

# Animal Pharm News

A newsletter from the Pharmacy Department

## RATTLESNAKE ENVENOMATION

### Management and Prevention of Rattlesnake Bites in Pets

By: Valerie Wiebe, Pharm.D

Approximately 300,000 domestic animals a year are bitten by venomous snakes in the US. Of these, 99% are from the family Crotalidae (Pit Vipers). Pit vipers include; rattlesnakes, copperheads and cottonmouths. In California, rattlesnakes are the only venomous snake. Six species are found in the state (Table 1). Due to size and aggressiveness, the Western Diamondback is the most dangerous. The Mojave Green is also dangerous, due to its neurotoxic venom that can cause paralysis.

#### Recognizing Rattlesnakes:

- Broad, triangular head, narrow neck
- Cat shaped eyes/ not round
- Folding fangs
- Plus or minus rattles at the end of the tail



#### Rattlesnake Encounters:

Rattlesnakes cannot regulate their temperature so are less active when temperatures fall below 50° F. In hot temperatures (>100° F), rattlesnakes seek cool places under rocks or logs. In Southern California they may be found anytime, but are less active in January and February.

#### Avoiding Rattlesnake Bites in Pets:

- 1) Avoid hiking with your pet in peak season, in areas with tall grass, rocks or wood piles
- 2) Stay on trails and keep pets on a leash
- 3) If a snake is encountered keep pets away, rattlesnakes can strike up to 1/2 their length
- 4) Use a walking stick to rustle bushes along trail to alert snakes of your presence
- 5) Remove all food sources (exterminate rodents, etc.) and hiding places (wood piles) from areas where your pet is kept

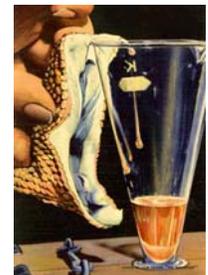
**Table 1. Rattlesnakes Found in California**

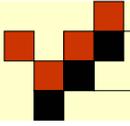
<u>Type</u>	<u>Common Name</u>	<u>Area</u>
<i>C. atrox</i>	Western Diamondback	Imperial Valley Southern CA
<i>C. cerastes</i>	Sidewinder	Sandy Dessert
<i>C. scutulatus</i>	Mojave Green	Southeastern CA
<i>C. mitchellii</i>	Speckled	Los Angeles Baja
<i>C. ruber</i>	Red Diamond	Coastal Los Angeles Baja
<i>C. viridis</i>	Southern/Northern Pacific	Coastal

#### Rattlesnake Venom:

Rattlesnake venom is not all the same. Venom is made of various proteins that contain substances toxic to nerves (neurotoxins) or to blood cells (hemotoxins). Venom quantity is related to the size of the snake (larger snakes > volume), but the potency varies with species, area, age, nutritional status and time of year. Young snakes may inject less volume but it may contain more neurotoxic elements. Snakes may also miss their target and release venom prematurely. Approximately 20-30% of human and animal bites receive no venom at all "dry bites".

The majority of adult rattlesnakes in CA have venom containing hemotoxic elements. These may destroy blood cells, skin tissue and cause severe localized swelling and internal bleeding. Baby rattlesnakes and Mojave Green rattlesnakes contain more neurotoxin making them very dangerous.





## **Discouraging Rattlesnakes in Your Yard:** **By: Dee Dee Weeks, Pharm Tech.**

Rattlesnakes typically do not stray far from home. They spend most of their time acquiring resources (rodents, abundant hiding places) and seeking mates. When resources are scarce they may move onto greener pastures. Therefore, the very best counter measure against rattlesnakes moving into your yard is to remove their resources. This means exterminate rodents and remove hiding places such as wood piles, old sheds and underbrush. Below ground fencing and frequent mowing also discourage snakes.

Rattlesnakes also may seek cool indoor areas such as garages when the temperatures are high. Keeping areas such as sheds and garages rodent free and clean may help prevent snakes from moving in. Wire mesh can be used to block off small holes or cracks under doorways that permit rattlesnakes from crawling in. Do not use caustic lye, or other advertised substances such as gels, powders, ropes, etc. to deter snakes. These are not only ineffective but can harm your pets.

## **Signs and Symptoms of Snakebites** **By: Michelle Forte, Pharm. Tech.**

One to two puncture wounds, acute swelling, bleeding and pain are the most common symptoms of a rattlesnake bite in animals. Most bites occur on the face or extremities (See Table 2). Bites around the face and throat may be more serious due to swelling of the throat and breathing impairment. Up to 1/3 of the blood supply may be lost in tissues within hours, this may cause a severe drop in blood pressure. The animal may also appear agitated or even depressed.



More severe reactions such as severe swelling, trouble breathing, ecchymosis (purple discoloration), necrosis (tissue dies and turns black) and low blood pressure give clues to the seriousness of the bite and what treatment route should be taken. Uncontrolled bleeding may occur due to disruption of blood clotting. Mojave rattlesnakes have neurotoxins that may cause rapid paralysis. Paralysis of the respiratory muscles may occur causing suffocation. In general, 20-25% of bites are "dry" (no venom), another 30% have mild local symptoms of pain and swelling, 40% are severe and about 5% are fatal.

## **What to Do if Your Pet gets Bitten:** **By: Eddie Contreras, Pharm. Tech.**

### **First Aid for Rattlesnake Bites:**

- 1) Remain calm
- 2) Wash the bite with clean water and soap
- 3) Keep the animal quiet
- 4) Immobilize the bitten area and keep it lower than the heart
- 5) Seek veterinary help immediately, even if you are uncertain if it is a rattlesnake bite
- 6) Call the emergency veterinary clinic ahead so that they can prepare
- 7) Remove restrictive collars, choke chains, etc. before swelling begins



### **Contraindications if Your Pet is Bitten:**

- 1) Do NOT ice or cool area
- 2) Do NOT use a tourniquet
- 3) Do NOT use electric shock
- 4) Do NOT try to suck or cut the wound

## **Table 2. Survey of Rattlesnake Bites in Patients at UC Davis** **By: Melissa Serino and Jonathan Woo, UC Davis students**

### **Feline Patients:**

**Total Cats Seen (1994-2005): 6**

**Areas bitten: Face (2), paws (4)**

**Primary Symptoms: Acute swelling, pain**

**Cats treated with Antivenom=3; without antivenom=3**

**Outcome: All alive/well with supportive care**

### **Canine Patients:**

**Dogs Seen (1994-2005): 67**

**Areas bitten: All on Face or legs**

**Primary Symptoms: Acute swelling/pain/bleeding**

**Number of Dogs treated with Antivenom: 43**

**Outcome: All alive/well**

**Number of Dogs treated without Antivenom: 24**

**Outcome: One dog euthanized due to severity/prognosis/cost**



*Note arrow: showing fang mark, swelling. Dogs most commonly bitten on face around the nose or lip region.*

**Other Species Bitten (1994-2005): Llama's=3,**

**Horses=15, Sheep=1,**

**Goats=1, Parrot=1**

## Treatment of Rattlesnake Bites:

**By: Valerie Wiebe, Pharm. D**

The treatment of snakebite wounds has changed from slicing, freezing, sucking, stopgap measures to a more conservative approach. Due to the extreme variability in venom potency and exposure, treatment is best titrated to the individual patient and the reaction to the venom. The faster an animal is seen by a veterinarian the greater the chance of survival and less chance of complications.



### Fluid Therapy:

Most deaths and side effects are related to loss of blood in the circulatory system causing circulatory collapse. Intravenous fluids (sodium chloride or colloid fluids) are given to maintain blood pressure. Oxyglobin can be given instead which has fewer risks of clotting abnormalities. In rare instances, blood transfusions may be required if uncontrolled bleeding occurs that is life threatening.

### Anti-histamines/Steroids/Antibiotics

#### Pain killers:

Antihistamines and steroids have been administered to help prevent further swelling and anaphylactic reactions. Steroids are controversial due to higher mortality rates reported in humans. However, their use may be indicated in patients with recurrent bites or those with symptoms of serum sickness. Antibiotics are administered to prevent secondary bacterial infections of the bite site. Pain killers (fentanyl, diazepam) are given to relieve the severe pain and agitation. Morphine is also used, but may cause histamine release that can be confused with anaphylaxis. Agitated patients may spread venom from local sites into the circulation more rapidly. Anti-inflammatories are contraindicated since they may contribute to bleeding problems.

### Antivenin:

Antivenin may be used within 6-9 hours of the bite. It should NOT be administered into the bite site and uptake can be delayed for up to 12 hours if given IM. Bites to the torso, tongue, or intravascular area require prompt antivenin administration. Antivenin is a collection of antibodies from the blood of a horse or sheep that has been previously exposed to various species of rattlesnake venom. Acute hypersensitivity, or a dose related chronic serum sickness, fever, muscle pain and itching may occur. Since the development of antivenin, mortality rates have improved in humans, although the same benefits remain to be proven clinically in animals. In humans, mortality rates are 2.6% without antivenin and only 0.28% with antivenin.

## Comparing Rattlesnake Antivenins:

**By: Jonathon Woo, Student**

For many years the mainstay of rattlesnake bites was the use of a horse serum-based whole-antibody preparation called Antivenom (Crotalidae) Polyvalent (Wyeth). In humans, this leads to a resolution of venom induced blood disorders (coagulopathy and thrombocytopenia) but is also associated with a high risk (56%) of hypersensitivity reactions and delayed serum sickness reactions, since the product is of equine origin. Both a human (Wyeth) and veterinary labeled (Fort Dodge) equine product are available. The use of either product in dogs may result in immune reactions. Skin testing prior to administration may be helpful, but is not always accurate. More recently, the Ovine Fab-based sheep-derived preparation

CroFab™ (Protheris) has become widely used in humans as an alternative to the equine derived product since it has less immune reactions. However, the Fort Dodge equine product is the only product labeled for use in dogs and is substantially cheaper (\$100-\$200.00/vial) compared to the Ovine FAB product (\$600-\$700.00/ vial).

## Administering Antivenin Therapy:

**By: Emily Ramos, CPHT**

- 1) Skin testing with 0.02-0.03 mls intracutaneously of a 1:100 dilution of antivenin is recommended but not always accurate.
- 2) Animals should be given a pre-med of diphenhydramine 5 mg/kg IV or IM.
- 3) A central venous access line may need to be obtained. However, do not place a central line in a non-compressible site because of risk of bleeding from venom-induced coagulopathy.
- 4) Antivenom (Crotalidae) Polyvalent (Wyeth-Ayerst) antivenin is reconstituted with 10 mls sterile water (supplied). Gently swirl (15-60 mins to dissolve). Do not shake. Further dilute with saline ( 1 vial to 100-250 mls saline).
- 5) Start IV infusion slowly at 1 ml/min. x 10 min. Monitor for allergic reactions (nausea, pruritus, hyperemia of inner pinna). Increase rate to complete infusion over 30 min. Start with one vial, additional vials may be given every 2 hours as required. Typically 1-2 vials is sufficient.
- 6) Doses are typically based on the amount of venom injected (molar amount), progression of symptoms and the bite site. Smaller patients may require more, due to dose of venom/kg body weight.

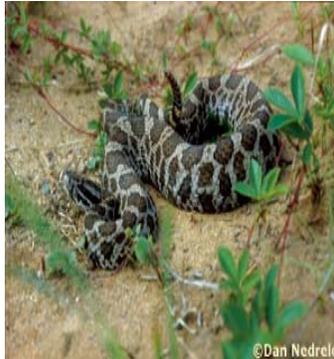
*"We ought not childishly neglect the study of the meaner animals because there is something wonderful in all of nature...We ought to investigate all sorts of animals because all of them will reveal something of nature and something of beauty".*

*Aristotle*

## Use of the Rattlesnake Vaccine in Dogs:

**By: Dr. Valerie Wiebe, Pharm.D**

*Crotalus Atrox* Toxoid (the rattlesnake vaccine) became available in the early 2000's as yet another means of preventing morbidity and mortality in dogs likely to be bitten by rattlesnakes. The *Crotalus Atrox* Toxoid (Red Rock Biologics) is manufactured from inactivated *Crotalus atrox* venom components. Exposure to the toxoid elicits an immune reaction (antibody titer)



that acts by binding and neutralizing the venom if the animal is bitten. Because rattlesnake venom is a complex mixture of 15-20 proteins and components vary with species and area, the protection of the vaccine against venom from various species is incomplete at best. For instance, protection against the Mojave rattlesnake (a neurotoxin) is unclear.

### Vaccine Protocol

The vaccine protocol calls for 2 doses of vaccine 3-6 weeks apart with at least an annual booster sometime in Spring. Large dogs (> 100lbs) may require a third booster, and additional doses may be necessary at 4-6 month intervals in dogs at high risk (field trial, hikers, etc.)

### Efficacy

Although the vaccine appears to be safe (1% injection site reactions), vaccinated animals must still be considered a veterinary emergency if bitten. This is due to the fact that 1) not all species of snakes are well covered by the vaccine 2) the dogs response to the vaccine is variable 3) the amount of venom may overwhelm even the highest titers and 4) the vaccine does not address secondary tissue necrosis or infection. While severe envenomation in vaccinated dogs may still require antitoxin, there does not appear to be a significant difference in the course of treatment if an animal is bitten. In addition, as of this writing there have not been any objective studies conducted to prove the efficacy of this vaccine.

Due to the vaccines questionable efficacy, cost, and no substantial difference in acute therapy if bitten, the product is currently not advocated for animals seen at the VMTH. However, in patients that are at very high risk, and in areas where treatment may be substantially delayed, the rattlesnake vaccine may buy time for the owner to get their animal to a veterinarian and may potentially decrease the overall severity of envenomation. Although the VMTH does not stock the vaccine, many referring veterinarians often carry the vaccine.

## Snakebites in Horses at UC Davis

**By: Dr. Tori Yamarik, Pharm. D.**

Over the last 10 years, 15 horses were evaluated for potential rattlesnake bites at UC Davis. One case was euthanized and one case died at admission. This is consistent with the 10-30% fatality rates reported elsewhere. Signs and symptoms were similar to those reported in small animals, with mild to severe swelling and pain, elevated heart rate, or difficulty breathing. Most horses were bitten on the face or legs. In general, supportive care was administered which included steroids, antihistamines, tetanus antitoxin, and antibiotics to control infection. None of the horses received intravenous antivenin therapy as part of their treatment, primarily due to cost.

In a published report of 32 cases from 1973-1993, similar findings were reported. Over 90% of horses were bitten on the head with symptoms of fever, nosebleeds, clotting abnormalities and heart arrhythmias in some cases. Interestingly, most horses that died survived the acute poisoning but developed severe dyspnea, cardiac dysrhythmias, and hemolytic anemia as a late complication. In general, supportive care with fluid therapy, antihistamines and antibiotics is indicated for mild bites. If the horse demonstrates severe swelling or trouble breathing, antivenin is indicated if the owner can afford therapy. Although anti-inflammatories such as banamine are frequently given, results in other species suggest that these products may increase the chance of clotting abnormalities.



### Followup Care after Treatment:

**By: Sara DeGregorio and Mekayla MacPhersons: Students**

- 1) Following "dry bites" animals should be observed for at least 8 hours. Mild bites may become severe within 2 hours.
- 2) Return to DVM if swelling worsens, or with appearance of dark tarry stools or new bruising.
- 3) Return for signs of wound infection, swelling, redness, heat, drainage (pus), extreme tenderness.
- 4) Return if fever, rash, itching, joint pain, swollen nodes occur within a few weeks.
- 5) Do not administer anti-inflammatory drugs (carprofen, meloxicam, etc.) or aspirin for 2 weeks after snakebite.
- 6) Limit physical activity, do not allow surgery or dental work for 2 weeks after snakebite.
- 7) Supply plenty of fluids, return if urine decreases in amount or becomes cola colored.
- 8) Ideally the wound should be rechecked within 2-3 days and laboratory tests should be repeated after 3 days.