

BITES AND WOUND MANAGEMENT

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Podiatrists may occasionally be consulted to care for bite wounds either in an emergency room or local office setting. The majority of bites occur at home or in association with "friendly" animals usually known to the patient. Therefore, many individuals may delay seeking medical attention until infection has already developed. Patients who have sustained spider envenomations may wait until early signs of skin necrosis are evident. As with any traumatic wound, thorough debridement, irrigation, and adequate tetanus prophylaxis are the most reliable means of preventing later complications. However, a basic understanding is important in instituting appropriate therapy for bites as each type of wound may have its own idiosyncracies based upon the offending animal. This paper will discuss the primary treatment concerns for the conditions most likely to be of interest to the podiatrist. Human bites will be purposely omitted as the incidence of such lesions in the lower extremity is extremely rare.

DOGS

Dog bites are the most common form of this injury encountered, occurring 1-2 million times each year.¹ In addition to the obvious puncture and tearing, dogs can produce enough force (150-450 lbs./sq. in.) to significantly crush tissues.² Such wounds may be susceptible to infection due to direct inoculation of bacteria into this compromised area. Therefore, basic wound care is of utmost importance.

Several studies have been performed to evaluate the organisms likely to cause infection following dog bites. A wide variety of organisms have been cultured from the oral cavity of dogs. Although early authors generally focused upon the presence of *Pasteurella multocida*, more recent studies have found this to be present in only 25% of dog bite wounds.² Ordog, et.al., cultured wounds in 420 patients upon initial presentation to the emergency room following injury. 48% of the specimens demonstrated no bacterial growth. Of the organisms cultured, *Staphylococcus epidermidis* was noted most commonly (20.5%). This was felt to be a contaminant. Multiple bacteria were present in 15.5% of the patients. 50% of those individuals with clinically infected wounds showed multiple pathogenic organisms. The predominant bacteria were of the family *Enterobacteriaceae*, *Pseudomonas*, *Staphylococcus aureus*, *Bacillus sub-*

tilis, and Beta *Streptococcus*. *Pasteurella* was not isolated from a single wound, despite a concerted effort to identify this organism.³

More recently, discussion has been held as to whether or not dog bite wounds may be sutured primarily upon initial examination. Classically, injuries of this nature have been cleansed and closed at a later date after careful examination to ensure infection had not developed. However, Callahan states that dog bite wounds can be safely sutured with an infection rate of only 5-10%, which is comparable to the rate of infection for clean, non-bite lacerations. However, the same author identifies the foot as a high-risk location for complications.⁴ Perhaps a more conservative approach for podiatrists is warranted until clinical studies dictate otherwise.

CATS

Cats generally produce a more characteristic puncture wound which has a greater tendency to become infected than injuries for dogs. More than likely this is due to the difficulty in achieving adequate cleansing of puncture versus open lesions. The primary organism implicated in subsequent infections is *Pasteurella multocida*. This gram negative bacillus can be isolated in the oropharynx of 50-74% of healthy cats.² Cat scratches may also inoculate this organism due to the routine cleaning habits of felines.² *Pasteurella* is apparently rather virulent and infection usually presents fairly soon following the injury. Other infectious organisms commonly encountered after cat bites are *Staphylococcus aureus*, *Streptococcus*, and *Staphylococcus epidermidis*.⁵

More recently, another unnamed bacteria has been associated with both dog and cat bites. Designated as DF-2 (dysgonic fermenter), it seems to have a predilection for patients who are asplenic, cirrhotic, or immunocompromised.⁶

PROPHYLAXIS

Antibiotic prophylaxis for bite wounds is still a topic of controversy. Antibiotic concentrations need to be present in the tissues prior to contamination to be maximally effective.

Each minute which passes following the inoculation of bacteria theoretically limits the effectiveness of "prophylactic" antibiotics. Callaham states that dog bites do not require antibiotics. However, as noted earlier, the foot is considered a high risk area for complications.⁴ Certain patient groups listed as being high risk are listed in Table 1.

If administered, these agents should provide adequate coverage for the most likely organisms to precipitate infection. No single drug will be sufficiently effective against all pathogenic bacteria. The recent recommendations of Callaham are listed in Table 2. Dicloxacillin or Cephalexin (Keflex) appears to adequately cover most organisms involved in dog bites.⁴ In another study 95% of patients

clinically infected following canine bites were treated successfully with Cephadrine (Velocef).³

As previously mentioned, *Pasteurella* is a major consideration in cat bite wounds. Although penicillin is very effective in treating this organism, less than optimum coverage is provided for *Staphylococcus*. Empiric therapy with Dicloxacillin or Cephalexin still seems to be a good compromise. In one clinical study 4 of 6 individuals receiving a placebo following cat bites developed infection, three of which were due to *Pasteurella*. Five patients receiving Oxacillin did not develop infection.⁵ Interestingly, these same authors found no benefit from the use of Oxacillin in dog bites.⁷

Table 1.

HIGH RISK PATIENTS FOLLOWING ANIMAL BITES

Location	Hand, wrist, or foot
Type of wound	Punctures Tissue crushing that cannot be fully debrided.
Patient	Older than 50 Asplenic Chronic alcoholic Altered immune status Diabetic Peripheral vascular insufficiency Chronic corticosteroid therapy Prosthetic or diseased cardiac valve Prosthetic or seriously diseased joint

Modified from Callaham (4)

Table 2.

PROPHYLACTIC ANTIBIOTICS FOR BITE WOUNDS

Organism unknown	Dicloxacillin or cephalixin Penicillin allergic - erythromycin
Cat bites	Penicillin or dicloxacillin Penicillin allergic - erythromycin Resistant to initial treatment- culture and consider tetracycline (exceptions -pregnant women and children)

Modified from Callaham (4)

Clinically, erythromycin has also been effective against this organism, despite *in vitro* evidence to suggest that oxacillin and erythromycin have questionable activity. Although there may be some resistant strains, the recommendation at this time is to use dicloxacillin initially and change to other antibiotics only if the clinical response dictates that it is in order.⁴

In dog and cat wounds one also needs to determine whether or not the animal has been adequately vaccinated for rabies. If the risk of rabies is high, it has been suggested that the wound be irrigated with 1% benzalkonium chloride (Bactine, Zephiran) due to an apparent virucidal action against the rabies virus. Local health officials should be contacted immediately to determine further appropriate measures.

NECROTIC SPIDER ENVENOMATION

Despite the irrational fear many have of spiders, the vast majority of these species are either harmless or beneficial to man. In the past few years more attention has been directed towards necrotic changes following spider bites. For many years the role of these animals in the development of dermonecrosis was not appreciated. The animal most often associated with these lesions has been *Loxosceles reclusa*, or the brown recluse spider. Bites from this arachnid may at times result in extensive necrosis of tissue. Until recently effective treatment measures had been lacking for these more severe envenomations.

The brown recluse has a very wide distribution and is seen mainly throughout the south and midwest, east from Texas to South Carolina, and south from Indiana to Alabama, excluding Florida. The most common areas for identification are Missouri, Arkansas, Oklahoma, eastern Kansas, and Tennessee.^{9,10} However, with central heating, it would be possible to discover these spiders in more northern states. Specimens have already been identified as far away as Idaho, Montana, Arizona, and California.⁹ The adult size ranges from 7-12 mm in length to 3-5 mm wide. Some color variation may be evident, but most are light to medium brown with a characteristic violin shaped marking on the body of a somewhat darker color.

As the name implies, the brown recluse spider is a shy animal which does not bite unless provoked by direct human contact and disruption of its habitat. Despite their timid nature, they have readily adapted to dwellings which place them in close proximity to man. *Loxosceles* has been identified in all types of buildings and prefers darkened storage areas such as closets, garages, basements, attics, and cupboards. Other preferred hiding places are utility boxes, under logs, hay bales, inner tubes, furniture, boxes, papers, bricks, in feed sacks, and behind picture frames.¹⁰

The initial bite may be imperceptible, or produce a very minor stinging or burning. Therefore, the patient may not have any idea as to the exact cause of the lesion unless the actual spider is noticed. A central pimple with an irregular red reaction may be noticed in 6-12 hours, followed by blister formation. A blue-gray macular halo surrounding the puncture site is said to be characteristic of necrotic arachnidism and may appear within a few hours to days. However, other authors have described a more variable appearance with central blanching surrounded by erythema. Blebs or purpura, a central purplish discoloration, or blood filled blisters nearly always indicate impending necrosis and ulceration which may take months to heal.

Treatment of reactive spider bites is still a subject of controversy. Wasserman states that the "benign neglect" approach almost always results in a suitable outcome.¹¹ Antipruritics, analgesics, tetanus prophylaxis, cold compresses, and immobilization are all measures with which most authorities will concur. Aspirin-type agents should be avoided as these drugs may tend to potentiate bleeding complications. Topical, intralesional, and systemic steroids have been used, as has early surgical excision of the bite area. All of these measures have generally failed to provide suitable results. Early surgical excision appears to be the one modality that most agree is contraindicated due to the poor results witnessed to date. Many times the full extent of the necrosis can not be fully appreciated early in the process. Better results have been noted with delayed excision after full demarcation of necrosis.^{9,12,13}

The use of Dapsone has been proven to be helpful in both experimental and clinical studies. Traditionally, this agent has been used in leprosy or by dermatologists in other dermonecrotic processes. Dapsone was shown to be effective in reducing inflammation surrounding brown recluse venom injection.¹³ In a comparative study, the results of early surgical excision versus the use of dapsone and delayed surgical excision of the skin defect were evaluated. Pretreatment with dapsone resulted in fewer wound complications, reduced objectional scarring, and reduced the need for future surgical excision.¹² However, judicious use of this agent is appropriate, especially in children. Severe adverse reactions may occur and include hemolysis, methemoglobinemia, and leukopenia. Wasserman recommends that adults with rapidly progressive severe bites (early blistering, hemorrhage, or necrosis) be started on a low dose and gradually increased from 50mg to 200mg/day, divided twice a day, for 2 weeks.¹¹ Fortunately, most envenomations will not progress to this extent. Therefore, dapsone should be used judiciously, and if in doubt, a period of close observation employed prior to the institution of its use.

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Additional References

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