Bee and Wasp Stings The stinger of the honeybee (*Apis mellifera*) is unique in being barbed. When a bee stings a foe, its stinging apparatus and attached venom sac tear loose from its body. Muscular contraction of the venom sac continues to inject venom into the skin. Other kinds of bees, ants, and wasps have smooth stinging mechanisms and can sting numerous times in succession. Honeybees, bumblebees, and social wasps generally attack only when a colony is disturbed. Africanized honeybees (now present in South and Central America and the southern and western United States) respond to minimal intrusions more aggressively. Whereas the sting of an Africanized bee contains less venom than that of its non-Africanized relatives, victims tend to sustain far more stings and therefore to receive a far greater overall volume of venom. Most patients who report having sustained a "bee sting," however, are more likely to have encountered stinging wasps instead.

The venoms of different species of hymenopterans are biochemically and immunologically distinct. Direct toxic effects are mediated by mixtures of low-molecular-weight compounds such as serotonin, histamine, acetylcholine, and several kinins. Polypeptide toxins in honeybee venom include mellitin that damages cell membranes, mast cell–degranulating protein that causes histamine release, the neurotoxin apamin, and the anti-inflammatory compound adolapin. Enzymes in venom include hyaluronidase and phospholipases. There appears to be little cross-sensitization between the venoms of honeybees and wasps.

Uncomplicated hymenopteran stings cause immediate pain, a wheal-and-flare reaction, and local edema, all of which usually subside in a few hours. Multiple stings can lead to vomiting, diarrhea, generalized edema, dyspnea, hypotension, and non-anaphylactic circulatory collapse. Rhabdomyolysis and intravascular hemolysis may cause renal failure. Death from the direct (nonallergic) effects of venom has followed stings of several hundred honeybees. Stings to the tongue or mouth may induce life-threatening edema of the upper airways.

Large local reactions accompanied by erythema, edema, warmth, and tenderness that spread ≥10 cm around the sting site over 1–2 days are not uncommon. These reactions may resemble bacterial cellulitis but are caused by hypersensitivity rather than by secondary infection. Such reactions tend to recur on subsequent exposure but are seldom accompanied by anaphylaxis and are not prevented by venom immunotherapy.

An estimated 0.4–4.0% of the U.S. population exhibits clinical immediate-type hypersensitivity to hymenopteran stings, and 15% may have asymptomatic sensitization manifested by positive skin tests. Persons who experience severe allergic reactions are likely to have similar reactions after subsequent stings by the same or closely related species. Occasionally, persons who have had mild reactions earlier in life will experience more serious reactions to subsequent stings. Mild anaphylactic reactions from insect stings, as from other causes, consist of nausea, abdominal cramping, generalized urticaria, flushing, and angioedema. Serious reactions, including upper airway edema, bronchospasm, hypotension, and shock, may be rapidly fatal. Severe reactions usually begin within 10 min of the sting and only rarely develop after 5 h.

TREATMENT BEE AND WASP STINGS

Honeybee stingers embedded in the skin should be removed as soon as possible to limit the quantity of venom delivered. The stinger and venom sac may be scraped off with a blade, the edge of a credit card, or a fingernail or may be removed with forceps. The site should be cleansed and disinfected and ice packs applied to slow the spread of venom. Elevation of the affected site and administration of analgesics, oral antihistamines, and topical calamine lotion help relieve symptoms. Large local reactions may require a short course of oral therapy with glucocorticoids. Patients with numerous stings should be monitored for 24 h for evidence of renal failure or coagulopathy.

Anaphylaxis is treated with SC injection of 0.3–0.5 mL of epinephrine hydrochloride in a 1:1000 dilution; treatment is repeated every 20–30 min as necessary. IV epinephrine (2–5 mL of a 1:10,000 solution administered by slow push) is indicated for profound shock. A tourniquet may slow the spread of venom. Parenteral antihistamines, fluid resuscitation, bronchodilators, supplemental oxygen, intubation, and vasopressors may be required. Patients should be observed for 24 h for recurrent anaphylaxis.

Persons with a history of allergy to insect stings should carry an anaphylaxis kit with a preloaded syringe containing epinephrine for self-administration. These patients should seek medical attention immediately after using the kit.

Repeated injections of purified venom produce a blocking IgG antibody response to venom and reduce the incidence of recurrent anaphylaxis. Honeybee, wasp, and yellow jacket venoms are commercially available for desensitization and for skin testing. Results of skin tests and venom-specific radioallergosorbent tests (RASTs) aid in the selection of patients for immunotherapy and guide the design of such treatment.

STINGING ANTS

Stinging fire ants are an important medical problem in the United States. Imported fire ants (*Solenopsis* species) infest southern states from Texas to North Carolina, with colonies now established in California, New Mexico, Arizona, and Virginia. Slight disturbances of their mound nests have provoked massive outpourings of ants and as many as 10,000 stings on a single person. Elderly and immobile persons are at high risk for attacks when fire ants invade dwellings.

Fire ants attach to skin with powerful mandibles and rotate their bodies while repeatedly injecting venom with posteriorly situated stingers. The alkaloid venom consists of cytotoxic and hemolytic piperidines and several proteins with enzymatic activity. The initial wheal-and-flare reaction, burning, and itching resolve in ~30 min, and a sterile pustule develops within 24 h. The pustule ulcerates over the next 48 h and then heals in ≥1 week. Large areas of erythema and edema lasting several days are not uncommon and in extreme cases may compress nerves and blood vessels. Anaphylaxis occurs in fewer than 2% of victims; seizures and mononeuritis have been reported. Stings are treated with ice packs, topical glucocorticoids, and oral antihistamines. Pustules should be cleansed and then covered with bandages and antibiotic ointment to prevent bacterial infection. Epinephrine administration and supportive measures are indicated for anaphylactic reactions. Fire ant whole-body extracts are available for skin testing and immunotherapy, which appears to lower the rate of anaphylactic reactions.

European fire (red) ants (*Myrmica rubra*) have recently become public health pests in the northeastern United States and southern Canada. The western United States is home to harvester ants (*Pogonomyrmex* species). The painful local reaction that follows harvester ant stings often extends to lymph nodes and may be accompanied by anaphylaxis. The bullet or conga ant (*Paraponera clavata*) of South America is known locally as *hormiga veinticuatro* ("24-hour ant"), a designation that refers to the 24 h of throbbing, excruciating pain following a sting that delivers the potent paralyzing neurotoxin poneratoxin.

DIPTERAN (FLY AND MOSQUITO) BITES

In the process of feeding on vertebrate blood and tissue fluids, adults of certain flies inflict painful bites, produce local allergic reactions, and may transmit pathogenic agents. Bites of mosquitoes, tiny "no-see-um" (ceratopogonid) midges, and phlebotomine sand flies typically produce a wheal and a pruritic papule. Small humpbacked black flies (simuliids) lacerate skin, resulting in a lesion with serosanguineous discharge that is often painful and pruritic. Regional lymphadenopathy, fever, or anaphylaxis occasionally ensues. The widely distributed deerflies and horseflies as well as the tsetse flies of Africa are stout flies measuring ≤25 mm in length that attack during the day and produce large and painful bleeding punctures. Houseflies (*Musca domestica*) do not consume blood but use rasping mouthparts to scarify skin and feed upon tissue fluids and salt. Beyond direct injury from bites of any kind