Multiple Fire Ant Stings Indoors

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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 1950s through the port of Mobile, Ala. Early attempts to eradicate this ant failed, and it has now spread throughout the southern United States and Puerto Rico. Between 80% and 60% of individuals in areas where the fire ant is indigenous are stung each year. 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 (Table 1). At least 50 deaths have occurred from fire ant sting-related anaphylaxis, and a variety of other medical sequelae have been reported.

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. As the density of IFA colonies has increased, they have come into progressively closer contact with man.

We recently reported 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 50-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>
<thead>
<tr>
<th>TABLE 1. Medical Consequences of Fire Ant Reactions</th>
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<tr>
<td>Local wheal and flare reaction followed by sterile pustule</td>
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<tr>
<td>Late-phase dermal reaction</td>
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<td>Anaphylaxis</td>
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<td>Neurologic reactions (seizures, mononeuropathies, stroke)</td>
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<td>Infection of sting sites</td>
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Case 2. A 35-year-old woman and her 9-year-old daugh-
ter complained to the management of an apartment com-
plex 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 con-
tinued 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. Sub-
sequently, 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 approxi-
mately 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 ex-
terminated.

DISCUSSION

We have previously reported 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 associ-
ated with indoor fire ant stings. Further, we
report repetitive stings in two healthy individu-
als 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 occa-
sionally move mounds indoors, especially after
flooding, but this is not well appreciated out-
side 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 tempera-
ture, 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 carbo-
hydrates (eg, honeydew, plant exudates, sug-
ars, 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 behav-
ior, 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, 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, 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

| TABLE 2. Chemicals Used to Control Fire Ants Around Homes |
|-----------------------------|----------------|------------------|
| Treatment | Chemical Name | Trade Name |
| Outdoors | | |
| Baits | Hydramethylnon | Amidro |
| | Abamectin | FT370 (Ascend) |
| | Fenoxycarb | Award (Logic) |
| Drenches, granules, sprays, dusts, aerosols | Acephate | Orthane |
| Albendazol | Ficarv |
| Carbaryl | Sevin |
| Chlorpyrifos | Durshane |
| Diazinon | Diazinon |
| Isazophos | Triumph |
| Isofenphos | Orthanol |
| Propoxur | Baygon |
| Permethrin | Resmethrin |
| Indoors | | |
| Baits | Abamectin | FT370 (Ascend) |
| | Hydramethylnon | Maxforce |
| Sprays, dusts, aerosols | Chlorpyrifos | Durshane |
| Permethrin | Resmethrin |
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.

References