



MEDICAL PROBLEMS AND TREATMENT CONSIDERATIONS FOR THE RED IMPORTED FIRE ANT

Bastiaan M. Drees, Professor and Extension Entomologist

DISCLAIMER: This fact sheet provides a review of information gathered regarding medical aspects of the red imported fire ant. As such, this fact sheet 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, which 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*, cause medical problems when sterile female worker ants from a colony sting and inject a venom that cause localized sterile blisters, whole body allergic reactions such as anaphylactic shock and occasionally death. In Texas, *S. invicta* is the only imported fire ant, although several species of native fire ants occur in the state such as the **tropical fire ant**, *S. geminata* (Fabricius), and the **desert fire ant**, *S. xyloni* McCook, which are also capable of stinging (see [FAPFS010](#) and [013](#) for identification keys).

Over 40 million people live in areas infested by the red imported fire ant in the southeastern United States. An estimated 14 million people are stung annually. According to The Scripps Howard Texas Poll (March 2000), 79 percent of Texans have been stung by fire ants in the year of the survey, while 20% 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 over 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 persons who are stung, and these reactions have been reported to 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 being 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 (Lard et al. 2002).

AVOID BEING STUNG

The best tip for avoiding medical emergencies associated with fire ants is to prevent being stung by learning to recognize threatening situations and controlling them where they are a potential problem (see publications and fact sheets on <http://fireant.tamu.edu>).

- Be aware of fire ants and take care not to stand on ant nests or resources on which they are foraging.
- Teach children and visitors about fire ants and their hazard.
- Wear protective clothing during outdoor activities, such as boots and/or tuck pant legs into 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).

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 on any vertical objects such as grass blades, sticks or legs of people or animals that are standing on or near to the nest. Under mild to high temperature conditions, this reaction is almost immediate. However, when temperatures are cooler (less than 55 degrees F, causing cold-blooded ants to move more slowly) or extremely hot (over 95 degrees F, causing worker ants to reside deeper in the soil), reaction can be delayed. Generally, these ants can begin to sting within 10 to 20 seconds after climbing upon victims.

Do not disturb ant nests. Although large visible ant mounds are avoided by most people, smaller mounds or nests with little “worked” soil can be stepped on inadvertently. Colonies can also be formed under rocks, wood or other debris on the ground. Furthermore, stepping on a mound may be almost unavoidable in some areas where there are over 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 are capable of floating in clusters or “rafts,” posing a threat to

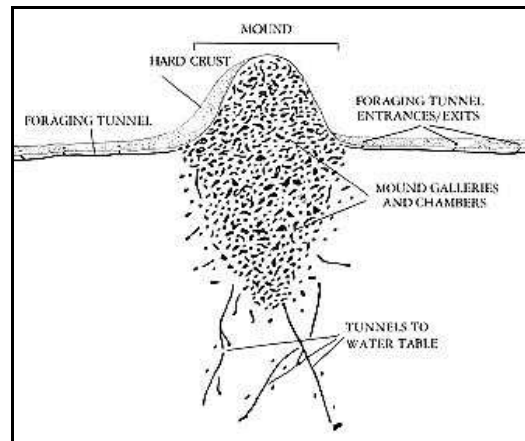


anything encountering them.

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 cloths or pinched in folds of skin. Fire ant mounds have subterranean tunnels produced by worker ants that lead to openings where foragers emerge. Upon discovering needed resources, foraging ants recruit other worker ants to those sites. Thus, edges of bodies of water, trash cans and areas with spilled food or sugary drinks become areas where large numbers of foraging workers congregate.

Expect indoor invasions. Fire ant workers can easily enter structures through even tiny cracks and crevices and forage in and around laundry, pet bowls or other areas where food and water resources are encountered.

Occasionally, entire colonies will migrate into structures and nest in wall voids or other locations. This is particularly common when conditions outdoors become very hot and dry or when flooding occurs in the immediate landscape. Fire ants move into beds of children or immobile people during the night. 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 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 presence of brood (eggs, larvae and pupae among the adult ants).



THE STINGING INCIDENT

Single 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, doubling under its abdomen and forcing the stinger into the tissue. After inflicting the first sting, it may remove the stinger and, rotating or pivoting around the head, it may sting several more times, leaving a circular pattern of sting sites.

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

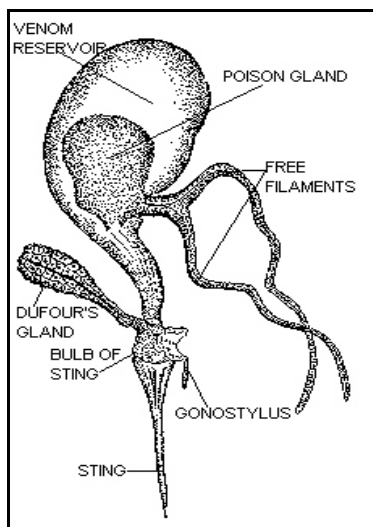


REMOVING STINGING ANTS

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 across ants from a spigot 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 contain a poison gland. However, they do not use their ovipositor as a stinger as do worker ants. Males of ants, wasps and bees do not possess stingers.



The venom of imported fire ants is produced in a gland connected to the stinger and 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).

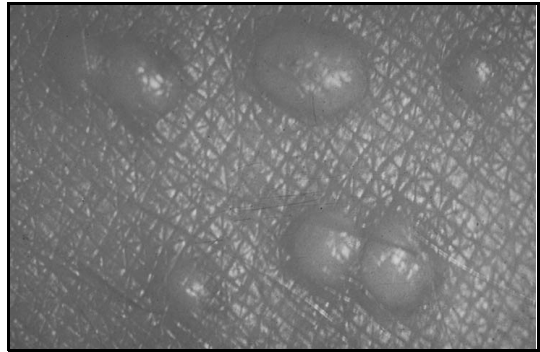
REACTIONS TO STINGS

People vary greatly to their sensitivity to fire ant stings, with some claiming to be “resistant” to the venom. Others are hypersensitive to venom or may have other medical conditions (e.g., heart condition, 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% of 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 a several hours to a day after being stung, most people develop an often white fluid-filled sterile pustule characteristic of imported fire ant sting. No other Texas’ ants are known to cause this type of reaction to the venom. These pustules last for several days 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 indurated, pruritic 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 be easily infected if the skin is broken.

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



BITE AND STING TREATMENT OPTIONS

- For minor stinging incidents, with the only symptoms being pain and the development of pustules, stings can be treated 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, nausea, severe sweating, loss of breath, serious swelling or slurred speech, the person should be taken to an emergency medical facility immediately.

Texas Allergy, Asthma and Immunology Society Addresses Fire Ant Allergies

A leaflet entitled “Are you allergic to fire ants?”, developed by the Texas Allergy, Asthma and Immunology Society encourages readers to call toll free: 1-888-451-9752. The text reads:

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. Don't live in fear - get help!”

The leaflet states that “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”.

Prevention of pustule formation. If fire ants are removed as they are biting, but before they can sting, venom will not be injected and a pustule will not form. Conversely, once venom has been injected, pustules will usually form regardless of treatment: “Topical steroids, diphenylhydramine, antibiotics, or epinephrine do not alter the course of pustular reactions” (Caro et al. 1957, Parino et al. 1981). Regardless, action should be taken as soon as possible after the attack to obtain maximum benefits from treatment.

Medical treatment considerations (for medical doctors). In patients without anaphylaxis, we suggest a conservative approach based on observation and treatment of symptoms. This treatment is similar to that used for small numbers of stings, which, more often than not, are only associated with acute itching and burning followed by development of sterile pustules. In such cases, the ants should be removed by washing with an antiseptic soap. Itching may be relieved by the use of 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 application of topical corticosteroids, such as 1% hydrocortisone (0.1% triamcinolone), and topical anti-itch agents, such as pramoxine HCl 1% (e.g., Anusol®, Cacoryl®). Care must be taken not to rupture the sterile pustules, because resulting lesions occasionally become infected. Intravenous fluids or parenteral corticosteroids for fire ant stings are not recommended unless evidence of hypersensitivity to fire ant venom is present; these agents may lead to fluid retention and cardiovascular compromise in patients with preexisting cardiovascular insufficiency. Site of ant stings 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 (quote from deShazo et al. 1999 edited by Dr. B. Paull).

“Adrenalin is the first-aid treatment of choice for the systemic allergic response with dyspnoea 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

The author wishes to thank Dr. Barry Paull, M. D. (Allergy Associates of Brazos Valley, 979/776-7895) and Dr. J. K. Olson, medical entomologist at Texas A&M University, for review of this manuscript.

Literature Citations and Sources of Additional Information

- Baer, H., T. Y. Liu and M. C. Anderson. 1979. Protein components of fire ant venom (*Solenopsis invicta*). *Toxicon* 17:397-405.
- Caldwell, S. T., S. H. Schuman and W. M. Simpson, Jr. 1999. Fire ants: a continuing community health threat in South Carolina. *J. South Carolina Medical Assn.* 95:231-235.
- Caro, M. R., V. J. Derbes, and R. Jung. 1957. Skin response to the sting of the imported fire ant (*Solenopsis saevissima*). *AMA Archives of Dermatology* 75:475-488.
- deShazo, R. D., C. Griffin, T. H. Kwan, W. A. Banks and H. F. Dvorak. 1984. Dermal hypersensitivity reactions to imported fire ants. *J. Allergy Clin. Immunol.* 74:841-847.
- deShazo, R. D., B. T. Butcher and W. A. Banks. 1990. Reactions to stings of the red imported fire ant. *N. Engl. J. Med.* 323:462-466.
- deShazo, R. D., D. F. Williams, E. S. Moak. 1999. Fire ant attacks on residents in health care facilities: a report of two cases. *Ann. Intern. Med.* 131:424-429.
- Drees, B. M. 1995. Red imported fire ant multiple stinging incidents to humans indoors in Texas. *Southwestern Entomol.* 20:383-385.
- Freeman, T. M., R. Hylander, A. Ortiz and M. E. Martin. 1992. Imported fire ant immunotherapy: effectiveness of whole body extracts. *J. Allergy Clin. Immunol.* 90:210-215.
- Hoffman, D. R. 1995. Fire ant venom allergy. *Allergy* 50:535-544.
- Hoffman, D. R., D. E. Dove and R. S. Jacobson. 1988. Allergens in Hymenoptera venom XX. Isolation of four allergens from imported fire ant (*Solenopsis invicta*) venom. *J. Allergy Clin. Immunol.* 82:818-827.
- Lard, C., D. B. Willis, V. Salin and S. Robison. 2002. Economic assessment of red imported fire ant in Texas, Pp. 123-1372. In Program highlights of the Texas Imported Fire Ant Research and Management Project, B. M. Drees (ed), *Southwestern Entomologist Supplement No. 25*.
- Parino, J., N. Kandawalla and R. F. Lockey. 1981. Treatment of the local skin response to imported fire ant sting. *South. Med. J.* 74:1361-1364.
- Prahlow, J. A., and J. J. Barnard. 1998. Fatal anaphylaxis due to fire ant stings. *Am. J. Forensic Med. Pathol.* 19:137-142.
- Rhoades, R. B., C. T. Stafford, F. K. James. 1989. Survey of fatal anaphylactic reactions to imported fire ants. *J. Allergy Clin. Immunol.* 84:159-162.
- Solley, G. O., C. Vanderwoude and G. K. Knight. 2002. Anaphylaxis due to red imported fire ant sting. *Medical J. Australia* 176(11):521-523
- Stafford, C. T. 1996. Hypersensitivity of fire ant venom. *Ann. Allergy Asthma Immunol.* 77:87-95.
- Vinson, S. B. And A. Sorenson. 1986. Imported Fire Ants: Life History and Impact. Texas Department of Agriculture, Austin, TX. 28 pp.

For more information regarding fire ant management, see Extension publications B-6043, *Managing Red Imported Fire Ants in Urban Areas*; B-6076, *Managing Red Imported Fire Ants in Agriculture*; B-6099, *Broadcast Baits for Fire Ant Control*; or L-5070 *The Texas Two-Step Method Do-It-Yourself Fire Ant Control for Homes and Neighborhoods*. Also visit our web site at <http://fireant.tamu.edu>.

The information given herein is for educational purposes only. Reference to commercial products or trade names is made with the understanding that no discrimination is intended and no endorsement by Texas Cooperative Extension or the Texas Agricultural Experiment Station is implied.

Educational programs conducted by Texas Cooperative Extension serve people of all ages regardless of socioeconomic level, race, color, sex, religion, disability or national origin.

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 ointments, creams, lotions or solutions containing one or more “active ingredients.” Some product labels specifically mention fire ant “bites” and stings (see listing below), 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 rash, irritation or infection develops, discontinue their use and consult a physician.

Common active ingredients. The surface anesthetic, benzocaine, is a common ingredient that inhibits 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.

Some examples of Fire Ant Specific Products:

- Wipe A way Pain™ Fire Ant Sting Medicated First Aid Gel - Wipe-Out! Company, Laguna Niguel, CA 92607-6246; 800/859-1520; www.wipeawaypain.com. Ingredients: 1% menthol, 3% camphor, formulated with aloe vera gel
- Re-Leaf with aloe for Fire Ant Bites Pain Relief Gel - Wilson Industries, Poloma, CA; 800/423-4277; www.wilsonindustries.com. Ingredients: Aloe concentrate, oil of tea tree, tocopherol (vitamin E), botanical complex #11, purified water
- Organic Plus® Sting Out - Bio Zapp Laboratories, Inc., San Antonio, TX 78217; 800/776-7721; www.organicinsecticide.com. Ingredient: “with aloe”
- Mitigator™ Sting and Bite Treatment - Mancini Ink, 914/941-2863, 914/941-3361 or FAX: 914/941-2850, mancink@ix.netcom.com

Some examples of general insect bite and sting over-the-counter treatments:

- Gnaraloo Sting-Aid® - Knight Industries, Inc., P. O. Box 50387 Pompano Beach, FL 33074; 305/942-8780; FAX: 305/946-0486. Ingredients: aluminum sulfate, CAS 7784-31-8, BTC 2125 M, water
- Campho-phenique® Pain Relieving Anticeptic Gel or Liquid - Bayer Corp., Morristown, NJ 07960; 800/331-4536; www.bayercare.com
- Easy-Ivy™ - Bethurum Research & Development, Inc., P. O. Box 3436, Galveston, TX 77552. Ingredients: process water (stream collected after passing through selected botanicals), sodium hypochlorite

Home remedies (Note: These are provided for educational purposes only and do not constitute a recommendation for use by the Texas Cooperative Extension): 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/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. A collection of these testimonials follow:

- 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 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 & itch of Fire Ant Stings! Tea Tree Oil (*Melaleuca alternifolia*) is a natural oil which comes

from the Tea Tree grown only in Australia. The oil's medicinal properties were discovered in the 1920's and was researched extensively until the end of the 1930's. Tea Tree Oil has increased in popularity in the past 20 years. It is a natural oil that is soothing and healing to insect bites and stings, poison ivy/oak and other minor skin injuries. Tea Tree Oil is a natural anticeptic/germicide/fungicide. "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 & stings such as mosquitoes, fleas, chiggars, etc. It is most effective when applied directly after sting with reapplication as needed. Extinguish relieves the pain, itch, 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 amonia and another in hydrogen peroxide. Beginning with the ammonia, alternate applyng the pads to the bites for firve minute stints for about 20 minutes - Austin American Statesman, June 8, 1998, Jane Greig Column
- Immediately apply 100% aloe jell (found at Walgreens or other pharmacy) - 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