

Managing insect sting allergy

The ins and outs of venom immunotherapy

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Stings from honeybees, yellow jackets, hornets, wasps, and imported fire ants cause about 50 deaths per year in the United States and a manyfold higher number of significant anaphylactic reactions. **Although** a whole-body (insect) extract for immunotherapy had been used for decades, a 1978 Johns Hopkins University study by Hunt and colleagues showed that **it** was no more effective than placebo. The study **also** showed that a new VIT preparation prevented almost all reactions.

Unfortunately, now more than 25 years later, many patients who have had allergic sting reactions, even very severe ones, are still not referred to an allergist for VIT. **This oversight** may occur **because** physicians are not aware of the high efficacy of VIT or **because** they mistakenly believe that one or more injections with epinephrine are always sufficient to terminate anaphylaxis. In the Johns Hopkins study, 3 of the 14 patients in the groups treated with placebo and whole-body extract had significant hypotension **after** being stung. In two of these patients, the hypotension persisted **despite** multiple doses of epinephrine, and one patient required intubation. In light of these findings, any patient with a systemic allergic reaction to an insect sting should undergo evaluation by an allergist.

The culpable insects

The stinging insects are members of the order Hymenoptera. **They** make up three major subgroups: apids, vespids, and formicids.

Apids include the honeybee and bumblebee. Honeybees are small, fuzzy insects with alternating tan and black stripes. **They** are often seen pollinating clover and other flowering plants, are relatively nonaggressive, and generally sting only when caught underfoot. The barbed stinger usually remains at the site of the sting. Africanized honeybees (killer bees) have spread from South America and Central America into Texas, Arizona, and California. **Their** venom is no more allergenic or toxic than that of the common European honeybee, **but** they are much more aggressive, and there have been many reports of reactions, some fatal, in persons receiving 500 to 1,000 or more stings. Bumblebees are large, slow-moving, noisy bees that have hairy bodies of alternating yellow and black stripes. They are nonaggressive and account for only a small fraction of stings.

The vespids include the yellow jacket, hornet, and wasp that make papier-mâché-like nests of wood fiber. Yellow jackets are identified by their alternating yellow and black body stripes and account for the majority of allergic sting reactions in most parts of the United States. **They** usually nest in the ground and are often disturbed by activities such as lawn mowing. Yellow jackets are very aggressive and are attracted to soda cans, food, and garbage. The thin-bodied wasps build nests in overhanging structures (**eg**, the eaves of buildings), and the development cells of these nests are not enclosed in a paper envelope. Allergic reactions resulting from wasp stings are more prevalent in the southern portions of the United States.

The formicids include the imported fire ant, which is **also** found in the southern United States and is a significant cause of allergic reactions. The ant attaches with **its** jaws and stings repetitively in a semicircular pattern. Within 24 hours, **these stings** develop into sterile pustules.

Sting reactions

The usual response to an insect sting is transient redness, pain, and itching at the sting site. A large local reaction occurs with a frequency of about 10% and consists of a swelling greater than 5 cm in diameter that persists for longer than 24 hours. Swelling usually occurs over hours and may sometimes affect an entire limb.

Systemic, or generalized, allergic reactions affect 1% of the US population and vary greatly in severity. **They** may be mild and exhibit only cutaneous symptoms, such as pruritus, urticaria, and angioedema, or they may be more severe, with potentially life-threatening symptoms such as laryngeal edema, bronchospasm, and hypotension. Patients with hypotension feel light-

headed, have darkening or tunnel vision, and often lose consciousness. Patients with severe reactions often have "a sense of impending doom" **and** feel that they might die.

Adults tend to have more severe reactions than children. Of the approximately 50 deaths that result annually from insect stings, only 1 or 2 occur in children. The number of deaths increases gradually with age, reaching 10 deaths per year for each 10 years of life in persons aged 40 to 49, 50 to 59, and 60 to 69 years. Patients can have vascular collapse in the absence of skin manifestations **such as** urticaria. Most systemic reactions start quickly, often within minutes of the sting.

Treatment of acute reactions

Treatment of large local reactions includes administration of antihistamines, application of ice packs, and elevation of the affected area. A short course of prednisone, initiated early, has been suggested for massive local reactions.

Patients with systemic reactions require careful observation. An intramuscular injection of epinephrine (1:1,000) at a dose of 0.3 to 0.5 mL (in children, 0.01 mL/kg; maximum, 0.3 mL) is the keystone of management **and** is often sufficient to terminate the reaction. It may be repeated in 10 to 15 minutes, if necessary. An oral or injectable antihistamine (eg, diphenhydramine) is often given. **This** may lessen urticaria or other cutaneous symptoms, **but** in more serious reactions, **its** use should not delay the administration of epinephrine.

Albuterol inhalants (AccuNeb, Proventil, Ventolin) may decrease bronchospasm **but** do not address other systemic manifestations, such as anaphylactic shock. Severe reactions often require treatment with oxygen, histamine₂ blockers, volume expanders, and vasopressor agents. Corticosteroids are commonly used, **but** their delayed onset of action limits **their** effectiveness in the early stages of treatment.

Prevention and treatment of future reactions

Stings can be avoided **by taking** commonsense precautions to significantly reduce exposure. **When** playing outside, children should wear shoes to prevent being stung if **they** step on a bee. Hives and nests around the home should be exterminated, **and** patients should remember that garbage and outdoor food, especially canned drinks, attract yellow jackets.

Venom immunotherapy

In VIT, increasing amounts of venom are given weekly for several months until the maintenance dose of 100 micrograms (300 micrograms for mixed vespid venom) is attained. Venom injections are given every 4 weeks during the first year of treatment, and **then** the interval can be extended to 6 weeks. VIT is highly effective: studies using intentional stings have demonstrated a 97% to 100% protection rate in adults and children **after** just 3 months of treatment. (The protection rate is slightly lower with honeybee venom.) The small number of patients who were not protected experienced mild reactions, and **their** outcomes might more properly be considered partial successes rather than failures.

Disadvantages of venom treatment include systemic and local reactions to injections. No long-term side effects have been reported. Patients should be informed of the possible risks and closely observed for 30 minutes or more after each treatment. Injections should be administered only in settings where adequate means of treating systemic reactions are available.

Conclusion

Allergic reactions to insect stings can be severe, even fatal. **Although** epinephrine may rapidly reverse many reactions, some reactions require multiple doses, **as well as** treatment with antihistamines and fluids. **Therefore**, patients with generalized reactions should be considered for VIT, a treatment that has been shown to prevent nearly all reactions.