

Pacific Tide

An informational newsletter

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About our Author

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A native of Chicago, Dr. Saphir graduated from Ross University School of Veterinary Medicine and finished his clinical year at Colorado State University in June 2007. He then completed an internship in small animal emergency and critical care and surgery at Animal Urgent Care in Escondido, CA. He enjoys all aspects of emergency medicine and has special interests in emergency surgery and trauma. Dr. Saphir shares his life with Stewie, his yellow Labrador, and his 3 cats Gus, Gonzo, and Tonka Truck. In his spare time he enjoys spending time with his family, hiking, back country camping, skiing, traveling, and is a diehard Chicago sports fan.



**Mark Saphir,
DVM**

Rattlesnake Envenomation (RSE)

Rattlesnake encounters and rattlesnake envenomation (RSE) is not an extremely common occurrence in the Monterey Bay area, however it still possible to encounter this emergency on occasion. Rapid awareness and recognition of its clinical presentation can lead to successful management and decrease morbidity and mortality.

While only treating a handful of patients at Pacific over the past 5 years, my internship in Southern California provided extensive first hand experience with a variety of these snakes and their toxic effects.

There are many different species of rattlesnakes, and among the most common to this area is the Western Rattlesnake. The Northern Pacific Rattlesnake (*Crotalus oreganos oreganos*) is the most common subspecies. Knowing which types of snakes are endemic to the area can assist in identification and may also aid in predicting patient clinical signs. The most easily identified trait of any rattlesnake is the sound of its rattle. Juveniles, however, do not have this classic rattle sound, as they are born with only a silent 'button' at the end of their tail. Rattlesnakes are most commonly found on warm days (80-90 degrees Fahrenheit) in open, rocky areas.



The purpose of rattlesnake venom is to immobilize prey then to begin digestion of prey by destruction of tissues. Rattlesnake venom is composed of a complex mixture of many enzymes. The main actions of the venom (depending on type of snake) have effects on local tissues, coagulation factors, platelets, and the central nervous system. They are often grouped into hemotoxic and neurotoxic categories. A small percentage of rattlesnake bites are 'dry bites,' in which no venom is injected into the patient.

Dogs or cats of any age can be affected and are at risk of RSE. Size and age influences clinical outcome based on venom per body weight and concurrent diseases. Jack Russell



Terriers can be bitten and infused with venom more than once during an encounter. When brachycephalic breeds are bitten in the ventral cervical area or around the face, they may develop severe respiratory compromise secondary to swelling and edema. Assisted ventilation is sometimes needed and should be prepared for in these particular cases. Cats can be hard to predict. They may have a higher risk of developing severe clinical signs with a more guarded prognosis, particularly because of their reclusive behavior that can delay treatment.

The most common findings in rattlesnake envenomation are severe swelling and intense pain. Oftentimes one or two bleeding puncture wounds can be found in the location of the bite. Clipping hairs around a swollen area can sometimes aid in identifying a puncture wound. Other signs that can be noted are muscle weakness, unilateral thick ropey saliva if bitten on the face, pale gums, dyspnea, tissue necrosis, shock. Most frequent locations of RSE are localized to the head/neck and distal extremities, although any location is possible. Bites to the thorax can result in less favorable outcomes. If a rattlesnake bite wound or envenomation is

suspected, treatment and diagnostics should not be delayed, as this is considered a toxicological emergency.

If RSE is strongly suspected, initiate intravenous fluid therapy to counteract the hypotensive effects of envenomation and obtain diagnostics. Colloids should be used with caution, especially if the patient has coagulation disturbances. Intravenous pain medication should also be implemented at this time. Judicious use of analgesics is imperative in patients that are exhibiting severe neurologic deficits and respiratory compromise.

Gentle clipping and cleaning of the site, as well as the use of a colored marker delineating the initial swelling and bruising, helps monitor the site of envenomation. A tape measure is valuable for monitoring progression of swelling. Close monitoring of vitals and blood pressure is indicated. Rattlesnake venom has antimicrobial properties, thus the use of antibiotics needs careful consideration.

Initial diagnostics include baseline chemistries, CBC, PT/aPTT, evaluation of blood smear for echinocytes and platelets. Location of venipuncture needs to be carefully considered, as many of these patients will have clotting abnormalities. In an otherwise healthy patient, expected chemistry abnormalities include an elevation in ALT secondary to tissue damage. Hyperlactatemia and electrolyte derangements are often seen. Urinary bladder cystocentesis should be avoided because of possible coagulation abnormalities. CBC may show an elevated HCT, elevated WBC, and thrombocytopenia. PT and aPTT are often prolonged. To perform an echinocyte check, place 1-2 drops of saline to 1 drop of whole blood (non-EDTA) on a slide with a cover slip. Place slide under high power objective (40X) for evaluation of red blood cell architecture. Echinocytes are extremely common findings in RSE, but not the only cause.

Administration of antivenom is indicated in some cases. Many factors should be considered prior to its administration, with the most important being coagulation times and severity of clinical signs (eg. intractable pain, progressive swelling). Other factors include previous exposure to antivenom, which may increase the risk of allergic reaction. Whether a patient has received a vaccine may also influence that decision. Evidence for effectiveness of the vaccine remains controversial and anecdotal at this time. Another factor to consider is cost of antivenom.

There are several types of antivenom available for use:

Crotalidae polyvalent antivenin (ACP) by Boehringer-Ingelheim, formerly Fort Dodge, is one of the more common. It is licensed for use in veterinary medicine. This antivenom is derived from equine serum globulins that have been immunized from 4 different types of venoms. It is deemed to be efficacious against all North American species of rattlesnakes, copperheads, and cottonmouth moccasins. It will not neutralize neurotoxic effects from Mojave rattlesnake venom. It is the most antigenic of the 3 antivenoms and reactions should be anticipated, as with any of these products

More recently, another antivenom derived from equine serum globulins has been introduced. It is currently awaiting FDA approval. It is being manufactured by Bioclon Institute in Mexico. This particular antivenom (Antivipmyn®) is less antigenic than the previously mentioned antivenom, but repeated doses may be necessary. This antivenom has historically been significantly less expensive than others

The third type of antivenom, Crofab®, is derived from ovine serum globulins. It is the least antigenic, but has a shorter duration of action, oftentimes requiring repeated administration. It may have some beneficial effects of neutralizing the neurotoxic venom. This antivenom is most frequently used in humans, and is extremely costly.

Depending on the severity of the RSE, several vials may be needed to help stabilize the patient. If possible, a minimum of 1-2 vials should be administered for severe envenomation. Depending on size of the patient, the

antivenom is often administered over 30-60 minutes. Additional antivenom use may be needed depending on response to initial therapy. Very careful monitoring is necessary because of potential allergic reactions.

Other treatments to consider include non-steroidal anti-inflammatory medications. These are not often recommended given the hemotoxic nature of venom. Tramadol for use at home will often suffice in adequate pain control or sedation. The administration of glucocorticoids to the rattlesnake envenomated patient is NOT indicated. Fresh frozen plasma is not used to treat coagulopathies secondary to rattlesnake venom. Tourniquets on peripheral limb bites are not advised. When tourniquets are loosened, a massive release of venom will be distributed which may be extremely detrimental to the patient.

Repeating diagnostics following the administration of antivenom can help assess the need for ongoing treatments and additional doses of antivenom.

Red Rock Biologics have designed a vaccine that is meant to help protect dogs with RSE. The vaccine is formulated from only a few different types of venom, the main one being from the Western Diamondback. A premise of snake venom having antigenic cross reactivity properties implies it will be efficacious for most types of rattlesnake envenomation. It does not claim, however, to have any benefit in neutralizing the effects the neurotoxic venom. Vaccination protocol is established by Red Rock and for dogs under 100 pounds, involves two vaccines spaced four weeks apart with a booster every 6 months for dogs with year round exposure to snakes. Studies show safety data, with only anecdotal evidence to prove its efficacy in reducing clinical signs and survival rates. It is suggested that vaccinated pets will have more time to seek care and allow the practitioner more time for a diagnosis and to decide on a treatment plan.

Antivenom is not contraindicated for use in dogs that are vaccinated, as the vaccine is composed of snake proteins, whereas the antivenom is composed of horse or sheep proteins. Many vaccinated dogs will also require the same treatment as unvaccinated dogs. The question of recommending the vaccine to dogs in endemic rattlesnake areas remains controversial. Thus far, I have noted very similar effects and outcomes from both vaccinated and unvaccinated dogs, suggesting its limited efficacy.

Courses designed for canine rattlesnake aversion training may be a viable option, particularly for repeat offenders or high-risk patients. Avoiding snake habitats and careful monitoring of curious patients is likely the best form of prevention.

Early recognition and treatment of RSE often results in successful outcomes. While carrying antivenom may not be a feasible option for your hospital, there are some basic treatments and diagnostics that can be initiated prior to transferring to a secondary or tertiary treatment hospital.

Photos Courtesy of Google

Our Doctors

Internal Medicine

Kelly Akol, DVM, DACVIM (SAIM)
Merrienne Burtch, DVM, DACVIM(SAIM)
Michelle Pressel, DVM, DACVIM (SAIM)
Ryan Garcia, DVM, DACVIM (SAIM)

Surgery

Lisa Metelman, MS, DVM, DACVS
Tom LaHue, DVM, DACVS
Dean Filipowicz, MS, DVM, DACVS

Oncology

Theresa Arteaga, DVM, DACVIM(Oncology)

Critical Care

Colleen Brady, DVM, DACVECC
Lillian Good, DVM, DACVECC

Cardiology

Mandi Kleman, DVM, DACVIM(Cardiology)

Dermatology

Katherine Doerr, DVM, DACVD

Radiology (VRS)

Larry Kerr, DVM, DACVR
Mark Lee, DVM, DACVR

Emergency

Christian Robison, DVM
Kim Delkener, DVM
Mark Saphir, DVM
Jessica Kurek, DVM

Behavior

Jan Brennan, DVM (practice limited to behavior)

About Our Hospitals

Pacific Veterinary Specialists was founded to provide high quality, specialized medical care to companion animal patients. Our practice is dedicated to serving the veterinary community as a partner in total patient care. We offer comprehensive specialized services including endoscopy, Doppler ultrasound, surgery, 24-hour ICU care, and emergency and critical care. Our staff is committed to providing compassionate and thorough medical care that meets the needs of the patient, client, and referring veterinarian. In September 2011 we opened PVSM and offer internal medicine, oncology, dermatology and cardiology Tuesday through Thursday in Monterey. Behavior consultations by appointment are available on Mondays.

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