

What's Eating You? Vespids

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Stinging insects with membranous wings are classified into the order Hymenoptera. Vespids, a family within the order Hymenoptera, are the most common source of insect stings and include the yellow jacket (*Vespula* species), hornet (*Vespa*, *Vespuila* species), paper wasp (*Polistes* species), and mason or potter wasp (subfamily Eumeninae).¹ Most vespids are social arthropods and build large nests, though potter wasps are solitary and build small vase-shaped cells of mud to house their eggs.

Yellow jackets and hornets will sting repeatedly if their nests are disturbed, whereas wasps are much more tolerant of disturbances. A vespid sting commonly produces a burning erythematous wheal localized to the site of the sting. Systemic reactions, including potentially life-threatening manifestations, also may occur as a result of vespid stings.

Background

Most yellow jackets are small (≤ 2 cm long) ground-nesting vespids commonly identified by yellow and black bands on the abdomen. Yellow jackets scavenge for decaying protein and carbohydrates, such as rotting fruit in garbage cans and at picnic grounds. Solitary stings often occur at such sites. Because colonies grow rapidly during late summer, yellow jacket stings are particularly hazardous at this time of year if the nest is disturbed.²

The body of the American hornet is often larger than that of other vespids, measuring 2.5 to 3.5 cm

long. Hornets may be black and white (Figure 1) or shades of brown, orange, and red. They tend to produce aerial paper nests in hollow trees, attics, and wall voids of houses. Hornets will hunt other insects and also have been observed feeding on ripe fruit.² The European species (*Vespa crabro*) is dark brown and yellow. The American white-faced hornet (*Vespula maculata*) is larger with black markings on a white background. Both species are very aggressive, and the local manifestations of stings from both *V crabro* and *V maculata* are severe. Hornets will sting repeatedly when their nest is disturbed, a behavior that has given rise to the colloquial expression "stirring up a hornet's nest" for any act that provokes a series of attacks.

Paper wasps have long slender bodies measuring 2 to 2.5 cm (Figure 2). Depending on the species, the colors can vary from brown to yellow, black, and red. Because some species are striped yellow or white and brown, they can be mistaken for yellow jackets. Paper wasps build their nests in various areas, including buildings, trees, and shrubs. Paper wasps feed on extrafloral juices, plant sap, and sweets. Paper wasps pose potential for human encounters any time of year because buildings are common hibernation sites.² Fortunately, paper wasps are less likely than other vespids to sting when disturbed. Most paper wasps in the colony are infertile female workers; the queen is only slightly larger than the worker wasps.

Mason wasps are solitary arthropods that build small mud cases, so multiple stings are less likely. These wasps are highly aggressive towards caterpillars but less so toward humans.

Reactions

Vespids typically sting when interrupted during a search for food or as a defense against being stepped on or swatted.³ Hundreds to thousands of stings typically result from a disturbance to the colony, especially a hornet or yellow jacket colony.³ In most vespids, the stinging apparatus originates in the

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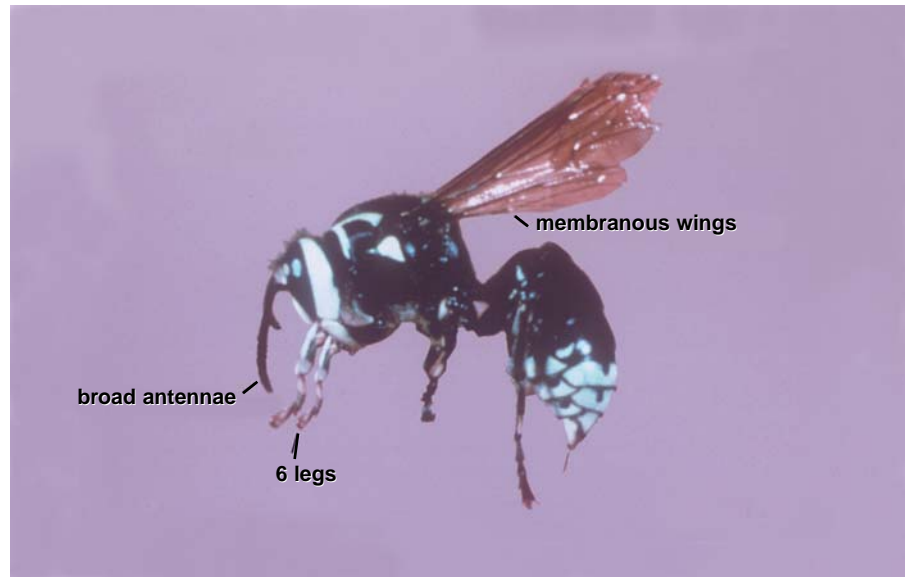


Figure 1. Black and white markings on a hornet.

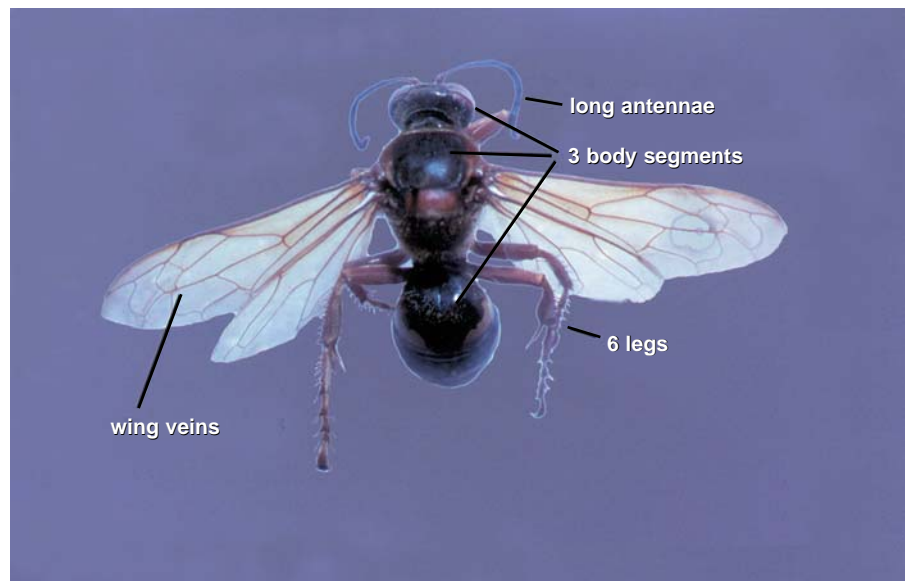


Figure 2. Typical morphology of a vespid, in this case a paper wasp.

abdomen of the infertile female worker. The stinging apparatus consists of a sac containing venom attached to a barbed stinger (Figure 3). When a sting occurs, the sac contracts, and venom is deposited into tissue. In contrast to the honeybee's stinger that detaches following contact, vespid stingers do not detach, giving them the ability to sting multiple times. Allergens in vespid venom responsible for IgE sensitization have been identified as phospholipase hyaluronidase proteins, including one known as antigen 5.¹ Interestingly, antigen 5 shows surprising homology with some filarial antigens.

A vespid sting commonly produces immediate pain and burning followed by pruritis, edema, and

erythema localized to the site of the sting. The presence of pain can help differentiate a sting from an insect bite.⁴ Clinically, the resulting lesion can be described as a wheal or as papular urticaria measuring 1 to 4 mm with central blanching surrounded by an erythematous halo.² The lesion appears within 2 to 3 minutes after the sting and generally subsides after several hours.⁵ The edema may extend over a larger area with marked erythema, peaking in 48 hours and lasting up to 7 days. Both mediators within the venom and IgE antibodies appear to play a role in local reactions. The reaction will recur if the patient comes in contact again with the same insect, and the risk for anaphylaxis following an extensive local reaction is about 5% with subsequent stings.⁶



Figure 3. Stinging apparatus.

Vasculitis and serum sickness have been reported following stings. The symptoms develop several days to a week after the sting and generally follow a progressive course.^{7,8} Skin and soft tissue necrosis also have been reported following untreated hymenoptera stings.⁹

Systemic reactions to vespid venom components occur following a large number of stings, usually numbering 50 to 100. Often, the reaction is not caused by an allergic mechanism but, instead, is the result of the vasoactive amines, peptides, and enzymes that comprise the venom.⁴ The clinical picture of vespid sting reactions is similar to that of anaphylaxis and may be difficult to distinguish from true allergy. Therefore, radioallergosorbent testing and evaluation by an allergist are recommended. Patients with mastocytosis may demonstrate severe reactions to vespid stings. Persistent elevations in the serum tryptase level identify a subgroup of patients, some with mastocytosis, who are at risk for severe recurrent anaphylactic episodes. Anaphylaxis occurs through an IgE-mediated type I hypersensitivity mechanism and is estimated to occur in 0.3% to 0.8% of children and 3% of adults in the general population.^{1,4} Barnard¹⁰ estimated that approximately 50 people die each year from insect anaphylaxis, and most of these individuals have not had previous generalized allergic reactions.

Symptoms of anaphylaxis generally start within 10 to 20 minutes after the sting but can occur up to 72 hours later. Early clinical features include generalized urticaria, flushing, and angioedema.¹ Hypotension, laryngeal edema, and bronchial constriction are the most common systemic reactions that result

in death.³ Death from systemic reactions occurs most commonly in people older than 40 years, especially those with preexisting medical conditions.^{5,11}

Exaggerated nodular reactions after bites and stings have been reported in patients with chronic lymphocytic leukemia. The lesions are unrelated to the stage of chronic lymphocytic leukemia and the course of therapy. Although many patients do not recall being stung or bitten, the distribution of the lesions and the histopathologic finding of degranulating eosinophils within the lesions suggest an exaggerated bite or sting reaction.¹² Other documented histopathologic findings in patients with chronic lymphocytic leukemia who have exaggerated bite reactions include follicular mucinosis and eosinophilic cellulitis with flame figures (also known as Wells syndrome).^{13,14} Vespid stings are more likely to be recalled than other insect bites or stings, but persistent unusual reactions should prompt evaluation for underlying lymphoproliferative disease.

Treatment

Treatment for local reactions is generally symptomatic, with analgesics and cold compresses most commonly used. Extensive local reactions can be treated with an antihistamine. Sometimes, topical or systemic corticosteroids are required.⁷

Anaphylaxis is treated initially with 0.3 cc of subcutaneous epinephrine, with the dose repeated every 30 minutes as required. A half strength dilution (1:2000) is used for young children. Urticaria and itching generally are treated with antihistamines. Vasopressors, intravenous fluids, oxygen,

and aerosolized bronchodilators may be necessary depending on the presenting systemic symptoms. It is imperative to maintain an adequate airway at all times. Aerosolized β -agonists can help alleviate upper airway edema and constriction. Corticosteroids may be employed if symptoms persist.¹

Prophylaxis

Prophylactic recommendations should be discussed with every patient following an anaphylactic episode. Patients should be counseled regarding prevention, including education about vespids and their general behavior. Wearing shoes, slacks, and long-sleeved shirts in grassy areas or fields and wearing gloves when gardening are appropriate recommendations. Products that may attract vespids, such as cosmetics, perfumes, and hair sprays, should be avoided, as well as wearing bright colors, pastels, or white clothing. Proper measures also should be taken when eating or cooking outside because food and odors may attract vespids. Waste cans should be covered.

When vespids sting, they usually are drawn to the upper body. If people are attacked, they should cover their head and run for shelter. Patients who have an increased risk for allergic reactions should be supplied with and educated about proper use of self-administered subcutaneous epinephrine.^{1,7}

REFERENCES

1. Reisman RE. Insect stings. *N Engl J Med*. 1994;331:523-527.
2. Goddard J. Wasps (paper wasps, hornets, and yellow-jackets). In: *Physician's Guide to Arthropods of Medical Importance*. Goddard J, ed. Boca Raton, Fla: CRC Press, Inc; 1993:295-302.
3. Vetter RS, Visscer PK, Camazine S. Mass envenomations by honey bees and wasps. *West J Med*. 1999;170:223-227.
4. Volcheck GW. Hymenoptera (apidae and vespidae) allergy: update in diagnosis and management. *Curr Allergy Asthma*. 2002;2:46-50.
5. Alexander JO. *Arthropods and Human Skin*. Berlin, Germany: Springer Verlag; 1984:135-150.
6. Mauriello PM, Barde SH, Georgitis JW, et al. Natural history of large local reactions from stinging insects. *J Allergy Clin Immunol*. 1984;74:494-498.
7. Reisman RE. Stinging insect allergy. *Med Clin North Am*. 1992;76:883-894.
8. Reisman RE, Livingston A. Late-onset allergic reactions, including serum sickness, after insect stings. *J Allergy Clin Immunol*. 1989;94:331-337.
9. Kocer U, Ozer Tiftikcioglu Y, Mete Aksoy H, et al. Skin and soft tissue necrosis following hymenoptera sting. *J Cutan Med Surg*. 2003;7:133-135.
10. Barnard JH. Studies of 400 hymenoptera sting deaths in the United States. *J Allergy Clin Immunol*. 1973;52:259-264.
11. Graham MD, McPherson H, Lieberman P. Skin testing in the evaluation of hymenoptera allergy and drug allergy. *Immunol Allergy Clin North Am*. 2001;21:301-320.
12. Davis MDP, Percicario C, Dahl PR, et al. Exaggerated arthropod-bite lesions in patients with chronic lymphocytic leukemia: a clinical, histopathologic, and immunopathologic study of eight patients. *J Am Acad Dermatol*. 1998;39:27-35.
13. Rongioletti F, Rebora A. Follicular mucinosis in exaggerated arthropod-bite reactions of patients with chronic lymphocytic leukemia. *J Am Acad Dermatol*. 1999;41:500.
14. Schorr WF, Tauscheck AL, Dickson KB, et al. Eosinophilic cellulitis (Wells' syndrome): histologic and clinical features in arthropod bite reactions. *J Am Acad Dermatol*. 1984;11:1043-1049.