

## Bee Stings and Animal Bites

**Competency:** The resident should:

Understand the appropriate management of Hymenoptera stings

Know the risks of anaphylaxis from Hymenoptera stings

Be able to manage the acute and short-term treatment of animal bites.

Know the common pathogens associated with animal bites and the appropriate antibiotics to use.

Understand the appropriate use of vaccines for animal bites.

### Case:

A 5-year-old and 3-year-old sibling pair present to your office for urgent care. Mom explains that the 3-year-old was playing in the garden this morning, when he came running to her crying and holding his hand outstretched. On the back of the hand there is swelling and erythema around a point where a stinger is visibly sticking out. Mom has observed several bees in the garden. Mom asks you if her son is allergic to bees and what she should do for future stings. In addition, Mom explains that the 5-year-old was playing with the family cat, when the cat bit him once on the hand. A cursory examination reveals 4 puncture wounds; there is no bleeding. Mom brought him to the office urgently because she is concerned about rabies and wonders what she should do at home for wound care.

### Questions:

1. What are the four types of Hymenoptera sting reactions?
2. What is the management of each type of sting reaction?
3. What are the risks of animal bites?
4. What is the appropriate management of animal bites?
5. What, if any, are appropriate vaccines for animal bites?

### References:

The Management of Bite Wounds. Fleisher G. R. N Engl J Med 1999; 340:138-140, Jan 14, 1999.

Gail M. Booker and Henry M. Adam. **Insect Stings**. Pediatr. Rev., Oct 2005; 26: 388 - 389.

Jane Curtis. **Insect Sting Anaphylaxis**. Pediatr. Rev., Aug 2000; 21: 256.

Victor F. Garcia. **Animal Bites and Pasturella Infections**. Pediatr. Rev., Apr 1997; 18: 127 - 130.

Mark Rapoport and Henry M. Adam. **Animal Bites: Assessing Risk for Rabies and Providing Treatment**. Pediatr. Rev., Apr 1997; 18: 142 - 143.

Chitra S. Mani and Dennis L. Murray. **Rabies**. Pediatr. Rev., Apr 2006; 27: 129 - 136.

## Bee Stings and Animal Bites

**Competency:** The resident should:

Understand the appropriate management of Hymenoptera stings

Know the risks of anaphylaxis from Hymenoptera stings

Be able to manage the acute and short-term treatment of animal bites.

Know the common pathogens associated with animal bites and the appropriate antibiotics to use.

Understand the appropriate use of vaccines for animal bites.

**Case:**

A 5-year-old and 3-year-old sibling pair present to your office for urgent care. Mom explains that the 3-year-old was playing in the garden this morning, when he came running to her crying and holding his hand outstretched. On the back of the hand there is swelling and erythema around a point where a stinger is visibly sticking out. Mom has observed several bees in the garden. Mom asks you if her son is allergic to bees and what she should do for future stings. In addition, Mom explains that the 5-year-old was playing with the family cat, when the cat bit him once on the hand. A cursory examination reveals 4 puncture wounds; there is no bleeding. Mom brought him to the office urgently because she is concerned about rabies and wonders what she should do at home for wound care.

### 1. What are the four types of Hymenoptera sting reactions?

Hymenoptera is an extensive order of insects, including the bees, ants, ichneumons, sawflies, etc. They have four membranous wings, with few reticulations, and usually with a thickened, dark spot on the front edge of the anterior wings. In most of the species, the tongue, or lingua, is converted into an organ for sucking honey, or other liquid food, and the mandibles are adapted for biting or cutting. In one large division (Aculeata), including the bees, wasps, and ants, the females and workers usually have a stinger, which is only a modified ovipositor. In bee stings, the stinger is left in the victim's skin. In wasp and hornet stings, no stinger is left behind. Hymenoptera stings can produce four types of reactions:

**Local reaction:** The most common type of reaction is a local reaction of pain, with a pruritic urticarial lesion that is less than 5cm in diameter developing at the site of the sting. These typically last less than 24 hours.

**Large local reaction:** Large local reactions are reported in about 10% of people who are stung, and consist of swelling and erythema contiguous to the bites, over an area greater than 5cm in diameter and lasting greater than 24 hours.

**Mild systemic reactions:** Systemic reactions occur in 0.4% to 0.8% of children. Mild systemic reactions consist of urticaria, erythema, angioedema, and pruritus in areas distant from the bite or diffusely spread. There may be mild gastrointestinal symptoms, with nausea, cramping, or diarrhea. Onset of symptoms may be minutes to hours.

**Severe systemic reactions:** Severe systemic reactions consist of laryngeal edema, bronchospasm, and hypotension. Onset of symptoms may be within minutes.

## 2. What is the management of each type of sting reaction?

**Local reaction and large local reaction:** a) Immediate management: Symptomatic treatment with benadryl for itching and swelling, along with Tylenol for pain is recommended. Some parents choose to apply tenderized meat to the site. In addition, the stinger should be removed, when present. The most appropriate method of removing the stinger is to scrape it out with a plastic card or similar object, which will not allow more venom to be injected. Although it is possible to remove the stinger with the fingers, this approach injects more venom into the site. Applying mud packs, using ice cubes, or allowing the stinger to fall out on its own does not remove the stinger in a reasonable period of time.

b) Long-term management: Children who have usual local reactions or large local reactions do not need further evaluation; they can be instructed to try to avoid re-stings by wearing shoes, avoiding perfumes, and keeping food products covered when outdoors. Several studies have examined the natural history of untreated patients who are stung again. The vast majority have the same or a milder reaction on re-sting. Thus, it appears that the risk is very low for children to have a more severe reaction to future stings, even if they had urticaria and angioedema with the first sting.

**Mild and severe systemic reactions:** a) Immediate management: For any type of systemic symptoms (eg, feeling of impending doom, hives, wheezing, or dizziness), epinephrine should be injected immediately. The patient should be brought to the emergency room for evaluation. In some cases, anaphylaxis will result from a first insect sting. Patients with severe systemic reaction or anaphylaxis should be supported by basic life support measures and brought to immediate medical attention to receive epinephrine and advanced life support, as needed.

b) Long-term management: Referral to an allergist may be considered for children who experience mild systemic reactions, and it is essential for children who have severe systemic reactions. Immunotherapy is effective and clearly is indicated for children who have had a severe anaphylactic reaction. Immunotherapy for children who have mild systemic reactions is decided case-by-case, but generally it is not recommended. Children who have severe reactions must be given a kit for emergency epinephrine self-administration (Epi-Pens), with instructions on using it and seeking immediate medical evaluation after using it. Note that there is no cross-reactivity in bee vs wasp allergy. In effect, a patient who has anaphylaxis from bee stings will not have anaphylaxis to wasp

stings.

### **3. What are the risks of animal bites?**

The prominent risks of animal bites include infection and mechanical trauma. Each year in the United States, an estimated 300,000 to 4.5 million people sustain dog bites, accounting for up to 1% of all ED visits. Children younger than age 10 years are at greatest risk, and most injuries in this age group involve the head and neck. Certain breeds of dogs are overrepresented in severe and fatal dog bites. Fifty percent of the deaths in the United States from dogs are attributed to pit bull-type dogs and Rottweilers, although a great number of breeds were involved in the other 50%. Most dogs are either family pets or are known to the child. Male dogs are sixfold more likely to bite a child than are female dogs. Although animal bites may be life-threatening, we will focus on the risks of minor bites, which include wound infection, fracture, and tendon damage.

### **4. What is the appropriate management of animal bites?**

**Initial assessment:** Since bites may be life-threatening, primary assessment of bites must involve ABCs. Hemostasis must be achieved. The effect on vital organs should be assessed. Next, the wound itself should be addressed:

**Cleaning and exploration:** The appropriate first step in treatment of all bites is to clean the wound with copious amounts of sterile water or saline and to visually inspect it. Even apparently minor wounds require careful exploration, because injuries that appear to be superficial may overlie fractures; involve lacerated tendons, vessels, or nerves; extend into body cavities; penetrate joint spaces; or damage structures such as the eye.

**Suturing:** The physician must decide whether to close cutaneous wounds, weighing the cosmetic benefits against the increased risk of infection. As a general rule, such wounds should be treated and left open initially if they are punctures rather than lacerations, are not potentially disfiguring, are inflicted by humans, involve the legs and arms (particularly the hands) as opposed to the face, or occurred more than 6 to 12 hours earlier in the case of bites to the arms and legs and 12 to 24 hours earlier in the case of bites to the face. Facial lacerations from dog bites or cat bites are almost always closed. Because any foreign material in a contaminated wound increases the risk of infection, subcutaneous sutures should be used sparingly.

#### **Infection prophylaxis:**

**Standard management:** Even when they receive prompt attention, about 85 percent of bites harbor potential pathogens. Adherence to standard principles of wound management provides the best defense against purulent bacterial infections. Copious irrigation at high pressure markedly decreases the concentration of bacteria in contaminated wounds. Débridement of devitalized

tissue further decreases the likelihood of infection; however, débridement must be performed cautiously on the face, particularly near landmarks such as the vermilion border of the lip and the eyebrows. Cultures obtained at the time of injury are of little value because they cannot be used to predict whether infection will develop or, if it does, the causative pathogens.

**Common pathogens:** In dog and cat bites, *Pasteurella* species are the most common isolates, anaerobic organisms are recovered frequently but were seldom present alone, and *Staphylococcus aureus* and *Streptococcus pyogenes*, which are the usual pathogens in cutaneous infections not caused by bites, are relatively uncommon. When fever occurs in immunosuppressed patients after a dog bite, the possibility of an infection with *Capnocytophaga canimorsus*, an invasive organism, should be considered. Other uncommon pathogens that merit consideration include *Eikenella corrodens* (a cause of infection in human bites), *Bartonella henselae* (the cause of cat scratch disease), *Francisella tularensis* (the cause of tularemia), leptospira species (which cause leptospirosis), and *Streptobacillus moniliformis* and *Spirillum minus* (which cause rat-bite fever).

**Antibiotics:** Antibiotics are recommended for high-risk wounds, such as deep punctures (particularly if inflicted by cats), those that require surgical repair, and those involving the hands and face. Augmentin is the antibiotic of choice to cover the most common pathogens.

## 5. What, if any, are appropriate vaccines for animal bites?

**Tetanus prophylaxis:** Given the risk of tetanus after bites of all kinds, tetanus immune globulin and tetanus toxoid should be administered to patients who have had two or fewer primary immunizations. Tetanus toxoid alone can be given to those who have completed a primary immunization series but who have not received a booster for more than five years.

**Rabies prophylaxis:** Although the bite of any mammal can transmit rabies, the bites of some species (e.g., those of rats) pose a minimal risk, whereas the bites of others (e.g., those of bats, raccoons, skunks) should prompt a higher level of concern. Dog bites pose virtually no concern for rabies as the last case of rabies in a dog in the city of Chicago was early in the last century. When rabies prophylaxis is indicated because the laboratory evaluation found that the animal was rabid or because the animal was not captured, the regimen for patients who have not been vaccinated previously should include both human rabies vaccine (a series of five doses administered intramuscularly in the deltoid area) and rabies immune globulin (20 IU per kilogram of body weight, with as much as possible infiltrated in and around the wound and the remainder administered intramuscularly at a site distant from that used for vaccine administration). Rabies

prophylaxis is now recommended after exposure to bats in a confined setting, particularly for children, even when no bites are visible.

#### References:

The Management of Bite Wounds. Fleisher G. R. N Engl J Med 1999; 340:138-140, Jan 14, 1999.

Gail M. Booker and Henry M. Adam. **Insect Stings.** Pediatr. Rev., Oct 2005; 26: 388 - 389.

Jane Curtis. **Insect Sting Anaphylaxis.** Pediatr. Rev., Aug 2000; 21: 256.

Victor F. Garcia. **Animal Bites and Pasturella Infections.** Pediatr. Rev., Apr 1997; 18: 127 - 130.

Mark Rapoport and Henry M. Adam. **Animal Bites: Assessing Risk for Rabies and Providing Treatment.** Pediatr. Rev., Apr 1997; 18: 142 - 143.

Chitra S. Mani and Dennis L. Murray. **Rabies.** Pediatr. Rev., Apr 2006; 27: 129 - 136.

Author: Bill Harenburg, MD

Faculty review by: Alison Tothy, MD