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# In Brief

## Insect Stings

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### Author Disclosure

Drs Booker and Adam did not disclose any financial relationships relevant to this article.

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Reactions to insect stings, both allergic and toxic, are seen commonly in pediatric practice. Stinging insects include honeybees, bumblebees, sweat bees, wasps, yellow jackets, hornets, harvester ants, and fire ants, all belonging to the order *Hymenoptera* of the class Insecta. Only female insects have the stinging apparatus to inject venom, which may contain toxic vasoactive amines or allergenic proteins that can trigger an immunoglobulin (Ig) E-mediated response.

Honeybees include the domesticated European honeybee and the Africanized

honeybee. The venoms of the two types of honeybee are virtually identical and have similar toxicities and allergenicity. However, because the Africanized honeybee is more aggressive and may attack in large swarms, death can result from the toxic effects of huge quantities of venom rather than from an allergic reaction. The honeybee's stinging apparatus, because it has multiple barbs, usually is left behind after a sting, leading to the bee's death. Fire ant stings are becoming more common, particularly in southern regions of the United States, and can be recognized by the distinctive sterile pustule that develops at the site of the sting. In many areas of the United States, yellow jackets are most commonly responsible for stings that cause allergic reactions.

Typical reactions following an insect sting include erythema, itching, pain, swelling, and induration localized to the area of the sting. These local reactions usually last only several hours and may respond to the application of cool compresses. Antihistamines and analgesics can be helpful. Larger local reactions also occur frequently, involving more extensive areas of the skin, typically with swelling 5 to 10 cm in diameter (sometimes more) that is contiguous to the site of the sting. The swelling generally peaks in 24 to 48 hours, but the reactions can last up to 7 to 10 days.

Although systemic reactions to insect stings are the exception, with less than 1% of children experiencing them, they can be life-threatening. Estimates suggest that 40 to 150 people die annually in the United States from reactions to insect stings. IgE-mediated systemic reactions following insect stings include urticaria, angioedema,

pruritis, upper or lower airway obstruction, bronchospasm, shortness of breath, hypotension, shock, dizziness, nausea, vomiting, diarrhea, abdominal pain, and loss of consciousness. Generalized cutaneous reactions, including flushing, pruritus, urticaria, and angioedema, are considered systemic even without the involvement of other organ systems. Most people who experience isolated cutaneous reactions to insect stings do not develop more serious reactions after subsequent stings. Even with a history of a large local reaction, the risk of anaphylaxis after a subsequent sting is less than 5%. Toxic reactions, not induced by an allergic response, can present with a clinical picture similar to that of IgE-mediated reactions. Uncommon delayed reactions following insect stings include the development of serum sickness, glomerulonephritis, encephalitis, myocarditis, vasculitis, polyradiculitis, and neuritis.

A stinger that remains in the skin after an insect sting should be removed. If the venom sac is left behind, as often happens with a honeybee sting, it also should be removed promptly, with care taken not to squeeze it and release more venom. The area should be cleansed with soap and water. The immediate management of systemic reactions focuses on the treatment of anaphylaxis, for which administration of subcutaneous epinephrine is the treatment of choice. An antihistamine, such as diphenhydramine, may be given after epinephrine has been administered. Intravenous fluids, corticosteroids, beta-agonists, oxygen, histamine<sub>2</sub> blockers, and vasopressors also may be useful, depending on the clinical presentation. For a patient who has developed a systemic reaction to an insect sting, in

vitro or skin testing by an allergist/immunologist for venom-specific antibodies is appropriate. Skin testing, which uses either insect venom or whole body extract, is preferred over the less sensitive in vitro testing. Standardized venoms for skin testing (and immunotherapy) are available for wasp, yellow jacket, yellow hornet, honeybee, and white-faced hornet bites. Whole body fire ant extract and a mixed vespid venom extract also are available. Skin testing may be performed by prick puncture or intracutaneous methods. In general, prick puncture testing precedes intracutaneous skin testing.

In Europe, controlled sting challenge testing has been used to evaluate patients who have a history of insect sting allergy. One study found that up to 15% of individuals who developed anaphylaxis on sting challenge testing had prior negative radioallergosorbent test or skin testing results. Another study did not find a correlation between specific IgE antibodies and subsequent reactions to sting testing. Sting challenge testing remains controversial and is not recommended in the United States.

Venom immunotherapy prevents 97% of systemic reactions to subsequent insect stings. In general, immunotherapy is advised for individuals who have had a systemic reaction to an insect sting and test positively for venom-specific IgE antibodies. For persons older than 16 years of age, immunotherapy is recommended following any systemic reaction, including a cutaneous systemic reaction. Venom immunotherapy also is advised for children younger than 16 years of age, but

only for those who have a history of a systemic reaction; it is not recommended routinely for one who has a cutaneous systemic reaction, although this use may be considered. Whole body fire ant extract immunotherapy is advised for persons older than 16 years who have had a systemic reaction and a positive skin test; it also may be considered with a positive skin test after a cutaneous systemic reaction.

Immunotherapy involves the subcutaneous administration of increasing doses of venom extract until a maintenance dose is reached. The frequency of immunotherapy injections usually starts at once a week. The interval between injections is increased during the first and subsequent years, usually reaching an interval of up to 8 weeks. Some protocols have used intervals as long as 12 weeks. Semi-rush, rush, and ultra-rush protocols also have been used. The risks of venom immunotherapy include erythema, itching or swelling at the injection site, and the possibility of more serious systemic reactions and anaphylaxis.

Recommendations for the duration of venom immunotherapy differ among experts. Venom immunotherapy frequently is discontinued once skin testing results become negative or serum venom-specific IgE becomes undetectable. It also appears that most patients who have their immunotherapy stopped after 3 to 5 years despite persistent positive skin test results will not develop a systemic reaction following subsequent insect stings. With some evidence to suggest that future risk is related to the severity of the initial

reaction, it may be wise to continue immunotherapy beyond 3 to 5 years for patients who have had particularly dangerous systemic reactions.

Anyone who has an adverse reaction to an insect sting should undertake general precautions to avoid future stings. Individuals should avoid wearing floral, light, or bright-colored garments. Hats, long-sleeved garments, long pants, shoes, and socks should be worn. Gloves are recommended when gardening or during other outdoor work. The use of scented products such as perfumes also should be avoided. Special insecticides specifically formulated for stinging insects are required. Susceptible individuals should receive patient education regarding the management of insect stings and carry emergency epinephrine injection kits. Bracelets or necklaces imprinted with medical information are advised for high-risk individuals. With these and other precautions and the use of immunotherapy when indicated, the risk of serious and life-threatening sequelae of insect stings can be reduced significantly.

**Comment:** Bites are different from stings. Only rarely do insects that bite, like mosquitoes, cause anaphylactic reactions. The saliva that biting insects deposit in their victims is not allergenic in the way that the venom of a stinging insect can be. Insect bites, however, are more likely to cause large localized reactions, which may or may not be IgE-mediated.

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Editor, In Brief*

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