



Recognition, Management, and Prevention of Hymenopteran Stings and Allergic Reactions in Travelers

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Allergic reactions to insect bites and stings remain exceedingly common indications for urgent health care visits worldwide. Estimates of the worldwide annual incidence of immunologic reactions to hymenopteran stings in the world population range from 0.3% to 3.0% or nearly 100 million cases per year ranging from local wheal-and-flare reactions to deaths from anaphylactic shock.¹⁻⁴ In the United States, the annual incidence of allergic reactions to hymenopteran stings ranges between 0.4% and 4.0%, with 40 to 50 deaths a year.¹⁻⁶ These allergic reactions are mediated by immunoglobulins that target specific antigens in hymenopteran venoms.⁵ Hymenopterans are, therefore, among the most medically important arthropods, responsible for most cases of hypersensitivity reactions to insect stings.²⁻⁸ This article will review the descriptive epidemiology of hymenopteran stings and allergic reactions, risk stratified by severity and outcomes. In addition, this article will review current recommendations for the clinical assessment and management, immunoprophylaxis, and prevention of hymenopteran stings and allergic reactions in travelers.

The Biology of Hymenopterans

The Taxonomy of Hymenopterans

The current taxonomy of the medically important hymenopterans is depicted in Table 1.

The Mechanisms of Hymenopteran Envenoming

Apids or bees inflict single stings as their stingers deeply embed in victims and detach in contiguity with the distal ends of their abdomens, whereas vespids or wasps often inflict multiple stings with stingers that have few barbs and can be easily withdrawn, usually without detaching. Formicids or ants first anchor to their victims by biting,

then pivot around the bite site, stinging repeatedly in a circular pattern with modified ovipositors similar to vespid stingers.

The Toxicology of Hymenopteran Venoms

In general, hymenopteran venoms all exhibit the following physiochemical characteristics: (1) acidic, proteinaceous liquids with an aromatic odor and a sharp, bitter taste; (2) a slightly yellowish color; and (3) a dried residue also with a slightly yellowish color that constitutes about 12% of venoms by weight.⁸ Hymenopteran venoms contain both species-specific components and shared components, most commonly enzymes, including hyaluronidase and phospholipases (Table 2).

The Epidemiology of Hymenopteran Stings and Allergic Reactions

In an analysis of nearly 3,000 insect stings requiring medical attention at four hospitals in Denmark between 1988 and 1990, Mosbech and Bay-Nielsen reported that most stings occurred on the hands or head during the summer months between 3 pm and 9 pm.⁹ In a 2004 Symposium, Golden reported that anaphylaxis occurred with an incidence of 30 cases per 100,000 people per year with a mortality rate of 1% to 2% and was caused by foods (35%), drugs or biologicals (25%), hymenopteran stings (15%), exercise (5%), or unrecognized, idiopathic mechanisms (20%).¹⁰ The onset of anaphylaxis to hymenopteran stings or to venom injections during venom immunotherapy (VIT) was usually rapid with 70% beginning within 20 minutes and 90% within 40 minutes.¹⁰ In a 2006 epidemiologic analysis of anaphylaxis, Lieberman and colleagues reported a higher incidence of anaphylaxis with 50 to 2,000 episodes per 100,000 persons per year for a lifetime prevalence of 0.05% to 2.0%, with the largest number of incident cases among children and adolescents.¹¹

Certain occupations and avocations, most notably beekeeping, predispose individuals to hymenopteran stings and subsequent reactions. Besides beekeepers, other outdoor occupations and avocations with a predisposition to hymenopteran stings include arborists,

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Table 1 The taxonomy of hymenopterans (phylum: Arthropoda, class: Insecta, and order: Hymenoptera)

Hymenopteran families	Apidae (bees)	Vespidae (wasps)	Formicide (ants)		
Hymenopteran subfamilies	Apinae (bees)	Vespinae (hornets)	Politinae (wasps)	Mutillidae (wingless wasps)	
Hymenopteran species	Bumblebees, carpenter bees, old and new world honeybees, Africanized honeybees	Hornets, yellow jackets	Paper wasps	Velvet “ants” (wingless wasps or “cow killers”)	Domestic fire ants, imported fire ants, harvester ants, bulldog ants, bullet ants

carpenters, heavy equipment operators, farmers, landscapers, nurserymen, painters, roofers, and travelers.^{12,13}

Besides occupation or avocation, prior allergic history, or severity of preceding reactions, there are a number of other significant preexisting risk factors for allergic reactions to hymenopteran stings including increased baseline mast cell numbers or mastocytosis, increased serum tryptase concentrations, and antihypertensive therapy with angiotensin converting enzyme inhibitors (ACEIs).^{14,15} A diagnosis of mastocytosis, a very rare disease characterized by increased mast cell numbers in the skin, lungs, and gastrointestinal tract, may be confirmed by elevated serum tryptase concentrations (>11.4 mcg/L).¹⁴

In a 2006 meta-analysis on the safety of ACEIs in patients with insect venom allergies, Stumpf and colleagues identified 24 case reports of severe allergic reactions, including anaphylaxis, following either hymenopteran stings or during VIT for hymenopteran venom allergies in patients taking ACEIs.¹⁶ The authors concluded that antihypertensive therapy with ACEIs may result in potentially life-threatening allergic reactions to hymenopteran stings or to VIT.¹⁵ The authors attributed the mechanisms of the exaggerated allergic response to massive systemic release of bradykinin and other cytokines accumulating in the lungs where ACEIs act to block production of angiotensin II.¹⁵

In summarizing the epidemiology of hymenopteran-inflicted injuries, hymenopteran stings occur often throughout the world; more so in young adult males in outdoor occupations or hobbies; may cause allergic reactions in up to one third of victims, only a third of whom have prior allergy histories; and are more often inflicted by vespids, particularly paper wasps (not hornets) and

yellow jackets, than apids, such as bumblebees and honeybees. In addition, unrecognized anaphylactic reactions to hymenopteran stings may be a cause of sudden death in nearly one fourth of sudden and unexpected deaths outdoors.^{17,18}

The Classification of Hymenopteran Sting Reactions

Mueller has classified hymenopteran sting reactions as local, large local, systemic grades I to IV, and unusual delayed reactions (Figure 1; Table 3).¹⁹

The Initial Field and General Management of Hymenopteran Stings

The most important initial step in the general management of hymenopteran stings and allergic reactions is to stabilize the patient by securing the airway and assuring effective ventilation and circulation. The sting site should be inspected with a magnifying glass to identify embedded stingers to be removed. Although most apid venom is injected immediately on stinging, attached venom sacs have been observed to pulsate and to continue to embed stingers into flesh wounds and to inject venom after detaching from the apid's abdomen.¹⁶ Some wasp stingers may also break off in victims and should also be removed immediately.

Many local and traditional folk remedies have been recommended for initial local management of hymenopteran stings including topical applications of tobacco poultices and solutions of vinegar and salt, aluminum sulfate, and papain, or meat tenderizer. These

Table 2 Some shared and specific chemical constituents of hymenopteran venoms

Families	Apids	Vespids	Formicids
Species	Bumblebees, honeybees	Hornets, wasps, yellow jackets	Fire ants, bulldog ants, bullet ants, (<i>Paraponera clavata</i>)
Proteins	Adolapin, apamin, biogenic amines, mast cell degranulating peptide, melittin*, minimine	Acetylcholine*, antigen 5*, biogenic amines, kinins*, mast cell degranulating peptide, mastoparans, serotonin*	Biogenic amines, piperidines* (primarily 2,6-disubstituted piperidine), <i>Solenopsis invicta</i> I–IV (fire ants), poneratoxin (<i>P clavata</i>)
Enzymes	Acid phosphatase, hyaluronidase*, phospholipase A ₂ *, phospholipase B*	Acid phosphatase, hyaluronidase, phospholipase A ₂ , phospholipase B	Hyaluronidase*, N-acetyl-β-glucosaminidase, phospholipase A ₂ *, phospholipase B

*Indicates major venom organic chemical components.

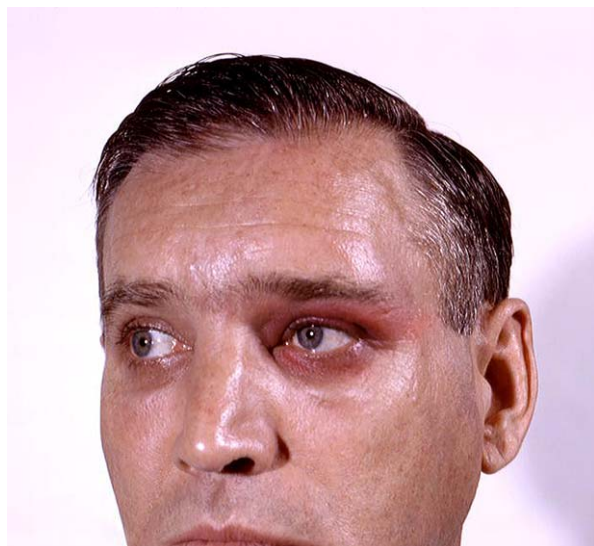


Figure 1 Large local hymenopteran sting reaction 24 hours following multiple wasp stings to the face. Note the generalized erythema and edema and specifically the edema of the left upper eyelid, left medial canthal area, and nasal philtrum. In addition, the nasolabial folds have been replaced by edema bilaterally. Source: US Department of Health and Human Services, Centers for Disease Control and Prevention, Public Health Image Library ID 6371. No copyright permission required.

traditional remedies may have powerful placebo effects but remain untested in case-controlled settings and are usually ineffective. The topical application of local anesthetics or antihistamine lotions or creams, such as diphenhydramine or tripeleminamine, may also relieve local pain and pruritus mediated by biogenic amines, such as histamine and mast cell degranulating peptide.²⁰

Tetanus prophylaxis is not indicated following hymenopteran stings by aerial dwellers, such as apids and most vespids.²¹ However, ground-dwelling insect bites and stings may be contaminated by tetanus spores. In a 1989 case series of 44 patients with larval jigger flea infestations by *Tunga penetrans*, 25% ($n = 11$) of the patients contracted tetanus.²² Tetanus prophylaxis should, therefore, be considered in cases of multiple stings by ground-dwelling formicids and vespids, especially velvet ants (cow killers).

Associated ascending lymphangitis and regional lymphadenopathy suggest an infected sting site and may indicate antibiotic therapy, as directed by Gram stain and culture and antibiotic sensitivity testing. A recent, retrospective, and descriptive analysis of 422 patients presenting to US emergency departments with skin and soft tissue infections, many following insect bites and stings, has now confirmed methicillin-sensitive and methicillin-resistant *Staphylococcus aureus* (MRSA) as the most frequently identified causative bacteria in infected bites and stings (*S aureus* in 320 of 422 cases, prevalence = 76%; MRSA prevalence = 59%).²³ Community acquired methicillin-sensitive infections should be treated with oral antistaphylococcal penicillins or tetracyclines in

penicillin-sensitive patients; and MRSA infections should be treated with trimethoprim-sulfamethoxazole, clindamycin, or doxycycline.^{23,24}

The Species-Specific Stinging Behaviors, Clinical Manifestations, and Specific Management of Hymenopteran Stings

Apids

The apids include the familiar, 15 to 20 mm long, yellow, and black-striped honeybees, *Apis mellifera* (Figure 2) and its subspecies; the larger, bulbous bumblebees, *Bombus* spp., over 20 mm long; and the dark-colored, docile carpenter bees, that bore into fences and wooden buildings, and rarely sting. Honeybees, bumblebees, and carpenter bees all have stingers that originate in an intraabdominal venom sac or gland and terminate in a stinger point with multiple barbs. Apid stingers will deeply embed in victims and then detach in contiguity with their venom sacs, fatally eviscerating stinging bees.

All honeybees, especially Africanized species, release alarm pheromones from their distally disemboweled abdomens on stinging, effectively attracting nearby honeybees to also attack and sting pheromone-marked victims.²⁵ Although Africanized honeybees have received much notoriety lately, their stinging mechanisms and venoms are no different from the stingers and venoms of the originally imported, and now ubiquitous honeybees, such as the European honeybee, *Apis mellifera mellifera*, and the Italian honeybee, *Apis mellifera ligustica* (Figure 3).^{25,26} Nevertheless, the stinging behaviors of Africanized honeybees are vastly different from domestic honeybees and characterized by aggressive, relentless swarming attacks, continuing pursuit of victims for up to 20 km, and massive, occasionally fatal stinging incidents in man and domestic animals.^{25,26}

Lingering misconceptions in the immediate field management of apid stings persist and include whether or not to remove stingers immediately and to avoid removing stingers by finger pinching that could compress proximally attached venom sacs.¹⁶ These misconceptions have now been dispelled by elucidation of the precise physical mechanisms involved in apid envenoming.¹⁶ Visscher and colleagues conducted several sets of blinded honeybee experiments on a volunteer to determine the best practices in the field management of honeybee stings.¹⁶ The investigators found a significant association ($p = 0.018$) between venom delivery as measured by wheal size and increasing time from stinging to stinger removal.¹⁶ There was no significant difference ($p = 0.42$) in wheal size when stingers were removed either by pinching (between the thumb and forefinger) or by scraping (with a credit card) after 2 seconds.¹⁶ The investigators concluded that (1) honeybee stings should be removed as soon as possible to limit venom delivery and reduce wheal size; (2) stingers should be removed by any means possible; and (3) sting victims should leave the sting area quickly to avoid additional pheromone-guided stings.¹⁶

Table 3 A classification of hymenopteran sting reactions (adapted from Mueller)²³

Classification of reactions	Hypersensitivity reaction types	Onset times	Reacting Igs	Clinical manifestations
Local	IV	4–48 h	Cell-mediated IgG	Painful, pruritic, and edematous sting lesions, 2.5–10 cm in diameter, lasting <24 h
Large local	IV	4–48 h	Cell-mediated IgG	Painful, pruritic, and edematous sting lesions, >10 cm in diameter, lasting >24 h
Systemic grade I: urticarial	I	10–20 min up to 72 h	IgE	Anxiety, malaise, generalized urticaria, itching
Systemic grade II: angioedema	I	10–20 min up to 72 h	IgE	Any grade I signs above, plus ≥ 2 of the following: angioedema (grade II if alone), dizziness, vomiting, diarrhea, chest tightness, abdominal pain
Systemic grade III: airway obstruction	I	10–20 min up to 72 h	IgE	Any grade II signs above, plus ≥ 2 of the following: stridor, dyspnea, wheezing (grade III if any of these alone), hoarseness, dysarthria, dysphagia, weakness, confusion
Systemic grade IV: anaphylactic	I	10–20 min up to 72 h	IgE	Any grade III signs above, plus ≥ 2 of the following: unconsciousness, hypotension, cardiovascular collapse, cyanosis, urine, and/or fecal incontinence
Unusual delayed reactions	III	2–14 d	IgM, IgG	Serum sickness, generalized vasculitis, rhabdomyolysis, acute tubular necrosis, CNS involvement (seizures, neuritis, peripheral neuropathy or radiculopathy, CVA), hemolysis, TTP, DIC, MI.

CNS = central nervous system; CVA = cerebrovascular accident; DIC = disseminated intravascular coagulation; MI = myocardial infarction; TTP = thrombotic thrombocytopenic purpura; Ig = immunoglobulin.

Bee stingers may be removed by any rapid method including a flick of a thin dull edge, such as a credit card edge, the unsharpened edge of a scalpel, or even a thin butter knife.¹⁶ Even using one's fingers, tweezers, or

forceps, or rubbing an unreachable site on one's back against an object to remove embedded apid stingers are all recommended and do not squeeze more venom into the victim.¹⁶ The mechanism of continued venom delivery by detached stings is by nerve-directed muscular contraction, not by reflex or by forcibly squeezed emptying



Figure 2 A dorsal view of a worker honeybee, *Apis mellifera*, distributed worldwide. Source: US Department of Health and Human Services, Centers for Disease Control and Prevention, Public Health Image Library ID 6342. No copyright permission required.

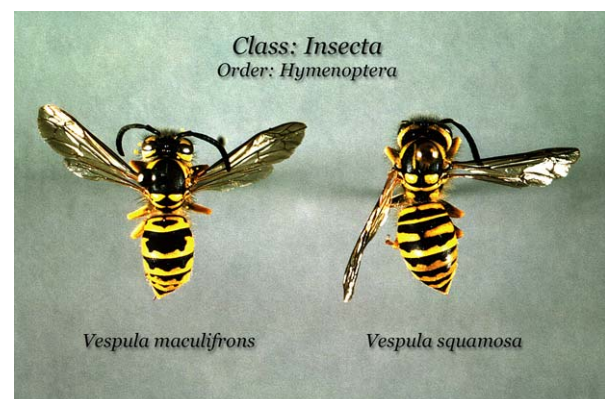


Figure 3 Two worker yellow jacket wasps, *Vespa maculifrons*, the eastern yellow jacket (left), and *Vespa squamosa*, the southern yellow jacket (right). Source: US Department of Health and Human Services, Centers for Disease Control and Prevention, Public Health Image Library ID 6340. No copyright permission required.

of the venom gland and will continue until the stinger is removed.¹⁶ Once the stinger is removed, the sting site should be cleaned with soap and water and cold compresses applied.

Vespid

Unlike apids, which can only inflict one sting, vespids often inflict multiple stings with stingers that have few barbs and can be easily withdrawn. The vespids are also ubiquitous, but much more aggressive stingers than non-Africanized honeybees, and include paper wasps of the subfamily *Politinae*, yellow jackets and hornets of the subfamily *Vespinae*, and wingless wasps of the subfamily *Mutillidae*, commonly called cow killers or velvet “ants.”²⁶

The paper wasps, the largest group of vespids, are classified as either solitary or social paper wasps, nest around buildings, and often encounter humans. However, of more than 15,000 species of venomous vespids distributed worldwide, most are solitary paper wasps that are not aggressive toward people.²⁶

Unlike most paper (*Polistes* spp.) wasps, yellow jackets and hornets are more aggressive venomous wasps from the subfamily *Vespinae* that includes more than 25 species distributed among three genera: *Vespula*, *Paravespula*, and *Dolichovespula*.²⁶ Many of these species nest on the ground or near humans and their recreation and refuse sites and often inflict painful stings with potential allergic reactions. In the United States, the commonly encountered black and white or bald or white-faced “hornet,” *Dolichovespula maculata*, is not a hornet at all, but a yellow jacket that builds globular aerial nests in trees.²⁶

In the late fall, many *Vespinae* colonies exhibit an aggressive swarming behavior or “delirium” as workers rush to provide nourishment to hundreds of hungry, emerging new queens and their mates.²⁷ The fall delirium is a common time for yellow jacket stings by many wasp species throughout the temperate world including the German yellow jacket, *Paravespula germanica*, in Europe and the northeast United States; the western yellow jacket, *Paravespula pennsylvanica*, in the western United States and Canadian Pacific; the eastern yellow jacket, *Vespula maculifrons* (Figure 4), in the southern United States and Caribbean; and the southern yellow jacket, *Vespula squamosa* (Figure 4), throughout the United States and in northern Mexico.^{26,27} Among the most frequently stinging yellow jackets worldwide is the common yellow jacket, *Paravespula vulgaris*, widely distributed throughout Asia, Europe, and North America.²⁶ *Vespa mandarinia*, the mandarin wasp, and *Vespa xanthoptera*, the Japanese “hornet,” are notorious stinging *Vespinae* wasps in Japan, and can inflict multiple stings, often associated with extensive local reactions marked by ecchymoses, often with subsequent skin necrosis and, rarely, intracranial hemorrhage.^{26,27}

Like the white-faced or bald-faced, black “hornets,” the velvet “ants” or cow killers are also wasps, specifically solitary wasps of the subfamily *Mutillidae*.²⁶ Both the winged males and the larger (up to 2.5 cm in length) wingless females are covered with bright red, orange,



Figure 4 Dorsal view of a velvet ant or “cow killer,” *Dasymutilla occidentalis*, which is a wingless wasp and not an “ant.” Source: US Department of Health and Human Services, Centers for Disease Control and Prevention, Public Health Image Library ID 4638. No copyright permission required.

black, or yellow hairs that often alternate in stripes encircling the abdomen. Because the cow killers or velvet “ants” are solitary dwellers that prefer sandy beachfront environments in the subtropics, multiple stings are rare.²⁶ Most species of velvet “ants,” such as *Dasymutilla occidentalis* (Figure 4), are distributed along the coastal beaches of the Canadian and US Great Lakes, the United States and Mexican Gulf of Mexico coasts and barrier islands, and the Caribbean Islands where they often inflict very painful stings on barefoot beachgoers.²⁶ Vespid and apid stings should be initially managed in a similar fashion. Both apids and vespids can also inflict envenoming stings postmortem.

Formicids

The formicids are important agricultural and human pests worldwide and include subfamilies and species of stinging and nonstinging ants. The notorious stinging formicids include native *Solenopsis* species fire ants, many of which have now been displaced by imported fire ants (IFAs), harvester ants, Australian bulldog ants, and Latin American bullet ants. Stinging formicids have modified ovipositors similar to vespid stingers.

The IFAs include the red fire ants, *Solenopsis invicta* (Figure 5), imported from Brazil, and the black fire ants, *Solenopsis richteri*, imported from Uruguay.²⁶ The IFAs range from 4 to 6 mm in length and have node-like abdomens, with adult workers having two abdominal nodes.²⁶ IFAs are omnivorous and will consume anything living from newly germinated seeds to other arthropods and even hatchling vertebrates.²⁶ IFAs will anchor themselves to their victims by biting and then sting repeatedly in a circular pattern as their abdominal stingers pivot around the bite site. Up to 10,000 stings have been recorded in human victims.^{26,28–30} Stings result in immediate painful burning lesions, which form pustules within 24 hours, then ulcerate, and heal slowly over a week or longer.^{28–30} The resulting sterile pustules from IFA



Figure 5 A red imported fire ant worker, *Solenopsis invicta*. Source: US Department of Health and Human Services, Centers for Disease Control and Prevention, Public Health Image Library ID 4635. No copyright permission required.

stings should not be unroofed but allowed to desiccate and scab over.^{20,28–30}

With venom components and initial sting reactions similar to IFAs, more than 90 species of Australian bulldog or bull ants of the genus *Myrmecia* are aggressive biting nuisances throughout Australia and Tasmania, with one rare species, *Myrmecia apicalis*, endemic to New Caledonia. Aptly named, bulldog ants can grow to over 40 mm in length, have long mandibles and large eyes, and can track colony intruders from distances of 1 m.³¹ One species of bulldog ant, the jack jumper ant, *Myrmecia pilosula*, is a notorious stinging ant in southeastern Australia and Tasmania that displays jumping movements when agitated.³¹ Like IFA stings, bulldog ant stings can induce anaphylaxis (approximate incidence = 3% of cases) in sensitized individuals who should be referred for species-specific VIT.³¹

Like the IFAs, bullet ants (*Paraponera clavata*) are Latin American natives that inhabit lowland rainforests from Nicaragua south to Paraguay and produce a paralyzing neurotoxin, poneratoxin.³² So named because their stings feel like bullet wounds that burn and throb for 24 hours, bullet ants are known locally as *Hormiga veinticuatro* (24 h ants) and have been used in manhood initiation rites by indigenous Amazon tribes.³² Bulldog and bullet ant stings may be treated in a similar manner to IFA stings.

The Management of Allergic Reactions to Hymenopteran Stings

The initial management of extensive local and wheal-and-flare allergic reactions to hymenopteran stings may require the addition of oral pharmacologic therapy with H_1 blocking antihistamines (diphenhydramine, 25–50 mg) and, occasionally, parenteral corticosteroids, such as dexamethasone, methylprednisolone, or prednisone.³³ Aspirin containing analgesics should probably be avoided because both bee and wasp stings may be complicated by local subcutaneous hemorrhage with extensive ecchymo-

ses and, rarely, thrombotic thrombocytopenic purpura (TTP), and cerebrovascular accidents, usually intracranial hemorrhage, following toxic and delayed reactions.³⁴

Systemic reactions to hymenopteran stings should be managed with supportive care including oxygen and intravenous fluid therapy and pharmacotherapy with intravenous analgesics, H_1 - and H_2 -receptor blocking antihistamines, and corticosteroids. As with field management strategies for removing embedded stingers, misconceptions in managing allergic reactions following hymenopteran stings abound, especially the combination of H_1 - and H_2 -receptor blocking antihistamines and the use of corticosteroids.^{33,35,36}

Although H_1 -receptor blocking antihistamines effectively inhibit the local vasodilating effects of histamine on vascular and bronchial smooth muscle, H_2 -receptor blocking antihistamines will reduce both anxiety and catecholamine-induced gastric acid secretion and potentiate H_1 blockers in antagonizing the direct cardiodepressant effects of histamine.^{33,36} Corticosteroids stabilize the membranes of the intracellular granules of circulating basophils and pulmonary mast cells and inhibit the release of local mediators of inflammatory vasodilation and pain, including histamine and serotonin.³⁶ Thus, combined pharmacotherapy with both H_1 - and H_2 -receptor blocking antihistamines, corticosteroids, vasopressors for hypotension, and β -agonists for bronchospasm is recommended for the initial management of severe systemic allergic reactions following hymenopteran stings.^{11,12,33,35–37}

Anaphylactic reactions to hymenopteran stings must be managed promptly with immediate airway establishment and circulatory support with vasopressors, specifically epinephrine and fluid resuscitation.^{11,12,36,37} Several recent reviews have examined the causes, mechanisms, and management of anaphylaxis following multiple antigenic exposures.^{11,12,36,37}

The mainstay of therapy for anaphylaxis remains epinephrine.³⁷ Vasopressor therapy for anaphylaxis should always be initiated with intramuscular, not subcutaneous, epinephrine, 0.3 to 0.5 mL of a 1:1,000 dilution (0.3–0.5 mg) in adults and in children aged older than 12 years and administered in the lateral aspect of the thigh (*Vastus lateralis* muscle).³⁷ Specific immediate dosing schedules for infants and for children aged younger than 12 years should be consulted.³⁸

The management of profound shock will require an initial intramuscular epinephrine bolus, followed by continuous intravenous epinephrine infusions.^{11,12,36–39} Bronchospasm may be managed with β_2 -selective inhaled agents, such as albuterol, terbutaline, or inhaled racemic epinephrine. An inadequate pressor response to epinephrine therapy may occur in patients with anaphylaxis who are currently on β blocker therapy for hypertension, heart disease, or glaucoma. In such cases, intravenous vasopressor support may be supplemented with intravenous infusions of pure alpha-mimetic agonists, such as phenylephrine, methoxamine, or metaraminol.^{36,39}

All patients at high risk of any systemic allergic reaction to hymenopteran stings, even those who have undergone successful VIT, should carry an emergency kit containing prefilled epinephrine syringes, such as EpiPen® or Twinject®, whenever outdoors and wear a medical alert identification bracelet or tag. All hymenopteran-venom-sensitive patients should also carry complete lists of all their specific allergies and prescribed and over the counter medications and a cover letter from their personal physician indicating the necessity of carrying prescribed injectable drugs to avoid potential confusion with illicit injectable drugs, especially while traveling. In the United States, preloaded epinephrine syringes are most readily available as EpiPen for adults and EpiPen Jr® for children. EpiPen and EpiPen Jr are epinephrine autoinjectors that will deliver either a 0.3 mL (0.3 mg) or a 0.15 mL (0.15 mg) dose of epinephrine, respectively.

Prophylaxis for Allergic Reactions to Hymenopteran Stings

The most reliable method to prevent hymenopteran allergic reactions in venom-sensitive patients is by VIT. The interested reader is directed to several recent, comprehensive reviews on VIT, authored by allergists and immunologists.^{40–45}

The Prevention of Hymenopteran Stings

Hymenopteran stings are best prevented, especially in allergic persons, by an understanding of hymenopteran feeding and stinging behaviors. Bees and several paper wasps are nectar feeders and plant pollinators that are attracted to brightly colored, blooming, and fragrantly scented flowers in grassy areas, fields, and meadows during the day. Thus, wearing shoes; hats; and drab-colored (brown, green, and khaki) clothing with long sleeves and long pants while outdoors; and avoiding bright clothing, especially yellow, pink, and red clothing, will reduce one's risks of honeybee, bumblebee, and most paper wasp stings. In addition, do not use scented deodorants, shampoos, bath oils, perfumes, cosmetics, and hair sprays when outdoors.

To avoid stings by yellow jacket and brown hornets, hymenopterans attracted to odors from food sources and garbage, special care should be taken when cooking, eating, drinking, and disposing of food, refuse, and human wastes while outdoors. Ground-dwelling vespids often nest in rotting tree stumps and fallen logs, which should be avoided. If repeatedly annoyed by bees or wasps, protect your head and neck with your hands and move away slowly from the likely nesting area. Finally, never approach or agitate a displaced honeybee hive or swarm or an active hornet or wasp nest. Notify the proper authorities of the exposed hive or nest and caution all to avoid the area, including domestic animals. Only an experienced beekeeper has the proper personal protective equipment to remove and to transport a displaced honeybee hive or swarm.

Conclusions

Apid stings can result in all reaction types, including toxic and delayed reactions, which may manifest as serum sickness, TTP, or, rarely, renal failure and intracerebral hemorrhage. Vespids stings can also cause all reaction types and may rarely result in local and systemic coagulopathies, including intracranial hemorrhage. Formicid stings commonly cause local and systemic reactions, although allergic and anaphylactic reactions are possible and can be prevented by formicid-specific VIT.

International travelers who intend to spend considerable time outdoors in temperate climates during spring through fall or in tropical climates year round are at significantly increased risks of hymenopteran stings and subsequent allergic reactions. Travel medicine physicians should counsel their patients about the risks of hymenopteran stings and recommend practical and simple avoidance measures for prevention. Last, travel medicine physicians should consider referring the following high-risk potential travelers to allergists for VIT before travel: (1) patients with past histories of systemic reactions to hymenopteran stings; (2) patients with mastocytosis; and (3) patients taking ACEIs.¹⁴

Declaration of Interests

The author states that he has no conflicts of interest.

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