. Relieve itching with nonsedative antihistamines. Two of these, cetirizine (Zyrtec) and loratadine (Claratin), are available in liquid form for use in children and patients with feeding tubes. Itching can also be treated with applications of topical corticosteroids such as 1 percent hydracortisone (0.1 percent triamcinolone), and topical anti-itch agents such as pramoxine

HCl 1 percent (such as Anusol, Cacoryl). Take care to not rupture the sterile pustules because resulting lesions occasionally become infected. Intravenous fluids or parenteral corticosteroids for fire ant stings are not recommended unless there is evidence of hypersensitivity to fire ant venom. These agents may lead to fluid retention and cardiovascular compromise in patients with preexisting cardiovascular insufficiency. The ant sting sites rarely become infected and antibiotic prophylaxis is therefore not routinely required.

"Symptoms of anaphylaxis should be treated with epinephrine, parenteral corticosteroids, and antihistamines, as is standard procedure" according to R. D. deShazo (deShazo et al 1999 edited by Dr. B. Paull). Adrenalin is the first-aid treatment of choice for the systemic allergic response with dyspnea and/or hypertension. It achieves the quickest reversal of the adverse events and is very safe in a life-threatening situation. Anyone who has had stinging-insect-induced anaphylaxis should carry an EpiPen (or EpiPen Jr for children; CSL) for immediate first-aid use if hypotension or dyspnoea occurs. Specific desensitization to prevent future anaphylaxis to imported fire ant stings in susceptible patients is effective (Freeman et al. 1992), and anyone suspected of imported fire ant sting anaphylaxis should be referred to an allergist for assessment" (Solley et al. 2002).

Acknowledgments

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Texas Pest Identification: An Illustrated Key to Common Pest Ants and Fire Ant Species
u.tamu.edu/ento-001

Economic Assessments of Red Imported Fire Ant on Texas' Urban and Agricultural Sectors
sswe.tamu.edu/PDF/SWE_S25_P123-137.pdf

How Can I Tell If I Have Fire Ants?
www.extension.org/pages/11278/identifying-fire-ants

Texas Imported Fire Ant Research and Management Project website
fireant.tamu.edu

Welcome to Texas: Avoiding the Sting of Fire Ants u.tamu.edu/ento-002

What happens to fire ants during a flood?
www.extension.org/pages/62880/what-happens-to-fire-ants-during-a-flood

Flooding and Fire Ants: Protecting Yourself and Your Family
u.tamu.edu/ento-006

What do fire ants eat?
www.extension.org/pages/60922/what-do-fire-ants-eat

Managing Red Imported Fire Ants in Urban Areas
www.extension.org/pages/11004/managing-imported-fire-ants-in-urban-areas-printable-version

Broadcast Baits for Fire Ant Control
www.agrilifebookstore.org/product-p/e-628.htm

Fire Ant Control: The Two-Step Method and Other Approaches
www.agrilifebookstore.org/product-p/ento-034.htm

APPENDIX 1.

Over-the-Counter Products and Reported "Home Remedies for Treating "Bites" and Stings of Red Imported Fire Ants

Over-the-counter products: There are many over-the-counter products promoted for treating insect bites and stings commonly formulated as creams, lotions, ointments, or solutions containing one or more "active ingredients." Some product labels specifically mention fire ant "bites" and stings, others are for general purpose. Available without a prescription, these products should be used according to directions provided on product labels. If the condition for which these preparations are used persists, or if infection, irritation, or rash develops, discontinue their use and consult a physician.

Common active ingredients: The surface anesthetic, benzocaine, is a common ingredient that inhibits the conduction of nerve impulses from sensory nerves. The antihistamine, benadryl, also has some localized anesthetic activity, relieving itching. The corticosteroid, hydrocortisone, has anti-inflammatory, antipruritic (anti-itching), and vasoconstrictive actions when applied topically. Antiseptics prevent secondary infections. Calamine is an astringent.

Home remedies: (These are provided for educational purposes only and do not constitute a recommendation for use by the Texas A&M AgriLife Extension Service) Non-commercial treatments of stings and bites include placing an ice cube over the skin to reduce pain. There are many other reported "home remedies" for fire ant stings. Most of these have not been scientifically evaluated or tested and are supported merely by testimonials. Some of these include dabbing the affected area with ammonia, meat tenderizer (papain), or a paste made of salt or crushed aspirin or stick deodorant. A collection of these testimonials follows:

- "For those suffering pain and the development of pustules, a simple solution of half bleach and half water applied immediately to the area can reduce the pain, itching, and pustule formation. It is essential to apply it quickly." (Vinson and Sorenson 1986)
- Desert Essence Tea Tree Oil—Chatsworth, CA 91311 or Extinguish (100%) Tea Tree Oil Relieves the pain and itch of Fire Ant Stings! Tea tree oil (Melaleuca alternifolia) is a natural oil that comes from the tea tree grown only in Australia. The oil's medicinal properties were discovered in the 1920s and researched extensively until the end of the 1930s. Tea tree oil has increased in popularity in the past 20 years. It is soothing and healing to insect bites and stings, poison ivy/oak, and other minor skin injuries. It is a natural antiseptic/fungicide/germicide. Extinguish (not to be confused with Extinguish ant bait by Wellmart International containing s-methoprene) is very effective when used on fire ant stings and other insect bites and stings such as chiggers, fleas, and mosquitoes, etc. It is most effective when applied directly after a sting with reapplication as needed. Extinguish relieves the itch, pain, and promotes healing. The bottle is small for ease in carrying and use. For very sensitive skin, Extinguish can be diluted with olive oil. — Handout, Whole Food Store, Austin, TX.
- Fire ant remedy No. 289: soak one cotton ball in household ammonia and another in hydrogen peroxide. Beginning with the ammonia, alternate, applying the pads to the bites for five-minute stints for about 20 minutes. — *Austin American Statesman*, June 8, 1998, Jane Greig column
- Immediately apply 100 percent aloe gel (found at Walgreens or other pharmacies). — R. Foley, Tampa, FL.

- "We use dishwashing liquid to treat fire ant bites. My son was bit today, and within 10 minutes, we washed it with soap and water and applied dishwashing liquid. The swelling and itching subsided in about 10 minutes and he's fine now."— J. M. Ira
- "Did you know that if you rub a fresh piece of onion on a fire ant bite as soon as possible, it never swells up and quits stinging?" — C. Snell
- "I have joyously found Arnica Gel by Boiron. It is a homeopathic medicine and it takes the sting, burn, and itch out of fire ant bites." — C. M. Fillieli

For more information regarding fire ant management, see Extension publications *Managing Red Imported Fire Ants in Urban Areas, Broadcast Baits for Fire Ant Control*, or *Fire Ant Control: The Two-Step Method and Other Approaches* posted on http://AgriLifeBookstore.org.

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