

Multiple Fire Ant Stings Indoors

RICHARD D. DESHAZO, MD, Mobile, Ala, and DAVID F. WILLIAMS, PhD, Gainesville, Fla

ABSTRACT: The progressive spread and increasing colony density of imported fire ants throughout the southeastern United States will result in increasing numbers of individuals with untoward reactions to the stings of these insects. In order to alert physicians that imported fire ant colonies may exist within homes and other inhabited dwellings and result in multiple stings to the occupants and to provide information about the management of this problem, we report two cases where individuals were stung indoors by imported fire ants. One of these cases involved the attack of a bed-bound patient by a colony of ants. The other report documents the establishment of an intact fire ant colony within an inhabited dwelling. Physicians should become familiar with the biology of these insects to assist patients in dealing with this problem.

THE RED FIRE ANT, *Solenopsis invicta*, was imported into the United States in the 1930s through the port of Mobile, Ala. Early attempts to eradicate this ant failed, and it has now spread throughout the southern and southeastern United States and Puerto Rico.¹ Between 30% and 60% of individuals in areas where the fire ant is indigenous are stung each year.^{2,3} Most stings result in self-limited, painful, pruritic, wheal and flare reactions followed by a sterile pustule. However, local allergic reactions are common, and other forms of hypersensitivity reactions do occur^{4,5} (Table 1). At least 50 deaths have occurred from fire ant sting-related anaphylaxis, and a variety of other medical sequelae have been reported.^{2,7}

The rapid spread of imported fire ants (IFAs) has been facilitated by interstate commerce of nursery stock, the development of multiple queen colonies, hybridization of *S invicta* with the other IFA species *S richteri*, and the presence of heat sumps (such as paved roads) that have increased their ability to survive cold temperatures.⁶ As the density of IFA colonies has increased, they have come into progressively closer contact with man.

We recently reported⁸ the medical consequences of innumerable fire ant stings in three adults and one infant stung indoors in home, nursing home, and motel settings. One of those individuals died. We postulated that the attacks occurred by foraging ants that

encountered individuals who served as an acceptable food source that was either unable to withdraw or unaware of the stings. We now report a second death associated with multiple fire ant stings and a previously unreported occurrence, the construction of a reproductive fire ant colony within an inhabited dwelling. Physicians should be aware that humans are acceptable food sources for IFAs. Moreover, physicians caring for patients with multiple fire ant stings that occurred indoors should investigate the possibility that these patients are cohabiting with fire ant colonies that have taken up permanent residence in their environment. Such patients are at risk for multiple and repeated stings and their medical consequences.

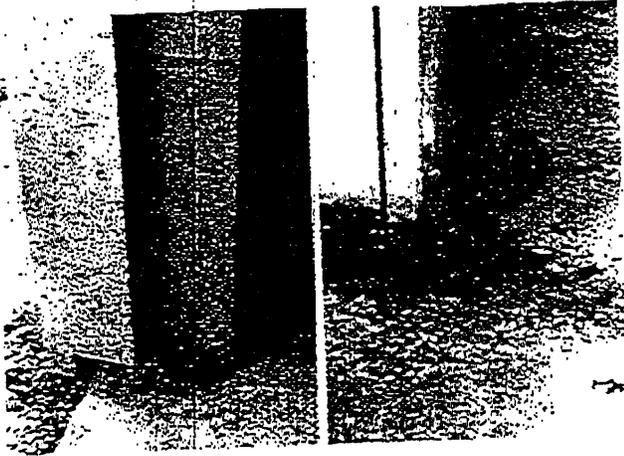
CASE REPORTS

Case 1. A 90-year-old Hispanic woman in a nursing home in Houston, Tex, had moderately severe dementia associated with multiple strokes, chronic congestive heart failure, and was no longer ambulatory. Nursing home personnel found her in bed covered with fire ants about 3 AM. Ants were noted coming from the patient's mouth. The nursing home had had an ongoing indoor problem with fire ants. The ants were washed off, multiple sting sites were identified over her entire body, and an antihistamine was administered. Because of increasing respiratory difficulty, she was admitted to a hospital approximately 6 hours later where parenteral corticosteroids were given. Despite treatment with oxygen, diuretics, and antibiotics, respiratory distress persisted, and she died 6 days later. The final diagnosis was respiratory failure, but no autopsy was obtained.

TABLE 1. Medical Consequences of Fire Ant Reactions

Local wheal and flare reaction followed by sterile pustule
Late-phase dermal reaction
Anaphylaxis
Neurologic reactions (seizures, mononeuritis multiplex, stroke)
Infection of sting sites

From the Division of Allergy and Immunology, Departments of Medicine and Pediatrics, College of Medicine, University of South Alabama, Mobile, and USDA-ARS Medical and Veterinary Entomology Research Laboratory, Gainesville, Fla.
Reprint requests to Richard D. deShazo, MD, 4th Floor Mastin, Suite A, 2451 Fillingim St, Mobile, AL 36617.



Left: Fire ant mounds above slab on first floor of patient's apartment building with ants visible on wall above. Other mounds were present under contiguous slabs. Right: Fire ant colonies along baseboard of family room of patient's apartment after treatment with insecticide. Colonies were constructed of same soil material used to construct outside mounds; material was obviously brought from outside.

Case 2. A 39-year-old woman and her 9-year-old daughter complained to the management of an apartment complex in Tampa, Fla, that the two of them and their family cat and dog were being repeatedly stung by fire ants inside their apartment. The apartment, which was on the second floor of a wooden three-story complex less than 10 years old, had been repeatedly exterminated. However, ants continued to be present. One of us (D.F.W.), an entomologist, was consulted by a pest control company and identified ants taken from the apartment to be *S. invicta*. Subsequently, the apartment and apartment complex were inspected. Colonies of ants were identified in the soil beneath the concrete slab foundation of the building and also above the slab in a first-floor corridor (Figure).

Ants were present throughout the apartment itself. On close inspection, a previously undetected lump was noted in the carpet along a wall in the living room. The carpet was pulled back to reveal a large colony with approximately 50,000 ants, including the brood and the queen. The mound was composed of soil transported into the apartment from outside (Figure). All colonies were exterminated.

DISCUSSION

We have previously reported⁸ four instances where individuals unable to withdraw from IFAs experienced multiple stings indoors. These include an infant in a crib, two patients with Alzheimer's disease, and a patient with diabetes and probable diabetic neuropathy. In this paper, we report a second death associated with indoor fire ant stings. Further, we report repetitive stings in two healthy individuals and their household pets by ants foraging for food from a colony within the confines of their own apartment.

Biology of IFAs

Imported fire ants are aggressive, reddish brown to black ants $1/8$ to $1/4$ inches long. They

usually build mounds of soil in sunny, open areas such as lawns, pastures, along roadsides, in meadows, under pavement, and around buildings. When their nests are disturbed or their foraging for food is interrupted, fire ants quickly attack any intruder. Entomologists have known for some time that fire ants occasionally move mounds indoors, especially after flooding, but this is not well appreciated outside the entomological community.

IFAs live in colonies that contain thousands of workers in varying sizes, immature ants (eggs, larvae, and pupae) called brood and the sexual castes. The sexual castes include winged males, winged females (unmated queens), and one or more mated queens. In the spring and early summer, the winged males and females fly from nests to mate in flight. After finding a suitable nesting site, mated females shed their wings. All the males die after mating. Newly mated queens can fly 12 miles or even further from the nest, but most land within a mile. Once a colony is established, a single queen may lay more than 2,000 eggs per day. Depending on temperature, adult workers develop in 20 to 45 days. Queens live an average of 6 to 7 years, and worker life span is usually 2 to 6 months.

Fire ants are omnivorous, feeding on carbohydrates (eg, honeydew, plant exudates, sugars, syrups), proteins (eg, insects, meats), and lipids (eg, grease, lard, oils from seeds). Their food preferences change depending on the needs of the colony. There are two types of fire ant colonies: single-queen or monogynous colonies and multiple-queen or polygynous colonies. Single-queen colonies have only 1 egg-laying queen and may contain as many as 100,000 to 240,000 workers. Multiple-queen colonies have many egg-laying queens (usually 20 to 60) and 100,000 to 500,000 workers. Single-queen colonies fight with other fire ant colonies. Because of this antagonistic behavior, colonies are farther apart, resulting in a maximum density of 40 to 150 mounds per acre. Multiple-queen colonies generally do not fight with other multiple-queen colonies. Consequently, mounds are closer together and can reach densities of 200 to 800 mounds per acre. Multiple-queen mounds may also be inconspicuous, oftentimes being clusters of small, flattened excavations, in contrast to the distinct dome-shaped mounds of single-queen colonies.

During food shortages, hot, dry periods of summer months, or times of heavy rainfall,

fire ants seek sites necessary for the colony's survival. The areas around homes and apartments offer ideal conditions for fire ants because of the availability of food (kitchen scraps, garbage cans, food in the sink, and pet food in dishes), moisture (water from sinks, faucets, toilets, and other sources), and protection from heat (temperature-controlled conditions). Movement into inhabited dwellings may be prompted by flooding, when IFAs move to the highest ground above the rising water.

Control Strategies and Techniques

Innumerable methods have been tried to control IFAs. Unfortunately, no control methods permanently eliminate fire ants from an area. Four strategies are currently being used to control fire ants: (1) broadcast bait applications, (2) individual mound treatments, (3) a combination of broadcast baiting and individual mound treatments, and (4) barrier and spot treatments. Consultation with a licensed pest control professional is recommended,^{9,10} however, physicians need to be aware of the generally accepted techniques and the chemicals that are used (Table 2).

Outdoor Treatments

Broadcast bait applications attempt to reduce fire ant populations by applying insecticides incorporated into an attractant or bait. Most bait products contain slow-acting toxicants (eg, hydramethylnon, abamectin, and fenoxycarb) dissolved in soybean oil, which is a food source for fire ants. The toxicant-laden oil is then absorbed into corn grits, which makes the product easier to handle and apply, as well as more available to the ants. The slow action of the toxicants allows the ants to feed the toxic oil to the other members of the colony before they die. When the toxicant is fed to the queen, she either dies, or no longer produces new workers and the colony eventually dies. A broadcast bait application eliminates the need to locate mounds because it relies on foraging fire ants to find and feed the bait to the rest of the colony.

Individual mound treatments attempt to eliminate colonies of fire ants by treating mounds individually. To eliminate a colony, the queen must be killed. If she is not destroyed, she will continue to lay eggs and the colony will recover. In the case of multiple-queen colonies, all the queens must be killed,

TABLE 2. Chemicals Used to Control Fire Ants Around Homes

Treatment	Chemical Name	Trade Name
Outdoors		
Baits	Hydramethylnon	Andro
	Abamectin	PT370 (Ascend)
	Fenoxycarb	Award (Logic)
Drenches, granules, sprays, dusts, aerosols (These chemicals can also be used as barrier or spot treatments)	Acephate	Orthene
	Bendiocarb	Ficam
	Carbaryl	Sevin
	Chlorpyrifos	Dursban
	Diazinon	Diazinon
	Isazophos	Triumph
	Isfenphos	Ofianol
	Propoxur	Baygon
	Permethrin	
	Resmethrin	
Indoors		
Baits	Abamectin	PT370 (Ascend)
	Hydramethylnon	Maxforce
Sprays, dusts, aerosols	Chlorpyrifos	Dursban
	Permethrin	
	Resmethrin	

thus making effective treatments extremely difficult. Colonies treated individually may be eliminated faster than colonies treated with broadcast bait applications.

There are chemical and nonchemical methods of treating mounds individually. Chemical methods include insecticides that are formulated as baits, drenches, granules, dusts, aerosols, or liquid fumigants. Nonchemical methods include applying hot water and physically excavating the nest. All individual nonchemical mound treatments may cause the surviving ants to relocate and create a new mound.

Combination broadcast baiting and individual mound treatments use the efficiency of broadcast baiting and the fast action of individual mound treatments. Baits must be broadcast first to efficiently reduce fire ant populations. Several days should be allowed after broadcasting to allow fire ants to forage or distribute the bait before mounds are individually treated. Mounds can be treated with a dust, drench, granular, or aerosol insecticide specifically labeled for fire ant control.

Products for barrier and spot treatments contain active ingredients such as acephate, bendiocarb, carbaryl, chlorpyrifos, diazinon, isofenphos, propoxur, permethrin, and resmethrin that kill ants on contact. These products are usually sold as sprays or dusts, and some are mixed into latex paint. They may be applied in wide bands on and around home and building foundations, equipment, and other areas to create barriers that exclude

ants. Barrier and spot treatments do not eliminate colonies.

Indoor Treatments

Only certain bait-formulated insecticides (abamectin and hydramethylnon) and a few sprays, dusts, and aerosols are registered for use inside structures. Indoor colonies are located by following foraging ant trails back to nesting areas. If the entire colony, especially the queen, is accessible, a dust or spray is applied onto the colony. If baits are used, the bait is applied first and then spot treatments are applied 3 days later. Foraging ants are killed by spraying ant trails or spot treating infested areas with products registered for this use. However, this will not eliminate fire ant colonies. If ants are entering the home from outdoor colonies, a residual insecticide containing chlorpyrifos or diazinon can be applied as an outside barrier around the base of the structure, and mounds in the proximity of the home or apartment should be treated.

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