

Venomous Snakebite

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Snakebites are rarely seen in the City of Lubbock or by Lubbock EMS however; in our area snakebites occur and in some places they occur with great frequency. Lubbock County is home to the Western Diamondback



Rattlesnake, the species of snake that is responsible for more envenomations than any other snake in the nation. The Western Diamondback is not the only venomous snake in this area. Exotic snakes such as Cobras and Mambas are kept as pets by some Lubbock citizens. People are also traveling into the ranges of other venomous species in search of outdoor adventure. Some are bitten by these venomous snakes and instead of going directly to the closest emergency room, they are returning home thinking it is a dry bite or so that they can be seen in an emergency center that is in their insurances network. UMC, in 2005 admitted 12 patients for treatment of snakebite. CMC admitted 9 patients 3 of which were children. Many of these patients are flown in from the region.

Snakebites are most commonly seen in areas were the snake's home and areas of human activity meet. In most cases, the snake is seen as the villain but the victim is usually the guilty party. Victims are bitten by holding, harassing, or trying to catch or kill a snake. Alcohol is often a factor as well as recreational drugs. For example, take three cases that were seen in the emergency room in 2005. The first case was a man who had been drinking and was playing with a rattlesnake that he

purchased from a hunter at a roundup. While playing with the snake and showing it off to friends he was bitten. The second was a young man who chased a snake under a portable building in an attempt to catch it. The third case was a man who started his car and heard a strange sound coming from under the hood. He turned off the engine and still heard the hissing sound. He opened the hood to investigate and was bitten on the hand. In these three cases it is clear to see that humans often place themselves in harms way and sometimes just in the wrong place at the wrong time.

This June, while working on an outdoor swimming pool near Roaring Springs I nearly became a statistic. I was unknowingly working on a filter less the two feet away from a 3 ft long rattlesnake that had entered the pump room looking for a meal and got trapped in a corner. The rattlesnake could not be heard over the sound of the electric pumps but when the pumps were shut off the snake clearly made his presence known. The fact that I was not bitten is evidence that the snakes do not want to bit you but he was not going to tolerate being trapped in a corner either.

In this article our objectives will be to

- Understand frequency of bites, injury and death.
- Identify who is most often the victim.
- Understand how someone is bitten.
- Understand the differences in species.
- Learn to identify snakes in our area.
- Understand how venom is injected.
- Understand what venom does to the body.
- Be familiar with signs and symptoms of envenomations.
- Understand the treatment for venomous snakebite.



- Be aware of exotics and how they may change treatment.

Snakebite Statistics

Snakebite envenomations are considered poisonings and are recorded by American Association of Poison Control Centers (AAPCC) as are all other types of poisonings. Reporting is voluntary however, and it is believed that as many as 50% of snakebites go unreported to the AAPCC. The most recent statistics are from 2004 and show that 7,212 people sought medical treatment for snakebites. Out of that number, 3,129 of those bites were from venomous snakes. The AAPCC continues



to break down the numbers into the species of snake responsible for the bite.

Copperhead-1,098

Coral-99

Cottonmouth-192

Rattlesnake-1,178

Unknown venomous native-431

Venomous Exotic-131

Of the 3,129 reported envenomations only three deaths were reported. A 55yo male died 7 hours after being bitten while feeding a captive Canebrake Rattlesnake. A 50yo male died after being bit on the finger by a snake that was not positively identified but believed to be a copperhead. And the last death was a 44yo man who was bitten by a captive South American Pit viper called an Urutu.



Urutu (*Bethrops alternatus*)

It is often said that children are most often victims of snakebites but this is not supported in the numbers reported to the AAPCC. In 2004, children less than 6 years old accounted for 153 bites, adolescents between 6 and 19 years old accounted for 581 bites but the majority of snakebite victims were older than 19 years old and accounted for 2368 bites. Between 1994 and 2004, 19 deaths were reported. Of those deaths, three were children less than 6 years old, one was between 6 and 19 years old, one was between 20 and 30 years old, five were between 31 and 40 years old, seven were between 41 and 50 years old, and two were older than 51. One theory explaining why more adults are bitten is that adults are more likely to have captive snakes or pursue and handle wild snakes. Children however, are most often bitten accidentally while playing or exploring in the places that snakes like to hide.

Most snake bites occur while the victim is interacting with



the snake. 40% of bites occur while the victim is handling the snake. In most cases the victim is male and older than 20 years old. Out of the snake bites that occur, 56% of the victims are bitten in the hand. A victim does not need to tease a snake in order to be bitten often a victim may be reaching into a space that a snake is in or lifting an object that a snake is under. These victims are often participating in activities that put them in the snake's habitat.

Hunters reaching into a bush to retrieve a downed bird or a golfer picking up a golf ball out of the rough on a rural course are examples of a growing group of victims. This group is made up of individuals who are enjoying

outdoor activities at scenic locations some are even building vacation homes in these places. Unfortunately, the scenic locations they seek are also home to venomous snakes.

Kinds of Venomous Snakes

One must understand the different types of snakes and the way that they deliver venom in order to understand how damage is inflicted in the body.

Pit vipers belong to the animal family Crotalidae. North American pit vipers

belong to this family. Rattlesnakes belong to the genus *Crotalus* and *Sistrurus*. Water Moccasins or Cottonmouths belong to the genus *Agkistrodon* as does its cousin the Copperhead.



Pit vipers have characteristics that make them unique. Pit vipers have triangular heads that can be easily seen

at a safe distance. Rattlesnakes are the only snakes that have rattles but other snakes will shake their tails in attempt to look like a rattlesnake.

This defensive tactic is called mimicking. Small Rattlesnakes may have rattles that can not be seen or

heard and it is not uncommon for rattles to be broken off the tail.

Pit vipers have very muscular bodies so they will appear to be heavy even when they are not in a defensive position. All snakes including non-venomous snakes will inhale air and inflate their bodies in order to look larger and more dangerous to a potential predator. Pit vipers also have elliptical pupils or cat



eyes and heat sensing pits that are located just in front of the eyes. These things can be hard to see at a safe distance so it is not recommended that you look for them.



Another family of snakes is found in southeast Texas. They are from the family Elapidea. This family includes many cobras and the Texas Coral snake (genus *Micrurus*). A characteristic of an elapid is a slender head. The body will be light and slender. The pupils of a coral snake will be round. The coral snake is a small snake and you would need to get dangerously close to see the pupils so it should not be attempted.



The coral snakes of North America will have red, yellow and black strips. A coral snake will have the red and yellow strips touching unlike the Kingsnake which mimics the coral snake. The Kingsnakes red and black strips touch which leads to the rhyme “Red touch yellow kill a fellow red touch black

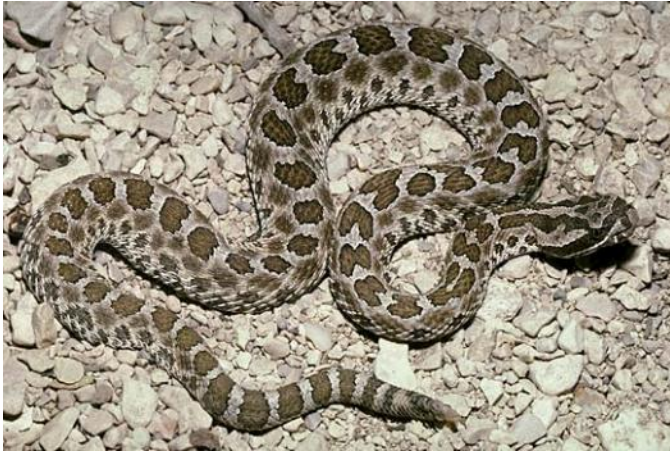


a poison lack”. There are 65 species of coral snake that are spread across North, Central and South America. Three are found in the United States. In Central and South America coral snakes are many colors so the rhyme should not be used when visiting many of the tourist destinations of southern Mexico. In a 100 mile radius from Lubbock 4



venomous snakes are found.

Desert Massasauga (*sistrurus catenatus edwardsii*)

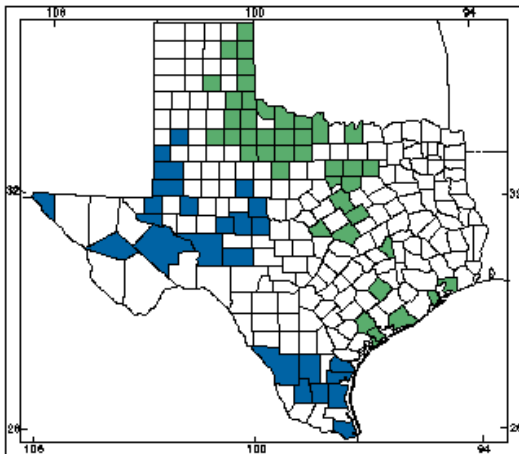


The desert massasauga is small nocturnal rattlesnake that is found near water in the area west and south of Lubbock County. This snake is shy and very alert. It will often run and hide before being seen but it will stand its

ground and become aggressive if cornered.

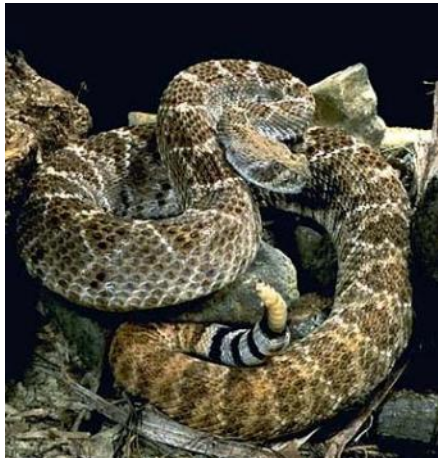
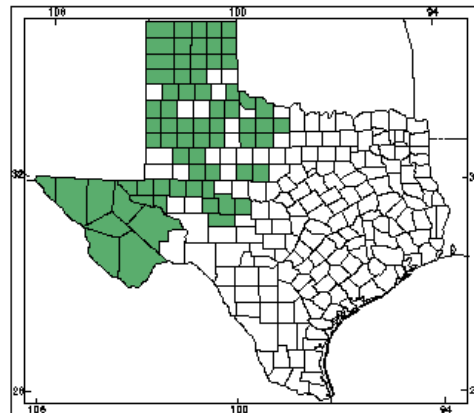
Western Massasauga (*sistrurus catenatus tergeminus*)

The western massasauga is closely related to the desert massasauga. The western massasauga is found in the county's east of Lubbock off of the caprock. Like the desert massasauga, the western massasauga is small and shy and prefers a moist environment. This snake is also aggressive when cornered and will stand its ground. Both the desert and the western massasauga are considered to be pigmy rattlesnakes and will rarely grow longer than 39 inches.



Prairie Rattlesnake (*crotalus viridis viridis*)

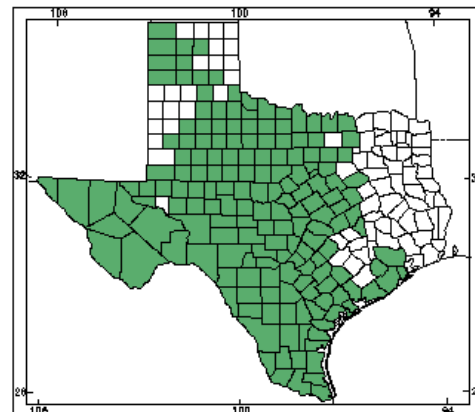
The prairie rattlesnake is a medium size rattlesnake that primarily lives in grasslands near its primary food source, the prairie dog. This snake is the most widespread rattlesnake in the United States, ranging from the Trans Pecos area of Texas to the grasslands of Canada. This snake will aggressively defend its self but prefers to retreat into a prairie dog hole. The prairie rattlesnake is active both during the day and night depending on the temperature and time of year.



Western Diamondback (*crotalus atrox*)

The western diamondback rattlesnake is the second longest rattlesnake in North America and is responsible for more bites than any other snake in the United States. The western diamondback is native to all of Texas with the exception of Far East Texas. This 30 to 72 inch

long snake will quickly retreat if given a chance but will also aggressively defend itself if it feels threatened. This snake prefers dry rocky grasslands and is common in the canyons of the caprock including the Yellowhouse





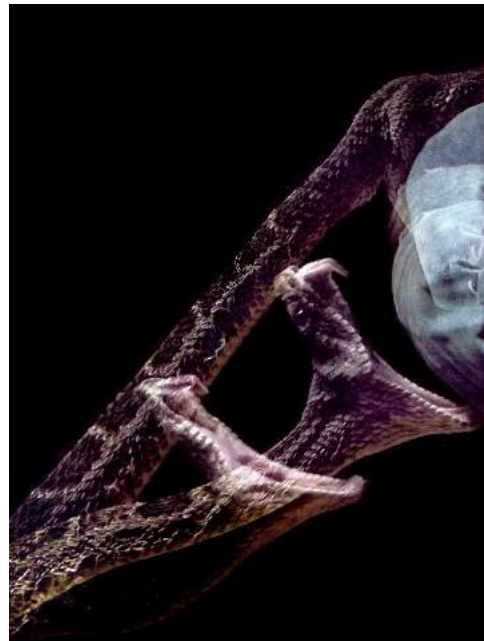
canyon which starts within the city limits of Lubbock.

Rattlesnakes use camouflage as their first line of defense. If given the opportunity, they will quickly retreat into grass, rocks or brush and try to hide but will aggressively defend themselves if

cornered or unable to hide. Rattlesnakes may not always rattle. When assessing a patient who has been bitten by an unknown snake do not rule out a rattlesnake bite based on the absence of a rattling sound.

How Venom is Injected

Rattlesnakes and other pit vipers use long fangs that fold inside the snake's mouth to inject venom deep into tissue. Venom glands push venom through the hollow fangs the same way medication is pushed through a hypodermic needle. The species of snakes determine the length of the fang. Small snakes will have short fangs while large snakes have longer fangs. The pit viper is known for striking extremely fast. The snake can use up to half of their body length to strike out and sometimes more depending on how threatened they feel. The fangs are very fragile and will often break while trying to bite through leather shoes or even heavy denim pants. Snakes do not always deliver venom when they



bite. Venom is a necessary component for digestion for the snake. The snake will often bite to fight off a threat but reserve the venom for its next meal. This results in a dry bite. As many as 50% of all venomous snake bites are dry bites.

Crotalidae Venom



The chemical make up and level of toxicity of snake venom is influenced by the environment the snake lives in and the type of prey the snake primarily eats. A snake that primarily eats lizards and birds may have a neurotoxin component called

mohavetoxin. The neurotoxin leaves the bird or lizard paralyzed and unable to run or fly away. This allows the snake to preserve energy and recover more of its victims. A snake that primarily preys on small mammals like mice and rabbits will have a higher level of hemotoxin. Since the small mammals will leave a scent trail that the snake can follow it is unnecessary to paralyze the prey in order to recover them. The hemotoxin also aids in digestion.

The hemotoxin venom is primarily made of water, however; the components that cause tissue destruction are protein based digestive enzymes. Proteases break down the proteins in the victim's tissue and are responsible for local tissue destruction. Collagenase breaks down cell walls and digests collagen and gelatin. Arginine Ester Hydrolase is an anticoagulant.

Depending on the amount of venom injected the injury may be limited to the site of the bite or may



cause tissue destruction throughout the body including internal organs.

Signs and Symptoms

Fang marks are obviously a primary sign of a pit viper bite. Two puncture marks are often the result of a pit viper bite. They may be small and hard to see. In comparison, a non venomous snake will leave rows of teeth marks. The location of the fang marks should be marked so that the site of the bite can be found later.



Swelling may begin immediately in a severe envenomation or take up to six hours to develop. Using a pen you should outline the swelling. Date and time the line as well. This outline will provide a timeline as to how fast the swelling is advancing.



Blisters filled with blood may form around the bite site. The blisters are caused by fluid leaking as cells and tissue is being destroyed. In order to prevent infection, the blister should be left intact. Fluid leaking from damaged tissue may also cause bruising and discoloration. The discoloration may be wide spread or just around the bite site.



Systemic symptoms that may be seen in a severe pit viper bite are hypotension, petechiae, epistaxis, hemoptysis, paresthesias and dyesthesias. Paresthesias and dyesthesias may be

a sign of a building neuromuscular blockade which may lead to respiratory distress or arrest.

Treatment

The protocol for the treatment of pit viper bites can be found on page 10 of the SPEMS protocol book. The protocol calls for the patient to be placed in a cool calm environment. Supportive measures such as oxygen IV fluids and cardiac monitoring should be used. If the bite is in an extremity then it should be kept at heart level. The extremity should be kept at zero degree elevation. If the bite is in a finger then the hand should be kept level with the elbow and the shoulder. This will prevent gravity from concentrating the venom in an extremity.



It will also allow the venom to enter the blood stream slowly causing it to be diluted throughout the body. Ice and constricting bands cause the venom to be concentrated in the injured extremity leading to greater tissue damage so they should not be used. In the past immobilization was

performed to prevent movement but this is no longer recommended. The act of immobilizing as you would a fracture may result in damage similar to what would be found if constricting bands were used. Instead pillows or blankets should be used to raise the extremity to heart level. Allow the patient to rest the extremity level on the pillows or blankets and try to prevent movement. All jewelry should be removed regardless of which extremity is affected since swelling can extend throughout the body. Careful observation of the ABC's vital signs and the EKG is important since the systemic affects of the

venom can lead to changes in the patient's condition quickly and with little warning.

Assessment

The severity of snake envenomations are defined as mild, moderate or severe. The amount of swelling and presence of signs and symptoms are used to determine the type of envenomation the patient has suffered. A patient who has suffered a mild envenomation will experience some localized pain and localized swelling but few other symptoms. A patient with moderate envenomation will have severe local pain and swelling that extends greater than 12 inches from the bite and symptoms of systemic toxicity such as nausea and vomiting. A patient that has had a severe envenomation will have swelling that extends greater than 12 inches from the bite and signs of internal bleeding such as petechiae, ecchymosis, and blood tinged sputum. This patient may also have a low blood pressure and may not be perfusing well. The patient's condition will change over time so assessment needs to be an ongoing process.



Non-Native Snake Bites

Non-native snakes are snakes that are not native to the South Plains but are native to the United States. Victims of snake bites from non-native snakes may have been bitten by



a wild snake in its natural environment and then traveled back to Lubbock to receive treatment or the victim may have been bitten by a captive snake that was being kept as a pet. In any case, the snake's venom may have characteristics that may be unfamiliar to medical personnel that do not live near the snake's natural range. From Lubbock, a person could drive only a few hours and be in the range of snakes that are not found around the South Plains. A person traveling east to Possum Kingdom Lake

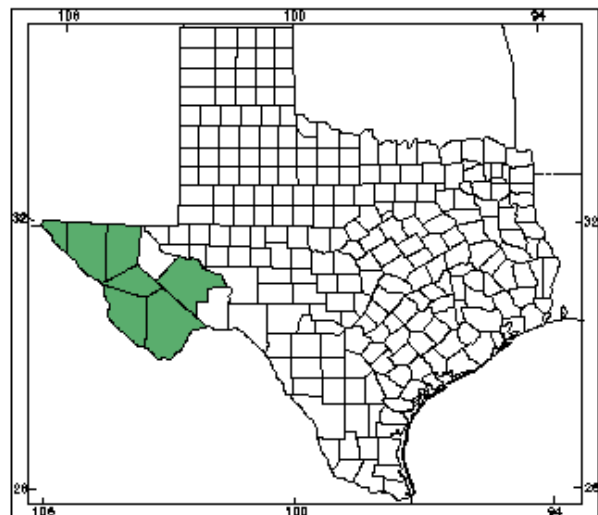


will find themselves in the range of the Copperhead. A person traveling to southwest to Carlsbad may find themselves in the habitat of the Mottled Rock Rattlesnake which has dangerous neurotoxic venom.

Two snakes of particular concern are within a day's drive from Lubbock. The Mojave rattlesnake is native to the trans pacos region of west Texas. The Mojave rattlesnake's venom is a powerful neurotoxin and cardiotoxin.

Mohovetoxin is named after this snake. The venom, which is the most lethal of all rattlesnakes, can cause paralysis, respiratory failure and profound hypotension. The Mojave rattlesnake can be easily misidentified as the western diamondback.

The coral snake is another unique Texas snake that has very dangerous venom.

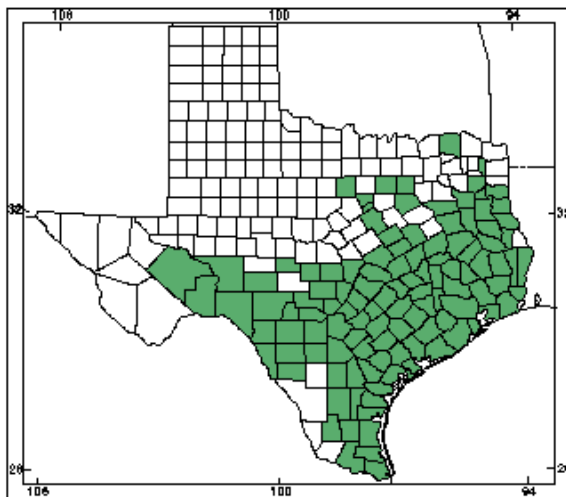


The coral snake is native to south and east Texas and is primarily nocturnal. The snake is very shy and non-aggressive. The coral snake has small fixed fangs that may not always



penetrate clothing. A common myth attached to the coral snake is that because of these short fangs the snake must hang on to its victim or chew the venom in to the victim. This, however; is not true. The pure neurotoxic venom of the coral snake is very

powerful and a quick strike can leave a victim in serious trouble. Signs and symptoms from a coral snake bite are different from a pit viper and in many ways are more similar to the bite of a non-venomous snake. The bite from a coral snake will leave rows of teeth marks rather than the fang marks that are seen with a pit viper bite. The patient will have pain at the bite site and some localized swelling but the neurotoxic venom will have a greater affect on the nervous system rather than causing tissue damage



as the hemotoxic venom does. Since there is very little tissue damage swelling will not be as significant so assessing the severity of the envenomation based upon swelling can not be done. Neurological symptoms are going to provide the clues as to the severity of a coral snake bite. Patients may

display an altered level of consciousness and complain of difficulty swallowing. During the assessment you may notice slurred speech, facial drooping and difficulty in keeping the eyelids open. These symptoms are not immediate and may take

up to 12 hours to develop. This may mislead individuals to believe that the snake may not have injected any venom and not call for medical help or refuse medical help only to find symptoms appearing hours after the bite. Once the symptoms appear they will rapidly develop. Some of the symptoms that may be seen are respiratory distress, pharyngeal spasm, hypersalivation, cyanosis, general weakness, muscle tremors, hypotension and tachycardia. Depending on the severity of the bite, the symptoms may progress as far as respiratory arrest. Rapid sequence intubation may be needed to protect this patient's airway.

Exotics



Exotic pets are growing in popularity and exotic reptiles are no exception. Individuals who like to pursue the extremes in exotic reptiles may become involved in a hobby called “hot herping”. Hot herping involves keeping venomous snakes in

captivity. These snakes are commonly native snakes that are caught in wild but sometimes more exotic and dangerous snakes are kept as well. A search of the internet can produce many sources for exotic snakes such as cobras. These snakes are usually sold and transported legally, however; it is very easy to transport live venomous snake illegally as well through UPS and the US postal service. Snakes can be easily kept in



houses and apartments without anyone noticing. Cages can be built using plywood and plexiglass. Building plans can be easily



found on the internet or pre-built cages can be ordered from the many “herp” websites.

Venomous snakes are considered dangerous animals and most cities require the owner to have a dangerous animal permit,

however; the owner does not need to provide proof that they are knowledgeable or experienced with the animal in order to obtain the permit. In most cases, inexperienced owners do not obtain a permit and are able to keep the animal in secret. The majority of people that get involved in collecting exotic snakes are very knowledgeable, experienced and skilled. These collectors who take their animals seriously and usually have city or state permits and in some cases keep an inventory of antivenom specific to the species they own.

In the case of a bite the owner of the snake can almost always provide information about the type of venom the snake has and treatment plan can be produced based upon whether the snake has hemotoxic or neurotoxic venom.

Venom does not have to be present for a snake to be dangerous non-venomous exotic snakes can be dangerous as well. Over 144,000 burmese pythons have been sold in American pet stores and many people buy them without thinking about how big this snake can get. In many areas of the United States, burmese pythons are being released into the wild either intently or accidentally after they get to big



for their owner to care for. These snakes are able to live in warm moist climates and in the Florida everglades they are becoming a serious problem. The burmese python can grow over 20 feet long and have been seen in the everglades eating alligators. U.S. Fish and Game officials have captured or killed more the 200 pythons since the mid 1990's. It is believed that U.S.F.G. has only



slightly affected the pythons which are believed to have become reproducing species in Florida.

Many non-venomous snakes are capable of delivering very painful bites. They can easily become infected if not cared for properly but bigger the concern is for children. In the wild large constrictors eat kangaroo's, pigs and antelope with out any difficulty. For a snake capable of eating a kangaroo a child is easy prey. The American Association of Poison Control

Centers recorded 515 non-venomous snakebites that were treated in emergency rooms in 2003. From these bites, 69 were serious enough to require the patient be admitted with moderate or major injury. Large constrictors can and do kill and



eat humans in the places that they are native. In the United States no deaths secondary to a non-venomous snakebite within last 10 years have been reported to the AAPCC. In the news however things are very different. Many cases have been reported of large constrictors killing children and even teenagers as old as 15 years old but this is not common. In most cases, the main concern with non-venomous snakebite is infection. In the

treatment, of those patients who have been bitten, tetanus should be confirmed. Patients who have not had a tetanus shot within 5 years should receive a tetanus booster.

For Lubbock EMS a rattlesnake bite is a rare event but it is not because the potential is not there. Snakebites are frightening and painful to the patient. For the EMS provider, treatment is often vague but by using the common sense that Paramedics are known for successful treatment can be done.

Credits

The American Association of Poison Control Centers

www.aapcc.org/

American Academy of Pediatrics www.pediatrics.org

Crotaline Fab Antivenom for the Treatment of Children with Rattlesnake Envenomation By Steven, R Offerman, Sean P Bush, James A Moynihan and Richard F Clark

www.pediatrics.org

E Medicine Coral Snake Envenomation by Robert Norris MD
Snakebite Brian James Daley MD

www.emedicine.com

Snakebite Productions Dr. Marja Kik, Walter Getreuer Dr.
Henk Pinjning

www.snakebite-firstaid.com/facts.html

www.venomousreptiles.org/

National Wildlife Federation

www.enature.com/