

Dog and Cat Bites

ROBERT ELLIS, MD, *University of Cincinnati, Cincinnati, Ohio*

CARRIE ELLIS, DVM, MS, *Animal Hospital on Mt. Lookout Square, Cincinnati, Ohio*

Animal bites account for 1% of all emergency department visits in the United States and more than \$50 million in health care costs per year. Most animal bites are from a dog, usually one known to the victim. Most dog bite victims are children. Bite wounds should be cleaned, copiously irrigated with normal saline using a 20-mL or larger syringe or a 20-gauge catheter attached to the syringe. The wound should be explored for tendon or bone involvement and possible foreign bodies. Wounds may be closed if cosmetically favorable, such as wounds on the face or gaping wounds. Antibiotic prophylaxis should be considered, especially if there is a high risk of infection, such as with cat bites, with puncture wounds, with wounds to the hand, and in persons who are immunosuppressed. Amoxicillin/clavulanate is the first-line prophylactic antibiotic. The need for rabies prophylaxis should be addressed with any animal bite because even domestic animals are often unvaccinated. Postexposure rabies prophylaxis consists of immune globulin at presentation and vaccination on days 0, 3, 7, and 14. Counseling patients and families about animal safety may help decrease animal bites. In most states, physicians are required by law to report animal bites. (*Am Fam Physician*. 2014;90(4):239-243. Copyright © 2014 American Academy of Family Physicians.)

CME This clinical content conforms to AAFP criteria for continuing medical education (CME). See CME Quiz Questions on page 226.

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► **Patient information:** A handout on this topic is available at <http://familydoctor.org/familydoctor/en/prevention-wellness/staying-healthy/pets-animals/cat-and-dog-bites.html>.

Animal bites account for 1% of emergency department visits in the United States, costing \$53.9 million annually.¹ Of the 4.7 million emergency department visits for animal bites every year, about 2% of patients need hospitalization.¹ There are 10 to 20 animal bite-related deaths, mostly from dogs, annually.¹⁻⁴

Dog bites account for 85% to 90% of animal bites in the United States at a rate of 103 to 118 per 100,000 population^{1,5}; no one dog breed is most often responsible.⁶ Pit bull and Rottweiler breeds account for most of the human fatalities related to dog bites over the past two decades.^{6,7} Most dog bite victims are children, and these bites usually involve the head and neck. Adolescents and adults tend to have more bite wounds to the extremities.^{2,3,7} More than 70% of bites are from a dog that is known to the victim, and about 50% are self-reported as unprovoked.²

Cat bites account for 5% to 10% of animal bite wounds.¹ Cat bites occur most often in adult women, usually on the extremities. Almost all of these bites are self-reported as provoked.²

Wound Treatment

Animal bite wounds are considered grossly contaminated; therefore, proper wound treatment is essential to prevent secondary

infection. The affected skin surface should be cleansed, and the wound should be copiously irrigated with water, normal saline, or dilute povidone-iodine solution, especially if the animal may be rabid.⁸⁻¹⁰ To irrigate the wound, a 20-mL or larger syringe should be used to generate the high pressure required for adequate cleaning.¹⁰ If a 20-mL or larger syringe is unavailable, a 20-gauge catheter can be connected to the syringe to increase the pressure.⁹⁻¹¹ Cautious debridement of devitalized tissue further decreases the potential for infection.^{9,10,12}

The wound should be carefully explored for tendon or bone involvement and foreign bodies, such as teeth fragments.^{9,10} Older dogs and cats often have significant periodontal disease, increasing the risk that a tooth will break off during a bite. Radiography is indicated if a foreign body or bone involvement is suspected.⁹ Tendon ruptures should be evident on examination, but identifying a partial tendon rupture requires careful exploration of the wound. Observing the tendon throughout the joint's full extension and full flexion can reveal small or partially torn tendons, which warrant referral for repair.

Wound Closure

There are few studies addressing whether an animal bite wound should be primarily

SORT: KEY RECOMMENDATIONS FOR PRACTICE

Clinical recommendation	Evidence rating	References	Comments
Bite wounds may be closed if cosmetically desirable. However, wounds at high risk of infection should be left open.	B	13, 14, 16	Randomized controlled trials
Antibiotic prophylaxis should be used for high-risk bite wounds and considered for average-risk wounds.	B	10, 16, 18, 19	Meta-analysis
Postexposure rabies prophylaxis should be given to all persons possibly exposed to rabies.	C	24, 26, 28	Evidence-based guidelines
Preexposure rabies prophylaxis should be considered for persons at higher risk of rabies exposure, and for international travelers to at-risk areas who are unlikely to get postexposure prophylaxis within 24 hours of a possible rabies exposure.	C	24, 26, 28	Evidence-based guidelines

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, go to <http://www.aafp.org/afpsort>.

closed. Traditionally, animal bite wounds were left open to prevent secondary infections. In one study of 169 dog bite wounds in 96 patients, the infection rate was statistically equivalent for wounds that were primarily closed (7.6%) and those that were left to heal by secondary intention (7.8%).¹³ In a second study of 145 bite wounds that were primarily closed, only 5.5% became infected, including bites from dogs (61%), cats (31%), and humans (8%).¹⁴ Both of these studies are small and have design limitations; therefore, wounds may be primarily closed if desired for cosmetic reasons.^{9,10,13-15} However, allowing a wound to close by secondary intention should be considered if there is a higher risk of infection (Table 1^{10,11,16}), such as wounds to the hand.^{9,10} The safety and effectiveness of skin adhesives have not been studied in animal bite wounds.¹⁷

Antibiotic Prophylaxis

There are conflicting data regarding antibiotic prophylaxis in the treatment of dog bite wounds and very limited data in other animal bite wounds. A meta-analysis of eight randomized trials showed a benefit with antibiotic prophylaxis in animal bites (relative risk = 0.56;

number needed to treat = 14); the infection rate was 16% in untreated patients.¹⁸ However, a Cochrane review of nine trials showed no statistical difference in infection rate between prophylaxis and no treatment, except in bite wounds to the hand.¹⁹ In hand wounds, antibiotic prophylaxis reduced the rate of infection from 28% to 2% (odds ratio = 0.10; number needed to treat = 4). However, studies were heterogeneous and used different antibiotics. Antibiotic prophylaxis should be used for high-risk bite wounds (Table 1^{10,11,16}) and considered in average-risk wounds.^{9,18,19}

Cultures of bite wounds are generally not helpful initially, unless the wound is abscessed or already infected.^{9,10} Common pathogens associated with animal bites include *Staphylococcus*, *Streptococcus*, *Pasteurella*, *Capnocytophaga*, *Moraxella*, *Corynebacterium*, *Neisseria*, and anaerobic bacteria.²⁰ *Pasteurella multocida* is a common bacterium in the mouths of cats, but it can also be present in dogs. This bacterium can cause a fast-growing infection in humans and is one of the reasons to consider antibiotic prophylaxis for bite wounds. Wounds that become infected within 24 hours of the bite are often caused by *Pasteurella*.¹⁰⁻¹² *Capnocytophaga canimorsus* is an emerging human pathogen that has been isolated from the mouths of 24% of dogs and 17% of cats.^{10,12,21} This fastidious gram-negative bacterium can cause septicemia, meningitis, and endocarditis. Patients who have had splenectomy or who abuse alcohol are at highest risk of *C. canimorsus* infection. A beta-lactam/beta-lactamase inhibitor combination is the initial treatment of choice for this bacterium.

Antibiotic prophylaxis should be considered for all bites requiring closure and for high-risk bites.^{9,10} All cat bites are considered high risk for infection because they tend to cause deep puncture wounds.^{9,10}

Table 1. Factors That Increase the Risk of Infection from an Animal Bite

Bite in extremities with underlying venous and/or lymphatic compromise	Delayed presentation Greater than 6 to 12 hours for bites to the arm or leg Greater than 12 to 24 hours for bites to the face
Bite involving the hand	
Bite near or in a prosthetic joint	Puncture wounds Victim with diabetes mellitus or immunosuppression
Cat bites	
Crush injuries	

Information from references 10, 11, and 16.

Table 2. Prophylactic Antibiotic Dosages for Animal Bites**Adults**

First-line

Amoxicillin/clavulanate (Augmentin), 875/125 mg every 12 hours

Alternatives

Clindamycin, 300 mg 3 times per day *plus* ciprofloxacin (Cipro), 500 mg twice per day

Doxycycline, 100 mg twice per day

Penicillin VK, 500 mg 4 times per day *plus* dicloxacillin, 500 mg 4 times per day

A fluoroquinolone; trimethoprim/sulfamethoxazole, 160/800 mg twice per day; or cefuroxime axetil (Ceftin), 500 mg twice per day *plus* metronidazole (Flagyl), 250 to 500 mg 4 times per day, or clindamycin, 300 mg 3 times per day

Children

First-line

Amoxicillin/clavulanate, 25 to 45 mg per kg divided every 12 hours

Alternative

Clindamycin, 10 to 25 mg per kg divided every 6 to 8 hours *plus* trimethoprim/sulfamethoxazole, 8 to 10 mg per kg (trimethoprim component) divided every 12 hours

Pregnant women who are allergic to penicillin

Azithromycin (Zithromax), 250 to 500 mg per day

Close monitoring is needed because of high failure rate

Information from references 10, 16, and 22.

Amoxicillin/clavulanate (Augmentin) is generally considered the first-line prophylactic treatment for animal bites.^{10,16} Table 2 summarizes the treatment options.^{10,16,22} A three-day to seven-day course of prophylactic antibiotics is likely adequate and was typical in most studies.⁹

Tetanus vaccination is recommended after an animal bite if it has been more than five years since the patient has been immunized.¹¹ Table 3 summarizes the indications for tetanus prophylaxis in patients with wounds.²³

Rabies

Rabies is a virus that can infect any mammal. In the past decade, there have been up to eight human cases in the United States each year.²⁴ Once symptomatic, it is almost universally fatal. Postexposure prophylaxis, which costs about \$1,000, is 100% effective if used properly.²⁴ There have been 6,000 to 7,000 documented cases per year of rabies in animals in the United States and Puerto Rico over the past 10 years.²⁵ In the United States, cats are the most commonly infected domesticated animal, whereas raccoons, bats, and skunks are the most commonly infected wild animals. In 2012, there were 257 cases of rabies in cats and 84 cases in dogs.²⁵ In most areas of the United States, it is required by law that dogs and cats be vaccinated. Despite this, data show that only 45% of dogs and 8% of cats that cause bites requiring an emergency department visit are vaccinated for rabies.²

Postexposure prophylaxis is indicated in all persons who were possibly exposed to a rabid animal and is given to about 16,000 to 39,000 persons in the United States each year.²⁶ Prophylaxis consists of immune globulin at presentation and rabies vaccination on days 0, 3, 7, and 14. The immune globulin is infiltrated around the bite wound, and any additional volume is administered at a site distant to the vaccination site, usually the opposite arm as the rabies vaccine. In the past, a fifth dose of the vaccine was given on day 28; however, in 2009, the Advisory Committee on Immunization Practices recommended dropping this step.^{24,27} If the patient had already received preexposure prophylaxis before the animal bite, no immune globulin is needed, and the rabies vaccine is administered only on days 0 and 3.²⁴

Postexposure prophylaxis is generally not needed in patients with a dog or cat bite as long as the animal is not showing signs of rabies, such as inappetence, dysphagia, abnormal behavior, ataxia, paralysis, altered

Table 3. Indications for Tetanus Prophylaxis

History of tetanus immunization	Clean, minor wounds		All other wounds	
	Vaccine	Immune globulin	Vaccine	Immune globulin
Uncertain or < 3 doses	Yes	No	Yes	Yes
≥ 3 doses	No, unless > 10 years since last dose	No	No, unless > 5 years since last dose	No

Adapted from Kretsinger K, Broder KR, Cortese MM, et al.; Centers for Disease Control and Prevention. Preventing tetanus, diphtheria, and pertussis among adults: use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine recommendations of the Advisory Committee on Immunization Practices (ACIP) and recommendation of ACIP, supported by the Healthcare Infection Control Practices Advisory Committee (HICPAC), for use of Tdap among health-care personnel. MMWR Recomm Rep. 2006;55(RR-17):25.

Table 4. Recommendations for Postexposure Rabies Prophylaxis

Type of animal bite	Evaluation and disposition of animal	Recommendations
Dog, cat, ferret	Healthy; observe animal for 10 days	Vaccination should not be initiated unless the animal develops clinical signs of rabies
	Rabid (or suspected)	Vaccination should begin immediately
	Unknown (e.g., escaped)	Public health officials should be consulted; immediate vaccination should be considered
Raccoon, skunk, fox, other carnivore, bats	Regarded as rabid unless the animal tests negative	Consider immediate vaccination; if the animal is being tested, delay vaccination until results are available
Livestock, horses	Consider individually	Public health officials should be consulted; most livestock in the United States are vaccinated for rabies
Rodent, rabbit, hare, other mammal	Consider individually	Public health officials should be consulted; bites of rabbits, hares, and small rodents (e.g., squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, mice) almost never require postexposure rabies prophylaxis

Adapted from Manning SE, Rupprecht CE, Fishbein D, et al.; Centers for Disease Control and Prevention. Human rabies prevention—United States, 2008: recommendations of the Advisory Committee on Immunization Practices. *MMWR Recomm Rep.* 2008;57(RR-3):12.

vocalization, or seizures; however, the animal should be monitored for at least 10 days.^{8,24,26,27} If the animal shows signs of rabies, becomes sick, or dies, immediate postexposure prophylaxis is recommended. No animal should be euthanized within 10 days of biting someone so that it can be properly observed. If there is a question about whether postexposure prophylaxis should be given, physicians can contact their local health department or go to <http://www.cdc.gov/rabies/resources/contacts.html> for a list of state and local rabies consultation contacts.

Preexposure prophylaxis should be considered in persons with higher risk of rabies exposure, such as certain laboratory workers, veterinarians, spelunkers, and certain international travelers. The Centers for Disease Control and Prevention recommends that travelers to at-risk areas receive preexposure prophylaxis if they are unlikely to receive treatment within 24 hours of a possible exposure. Preexposure prophylaxis consists of three vaccines given on days 0, 7, and 21 to 28.^{26,28}

Saliva, brain tissue, and nervous system tissue are considered infective. Blood, urine, and feces are not infective, and contact does not warrant postexposure prophylaxis. *Table 4* includes postexposure rabies prophylaxis recommendations for specific animal bites.²⁶ Postexposure prophylaxis should be strongly considered in persons possibly exposed to a bat, such as if awakening from sleep and finding a bat in the room or finding a bat in the room with an unattended child.

Preventing Animal Bites

Studies have shown that although most primary care physicians agree that counseling patients about pet-related health hazards is important, less than 20% counsel their own patients and family members.²⁹ There are a few studies that demonstrate a benefit of counseling children and families about preventing dog bites.³⁰ Most dogs that bite are known to the victim.^{2-4,6,7} Dogs should be socialized to children from the time they are puppies. Training makes a dog more confident and less likely to bite out of fear. Pets should have regular veterinary visits to stay updated on vaccines and to improve health. Pets that are in pain or sick are more likely to bite. Neutering dogs has been shown to decrease bites. Young children should never be left alone with pets.³¹ A brochure on dog bite prevention from the American Veterinary Medical Association is available at <https://www.avma.org/public/Pages/Dog-Bite-Prevention.aspx>.

Laws and Regulations

Most areas in the United States require health care professionals to report dog bites and many other animal bites, including bites in patients who present to an ambulatory office. Physicians should be familiar with their state and local laws. Because rabies in animals is a national reportable disease, suspected animals should be sent for testing. Local or state health departments can provide information about submitting and storing specimens.

Data Sources: We searched the Cochrane database using the key words animal bite, bite wound, and rabies; the U.S. Preventive Services Task Force and Institute for Clinical Systems Improvement using the key words animal bite, rabies, and bite wound; the Centers for Disease Control and Prevention using the key words animal bite and rabies; and the Agency for Healthcare Research and Quality, National Guideline Clearinghouse, Essential Evidence Plus, and UpToDate using the key word animal bite. Medline was searched when the other sources did not yield answers to our questions. We also searched the *Journal of the American Veterinary Medical Association*. Search dates: June 2011, January 2012, June 2013, and June 2014.

The Authors

ROBERT ELLIS, MD, is an assistant professor in the Department of Family and Community Medicine at the University of Cincinnati (Ohio). He is the family medicine clerkship director and the interim director of medical student education.

CARRIE ELLIS, DVM, MS, is an associate veterinarian at the Animal Hospital on Mt. Lookout Square in Cincinnati.

Address correspondence to Robert Ellis, MD, University of Cincinnati, P.O. Box 670582, Cincinnati, OH 45267-0582 (e-mail: robert.ellis@uc.edu). Reprints are not available from the authors.

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