

Management of dog bites in children

Vikram Sabhaney MD FRCPC Ran D. Goldman MD FRCPC

Abstract

Question A 4-year-old girl was playing with her neighbour's dog. The dog became excited and bit the girl on the forearm, leaving a puncture wound. As a result of the injury, she has presented to my office. Should she be treated with antibiotics? If so, which antibiotic should be used and for how long?

Answer Initiation of prophylactic antibiotics is indicated if the dog bite has undergone primary closure; if there is a moderate or severe bite wound; for puncture wounds (especially if penetration of bone, tendon sheath, or joint), facial bites, bites to the hands or feet, or genital area bites; or wounds sustained by victims who are immunocompromised or asplenic. The first-line choice of antibiotic is amoxicillin-clavulanate. Appropriate tetanus and rabies prophylaxis as indicated should also be a part of caring for a patient who has sustained a dog bite, as well as local debridement and thorough cleaning of the wound.

Dog bites account for 0.3% to 1.5% of all pediatric presentations for medical attention,^{1,2} and almost 50% of children have sustained dog bites.³ Dog bites occur more frequently in young children^{4,5} and have a higher risk of resulting in serious injury or death,^{6,7} usually from exsanguination.⁸ In Canada between 1990 and 2007, 24 of 28 fatal dog bites occurred in children younger than 12 years of age.⁹

The location of injury due to dog bites is largely dependent on age. In younger children, the most frequently affected areas are the head, face, and neck.^{10,11} As the child grows, bites to the extremities are most common.²

The incidence of dog bites peaks during the spring and summer seasons; they are often unprovoked, and frequently occur at home with a dog that is familiar to the child.^{1,4}

Treatment of bites

The management of dog bites remains a topic of controversy. It is important to sponge away visible dirt, perform copious irrigation, culture wounds (if they appear infected), and debride devitalized tissue. It is recommended that puncture wounds should not be closed, and that wounds on the hands and feet should be managed in consultation with an appropriate surgical specialist. Similar conservative care should be offered for wounds that are more than 8 hours old; however, primary wound closure is not recommended.¹²

Patients should be assessed for tetanus immunization status, and treated with immunization or

immunoglobulins if necessary (Table 1).¹² Necessity of rabies prophylaxis should be assessed on a case-by-case basis.

Table 1. Tetanus prophylaxis after dog bites

HISTORY OF ABSORBED TETANUS TOXOID (DOSES)	TETANUS PROPHYLAXIS	
	Td	TIG
<3 or unknown	Yes	Yes
≥3	No*	No

Td—tetanus-diphtheria toxoids, TIG—tetanus immune globulin.

*Yes, if ≥5 years since last dose.

Adapted from American Academy of Pediatrics.¹²

Do dog bites necessitate antibiotics?

One of the common questions after a dog bite is whether antibiotic prophylaxis is beneficial. Little evidence exists to support the routine use of antibiotics.

Complications from dog bites include wound infection, cellulitis, osteomyelitis, septic arthritis, sepsis, meningitis, endocarditis, pneumonia, and death.¹³ Rates of infection are estimated to range from 1% to 30%, the lowest among all mammalian bites.¹⁴ With local wound care, the rate of infection drops substantially.

Wounds sustained from dog bites tend to be polymicrobial, with a median of 5 bacteria in a culture. *Pasteurella* species (specifically *Pasteurella canis*) is most commonly isolated, and other common bacteria include streptococci, staphylococci, and *Fusobacterium* and *Bacteroides* species.¹⁵

Prophylactic antibiotics

Two meta-analyses have reviewed the role of prophylactic antibiotics in the treatment of dog bites. Cummings performed a meta-analysis of 8 randomized trials (of which 6 were placebo-controlled, double-blinded



This article is eligible for Mainpro-M1 credits. To earn credits, go to www.cfp.ca and click on the Mainpro link.

La traduction en français de cet article se trouve à www.cfp.ca dans la table des matières du numéro d'octobre 2012 à la page e548.

studies) assessing the use of prophylactic antibiotics among 786 patients who sustained dog bites. The relative risk of infection in those treated with prophylactic antibiotics as compared with controls was 0.56 (95% CI 0.38 to 0.82). However, given the baseline infection rate of 16%, 100 patients would need to be treated to prevent 7 infections.¹⁶ Furthermore, there was considerable heterogeneity among antibiotics used across the studies.

In a Cochrane review of 8 randomized controlled trials investigating antibiotic prophylaxis after mammalian bites, a subgroup analysis of 6 studies including dog bites reported no statistically significant reduction of local wound infection in the prophylaxis group (4%, 10 of 225 patients) as compared with the control group (5.5%, 13 of 238 patients) (odds ratio 0.74, 95% CI 0.30 to 1.85). Two of the dog bite studies included in the Cummings meta-analysis were not included in the Cochrane review. However, prophylaxis did substantially lower the rate of infection in dog bites of the hand from 28% to 2% (odds ratio 0.10, 95% CI 0.01 to 0.86, number needed to treat=4).¹⁷

A recent retrospective review of 87 children suffering facial dog bites of varying severity evaluated the rate of wound infections, scar revision, and other wound complications after primary closure with sutures. All

patients were treated with a course of antibiotics (amoxicillin-clavulanic acid was given to all except for 2). None of the patients developed wound infections, nor required scar revision in follow-up.¹⁸


A randomized controlled trial studied the infection rate at which prophylactic antibiotics were cost effective.¹⁹ Two of 46 patients (4%) receiving placebo developed wound infections, and none of the patients receiving 3 days of amoxicillin-clavulanate developed infection (absolute risk reduction 4%, 95% CI -1% to 4.5%). They determined that antibiotics would be cost effective if the rate of wound infection was 5% and antibiotics decreased the risk by greater than 3%, suggesting a role for prophylaxis of high-risk dog bite wounds.

As there is a paucity of evidence for or against it, antimicrobial prophylaxis is suggested for patients who have undergone primary closure of the wound; who have sustained moderate or severe bite wounds (especially if there is evidence of edema or crush injury, devitalized tissue, or full-thickness wounds involving tendons, ligaments, and joints); for those with puncture wounds, facial bites, hand or foot bites, and genital area bites; or those who are immunocompromised or asplenic.^{11,16,20}

First-line antimicrobial prophylaxis for high-risk dog wounds in healthy patients is amoxicillin-clavulanate for

3 to 5 days, which is based on in vitro sensitivity data and expert opinion.^{16,20,21} Alternatively, ampicillin-sulbactam might be given intravenously if the patient is unable to take oral antibiotics. If the patient is allergic to penicillin, first-line treatment is an extended-spectrum cephalosporin or trimethoprim-sulfamethoxazole plus clindamycin.¹²

Conclusion

Dog bites are a frequent reason for children to be brought for medical attention. Wounds should be cleaned and debrided to minimize risk of infection. Antibiotic prophylaxis is recommended only in high-risk wounds. 

Competing interests

None declared

Correspondence

Dr Ran D. Goldman, BC Children's Hospital, Department of Pediatrics, Room K4-226, Ambulatory Care Bldg, 4480 Oak St, Vancouver, BC V6H 3V4; telephone 604 875-2345, extension 7333; fax 604 875-2414; e-mail rgoldman@cw.bc.ca

References

1. Avner JR, Baker MD. Dog bites in urban children. *Pediatrics* 1991;88(1):55-7.
2. Daniels DM, Ritzel RB, O'Neil J, Scherer LR. Analysis of nonfatal dog bites in children. *J Trauma* 2009;66(3):S17-22.
3. Beck AM, Jones BA. Unreported dog bites in children. *Public Health Rep* 1985;100(3):315-21.
4. Lang ME, Klassen T. Dog bites in Canadian children: a five-year review of severity and emergency department management. *CJEM* 2005;7(5):309-14.
5. Kaye AE, Belz JM, Kirschner RE. Pediatric dog bite injuries: a 5-year review of the experience at the Children's Hospital of Philadelphia. *Plast Reconstr Surg* 2009;124(2):551-8.
6. Sacks JJ, Lockwood R, Hornreich J, Sattin RW. Fatal dog attacks, 1989-1994. *Pediatrics* 1996;97(6 Pt 1):891-5.
7. Brogan TV, Bratton SL, Dowd MD, Hegenbarth MA. Severe dog bites in children. *Pediatrics* 1995;96(5 Pt 1):947-50.
8. Morgan M, Palmer J. Dog bites. *BMJ* 2007;334(7590):413-7.
9. Raghavan M. Fatal dog attacks in Canada, 1990-2007. *Can Vet J* 2008;49(6):577-81.

10. Schalamon J, Ainoedhofer H, Singer G, Petnehazy T, Mayr J, Kiss K, et al. Analysis of dog bites in children who are younger than 17 years. *Pediatrics* 2006;117(3):e374-9.
11. Bernardo LM, Gardner MJ, Rosenfield RL, Cohen B, Pitetti R. A comparison of dog bite injuries in younger and older children treated in a pediatric emergency department. *Pediatr Emerg Care* 2002;18(3):247-9.
12. American Academy of Pediatrics. Bite wounds. In: Pickering LK, Baker CJ, Kimberlin DW, Long SS, editors. *Red book: 2009 report of the Committee on Infectious Diseases*. 28th ed. Elk Grove Village, IL: American Academy of Pediatrics, 2009. p. 187-91.
13. Garcia VF. Animal bites and Pasteurella infections. *Pediatr Rev* 1997;18(4):127-30.
14. Capellan O, Hollander JE. Management of lacerations in the emergency department. *Emerg Med Clin North Am* 2003;21(1):205-31.
15. Talan DA, Citron DM, Abrahamian FM, Moran GJ, Goldstein EJ. Bacteriologic analysis of infected dog and cat bites. *N Engl J Med* 1999;340(2):85-92.
16. Cummings P. Antibiotics to prevent infections in patients with dog bite wounds: a meta-analysis of randomized trials. *Ann Emerg Med* 1994;23(3):535-40.
17. Medeiros IM, Saconato H. Antibiotic prophylaxis for mammalian bites. *Cochrane Database Syst Rev* 2001;(2):CD001738.
18. Wu PS, Beres A, Tashjian DB, Moriarty KP. Primary repair of facial dog bite injuries in children. *Pediatr Emerg Care* 2011;27(9):801-3.
19. Quinn JV, McDermott D, Rossi J, Stein J, Kramer N. Randomized controlled trial of prophylactic antibiotics for dog bites with refined cost model. *West J Emerg Med* 2010;11(5):435-41.
20. Moore F. I've just been bitten by a dog. *BMJ* 1997;314(7074):88-90.
21. Goldstein EJ. Bite wounds and infection. *Clin Infect Dis* 1992;14(3):633-8.



Child Health Update is produced by the Pediatric Research in Emergency Therapeutics (PRETx) program (www.pretx.org) at the BC Children's Hospital in Vancouver, BC. Dr Sabhaney is a member and Dr Goldman is Director of the PRETx program. The mission of the PRETx program is to promote child health through evidence-based research in therapeutics in pediatric emergency medicine.

Do you have questions about the effects of drugs, chemicals, radiation, or infections in children? We invite you to submit them to the PRETx program by fax at 604 875-2414; they will be addressed in future Child Health Updates. Published Child Health Updates are available on the *Canadian Family Physician* website (www.cfp.ca).