

Snake-Bi_2004.txt

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From: "Eugene N. Miya" <eugene@nas.nasa.gov>
To: Larry London <london@SunSITE.Unc.EDU>
Subject: Snake bite (ask Hal)

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Summary:
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Panel 11

"There is in Melbourne a man who probably knows more about poisonous snakes than anyone else on earth. His name is Dr. Struan Sutherland, and he has devoted his entire life to a study of venom.
'And I'm bored with it,' he said when we went along to see him the next morning. 'Can't stand all these poisonous creatures, all these snakes and insects and fish and things. Stupid things biting everybody. And THEN people expecting me to tell them what to do about it. I'll tell them what to do.
DON'T GET BITTEN IN THE FIRST PLACE. That's the answer."
"Hydroponics, now, *that's* interesting...."

--Douglas Adam, Chapter 2 "Here Be Chickens," in Last Chance to See
See further for "What about a tourniquet?"

[These lines may not correspond in your news reader.]

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SUMMARY:

Poisonous snake bite is a potentially serious accident. It can lead to severe pain or other problems, occasionally even death. However in North America it is not nearly as dangerous as most believe. These snakes seldom bite humans and even when they do

such bites are seldom fatal. There is no need to allow fear of snakes to ruin your enjoyment of the outdoors.

Snakes will usually avoid you if you give them a chance. Try to be sure they know you are coming, don't reach into places they might hide, be careful turning over rocks, boards etc. in snake country. Leave snakes alone unless you are sure they are safe (there is no simple rule to identify which are poisonous). This also applies to dead snakes and detached heads - reflex bites are just as dangerous as bites by a live snake.

If someone is bitten:

Clean and disinfect the wound.

Transport to a hospital as quickly as reasonably possible. Try to keep the patient quiet and resting. If necessary a victim alone must walk to reach treatment but this should be avoided if possible.

Immobilize the area much as for a fracture. Use constricting bands above and below the site but be certain they do not interfere with blood circulation, they are only to slow down the movement of lymphatic fluids just under the skin. Alternatively, wrap entire area snugly with a cloth, elastic bandage, etc again being careful not to interfere with blood circulation.

As best you can, identify the snake to aid in determining the proper treatment. If you can do so safely, kill the snake and take it with you to the hospital for definite identification. (But don't kill snakes which haven't bitten anybody.)

DO NOT cut into the wound area unless you are medically

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trained to do so. You will probably do more damage than the snake did. If you have a good syringe style suction device and the snake is a pit viper, you may attempt to suck venom out through the wound it went into, but do not let this delay evacuation to a hospital.

[End of Summary]

ACKNOWLEDGEMENTS AND REFERENCES

At the outset I would like to thank the following for their helpful comments and suggestions:

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CWA@NAUVAX.UCC.NAU.EDU (Curt Anderson) for providing information I was not able to find in the library here.

ed@titipu.meta.COM (Edward Reid) who put me into contact with Paul Moler, a professional herpetologist with the Florida Dept. of Game and Freshwater Fish.

And of course a big thanks to Dr. Moler who was very helpful in correcting some errors and providing information.

References - as long as this posting is, it only scratches the surface. The following sources will provide more information:

Medicine for Mountaineering, (referred to as 'MFM' throughout this article) Third Edition 1985. James A. Wilkerson, M.D. ed. The snakebite section starts on p234. This book, published by the Mountaineers in Seattle, is probably the standard reference for backcountry medicine.

A Field Guide to Western Reptiles and Amphibians, Robert C. Stebbins, Houghton Mifflin, 1966. A good guide to snakes (and other reptiles etc.) including descriptions, color illustrations and maps of their ranges. Part of the Peterson Field Guide Series, sponsored by the Audubon Society and National Wildlife Federation. Covers only the western U.S.

Rattlesnakes, Laurence M. Klauber, University of California Press, 1982. This is a condensation of a 2 volume series on the same topic which I have not seen. This book does not provide as much identification information as does Stebbins (but it does include range maps). It does provide a lot of interesting information about all sorts of topics from the snake life cycle to collections of folklore and misinformation.

I have not actually seen the following although others have recommended them:

The Audubon Society Field Guide to North American Reptiles and Amphibians

Conant, R. 1975. A field Guide to Reptiles and Amphibians of Eastern and Central North America, Houghton Mifflin Company; Boston. Covers the eastern U.S. but there is also a western edition.

Russell, Findlay E. 1983. _Snake Venom Poisoning_. Scholium International, Great Neck, NY. (reprint with corrections of the 1980 edition.)

INTRODUCTION:

Snakebite is always a hot topic. In what follows I will attempt to describe prevention and treatment of bites by poisonous snakes in North America as well as the effects of such bites. Be aware that we are dealing with overreaction and hype here. Popular literature, folklore, movies etc. have greatly exaggerated both the probability of snakebite and the likely outcome should it happen. We are much less likely to get bitten than many would have us believe. Furthermore snakebite, while serious, is not the death sentence often implied. Snakes (poisonous and otherwise) have excited a lot of aversion and superstition over the ages, resulting in unwarranted fear, sometimes even panic. Aside from its adverse effect on the enjoyment of life, this fear and panic can lead to:

- Improper treatment of those few cases which need treatment for envenomation

- Dangerous overtreatment for bites in which envenomation does not occur

- Worsening of outcome of snakebites due to panic, and

- Unnecessary and dangerous treatment of bites by non-venomous snakes.

With a couple of exceptions listed below, snakebite in the U.S. should be treated conservatively. Even on those exceptions there is no need to jump in with knives, tourniquets etc. to try to suck out the venom (particularly by mouth). However victims should be given appropriate treatment and rapidly evacuated to medical facilities.

"About no other medical subject has so much been written when so little has been known!

"Poisonous snake bites are unquestionably serious, potentially deadly accidents. Nonetheless, the danger from a single bite has been greatly exaggerated, particularly in the United States, where an average of less than fifteen people die each year as the result of bites by poisonous snakes. Less than one percent of poisonous snake bites in this country are lethal. In other parts of the world poisonous snakes are a more serious problem. Many of the snakes in those areas have a much more toxic venom, treatment is less successful, and sophisticated medical care is less available." (MFM p234)

Of course severity will vary with species as well as with the individual snake - larger snakes of the same species tend to have more venom (possibly offset by the larger snake having learned to "ration" its venom while a younger animal is more likely to inject the full load). However in North America we do not have the really nasty varieties found in some parts of the world. There is no reason to panic when someone is bitten by a snake. Even the "three nasties" described below are not nearly as dangerous as the cobras, black mambas and death adders found in some parts of the world.

THE VARIOUS SNAKES AND THEIR EFFECTS:

Venomous snakes in the US all belong to one of two families (but see below for the dangers of "non-venomous" snakes):

Crotalids (pit vipers):

copperhead

water moccasin or cottonmouth

various species of rattlesnake

Elapids: only the coral snake (eastern and western versions)
lives in the U.S.

Crotalids have the most efficient injection mechanism of any snake, about as good as a hypodermic syringe and needle. They are equipped with relatively long hollow fangs backed up by a system of injecting venom through those fangs. This gives them the ability to inject large volumes of venom quickly. Crotalid fangs can fold back into the mouth so lack of visible fangs does not necessarily mean an unarmed snake. Most crotalids have venom less toxic than that of coral snakes. Crotalids, however are more dangerous because (a) they are more likely to bite a human, (b) they can inject venom *much* more efficiently, and (c) they are usually larger and have more venom to use.

Elapids on the other hand have grooved fangs, a much less efficient injection mechanism. Generally they chew to get the venom into the victim. The size of coral snakes also limits them to biting fingers or loose folds of skin. These snakes belong to the same family as some of the world's nastiest critters: black mamba, death adder and cobra. However the American coral snake is about as mild as a poisonous snake can be. It is not aggressive. - Children have reportedly played with them for hours without being bitten. (No record exists of how many parental heart attacks this has caused.) The venom is relatively potent, however, and treatment should be given for bites which do occur. Coral snake bites make up less than 2% of all U.S. snake bites. There are no known fatalities from coral snake bites since the development of the Micrurus fulvius antivenom.

The western coral snake is even less dangerous. It is smaller yet and would have a hard time biting a person even if inclined to do so. The rare bites which do occur should be treated the same as other coral snake bites.

VENOMS:

Snake venom usually contains two types of poison:

Hemolytic toxins which attack the walls of blood vessels, and

Neurotoxins which attack the nerves.

Hemolytic toxin attacks blood vessel walls, allows serum to escape into the surrounding tissues and causes clotting within the vessels. The result is severe swelling, pain, and discoloration at the site. In the few cases where hemolytic toxins cause death the actual cause is likely to be shock. The effects of hemolytic toxin are immediate and primarily localized. Symptoms will be obvious.

Neurotoxins produce much less obvious immediate symptoms, at times fooling the victim into believing envenomation has not occurred. However symptoms can appear later. Neurotoxins produce much less local reaction than do hemolytic toxins. However they can affect nerves quite removed from the site of the bite. In extreme cases they can cause respiratory arrest although this is uncommon with most North American snakes. However respiratory distress without actual arrest is likely to occur in neurotoxin victims. Less severe symptoms from neurotoxins include tingling or prickly feelings and eyelid paralysis.

All snake venom probably has some of each kind of toxin. However in general the pit vipers have a higher fraction of hemolytic toxin while elapids have more neurotoxin. (The Mojave rattlesnake, a pit viper, is an exception. See below.)

The potency of venom will vary, with species, with time of year and with geographic area. Furthermore the typical snake mouth is no

cleaner than a human's - they tend to have a lot of microbial contamination. It is common for a snake to bite without injecting venom, especially in larger animals. However the microbial contaminants will always be present and should always be treated. (Such contamination seems to be much less of a problem in bites by non-venomous snakes, probably because they do not penetrate deeply.)

FOUR SPECIAL CASES:

Four varieties deserve special mention: the copperhead because a single bite is not very dangerous, and the diamondback (eastern and western) and Mojave rattlesnakes because they are dangerous:

The copperhead has probably the mildest venom of any poisonous snake in the U.S. Adults bitten by a single copperhead usually need only supportive therapy and good cleansing and disinfection of the wound. A study of 400 victims of copperhead bites found only 2 deaths, both the result of simultaneous bites by 3 or more snakes. I would treat a copperhead bite pretty much as any other pit viper bite, but would be able to reassure the patient a bit more and would not be as concerned if medical help were not readily available. This not to say that a copperhead bite won't hurt, it will. These bites are still serious but are unlikely to be life threatening.

The diamondbacks, on the other hand, are potentially deadly. Both the eastern and western versions are huge, the western species compensating for its slightly smaller size with a more potent venom. MFM lists the eastern diamondback as an aggressive snake and claims it is responsible for more human deaths than any other U.S. snake. Others dispute this. Paul Moler claims it is not particularly aggressive and quotes some numbers which indicate that it is unlikely to lead in killing people. I am inclined to believe Dr. Moler who lives and works in the habitat of the eastern diamondback. I

suspect this snake's impressive size and defense displays have given it an exaggerated reputation. Its western cousin is almost certainly more aggressive and at least as well equipped to ruin your day.

The Mojave rattler is quite dangerous in spite of its size. This little rascal (little compared to the diamondbacks anyway) is armed with a very potent venom, high in neurotoxins. Initial reaction is usually mild with severe symptoms coming 12 to 16 hours after the bite. The early symptoms can easily fool you into believing there is no problem. By the time severe symptoms appear the best time for treatment will have passed. (This one also has a couple of close relatives south of the border, the Mexican west coast rattler and the South American tropical rattlesnake, also known as cascabel or neotropical rattlesnake. They provide problems at least equal to those of the Mojave version.)

Bites from either diamondback or the Mojave rattler should be *aggressively* treated. This does not mean cutting unless you meet all the conditions for it described below. However do treat such bites with any appropriate suction device you have, try to immobilize the venom and the affected area, and do your level best to evacuate the victim quickly to medical facilities.

There is of course a wide variety of poisonous snakes throughout the world. I can't discuss them here. They are generally confined to warmer climates in places such as Australia, Africa, the Indian Subcontinent and Southeast Asia. (There are some exceptions such as the European viper which ranges up to the Arctic Circle but is not as dangerous as some of the snakes inhabiting warmer climates). If you plan to engage in wilderness activities in these areas you might look up something about the snakes there before you go, or post a request and maybe somebody familiar with the area of interest can answer. Many of these areas are inhabited by snakes *much* more

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dangerous than those native to the North America. MFM does have some information on other areas as well as a list of central medical facilities which can provide more information. If you are not familiar with the snakes in an area, assume they are dangerous (especially in warm climates).

"NON-VENOMOUS" SNAKES

(I am indebted to Bob Drewes <casherp@sfsuvax1.sfsu.edu> for helping me find the information in this section.)

Snakes regarded as non-venomous are not necessarily completely safe. In fact the saliva of some of these snakes can contain some of the same dangerous components as the venom of their more feared relatives. Some snakes (eg. the gopher snake) essentially lack anything resembling venom while others (eg. hognose and garter snakes) have saliva which might be considered a mild venom. Snake venom is just modified saliva anyway. These snakes lack any efficient means of delivering their saliva/venom to a human victim. However there are recorded cases of them envenomating, even killing people. The victims tend to be people who regularly handle snakes either professionally or as a hobby but caution is advisable for everybody.

Apparently the most common reaction to such a bite (at least in the U.S.) is the swelling, pain and discoloration caused by hemolytic toxins. However neurotoxins have also been identified in the saliva of some of these snakes. There was a case of a child's death, previously discussed in rec.backcountry. This case involved symptoms consistent with neurotoxin envenomation by such a "non-venomous" snake. Information is uncertain in this case so I don't know for sure if that is in fact what happened.

More information on this subject can be found in several reference of which the only one I could actually locate was, Sherman A. Minton, Jr. "Beware: Nonpoisonous Snakes," Natural History, 87: 56, Nov 1978. Unfortunately most of this stuff is rather specialized and not found in just any library, or even in all university libraries.

IDENTIFICATION:

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* Rule One:  If in doubt about whether a snake is venomous or not, *
* >leave it alone<.  There is no reliable rule to distinguish which *
* snakes are venomous and which are not.  Characteristics vary *
* greatly depending on locale and occasional individuals have *
* atypical coloration or pattern. *
*****
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It is useful to be able to identify the dangerous species of snakes. However it is not always easy. Coral snakes are probably the easiest to properly identify, they are small (usually no more than about 30 inches long, sometimes up to 40 inches), thin and brightly colored with small heads. They can be distinguished from the nonvenomous king snake and other harmless species by the presence of adjacent red and yellow bands while king snakes have adjacent red and black bands:

Red touch yellow - kill a fellow
Red touch black - venom lack.

Another mnemonic is to think of a traffic light. If red is adjacent to yellow, stop!

Pit vipers are a bit more difficult. Of course the presence of

rattles tells you that you are dealing with a venomous snake, but absence thereof gives no assurance to the contrary. Copperheads and cottonmouths have no rattles and even rattlers sometimes lose their rattles. The presence of fangs indicates a venomous snake, but they may be folded back in the mouth and difficult to detect, or they may be broken off. The easiest indicator (but one which needs practice, maybe in a zoo) is the characteristic heavy body and triangular head of the pit viper. While some non-venomous snakes also have these characteristics it is better to treat a snake with caution unless you absolutely know it is safe.

You may also look for the pit after which the pit viper is named. This will be between the eye and nostril, one on each side of the head (of course on the other hand you may not want to look that closely.) The other sure indicator, although not terribly useful for obvious reasons, is the scales behind the anal plate. Pit vipers have a row of single scales reaching across the underside of their bodies behind the anus while most other snakes have a double row of scales, joining in about the middle. This last information is probably only useful to identify a dead snake, I certainly wouldn't want to pick up a live one to look at its underscales, at least until I know it is not venomous.

Some older references suggest checking the pupils of the snake's eyes for identification. Pit vipers will have vertical slit pupils. If it has round pupils it is not a pit viper. Perhaps, but I'm not anxious to get that close to a snake if I think it might be venomous.

One good indicator of the type of snake is the location. Snakes don't wander far from home and tend to have a limited range and not survive outside the conditions they prefer. Except in the rare case of an escaped pet you will not find them in areas far removed from their normal range. You simply won't find a Mojave rattler in Ohio

or an eastern diamondback in Colorado. Several of the books listed above describe the ranges for various species, usually with maps.

Body markings are rarely sufficient for identification by the inexperienced. It takes a *lot* of practice to learn to distinguish between various species, some of which are quite similar externally. Furthermore, individuals of the same species can have varying shades of color, making such identification even more difficult. It is good to be familiar with what the dangerous snakes look like, but be sure you can be accurate or treat all snakes with caution. See the references listed above for pictures and other help in identification. If you are concerned about venomous snakes, get a book on herpetology and study it. Visit zoos, talk with specialists etc. I assure you that you will not become an expert by reading usenet.

Again, the best rule is, if there is any chance that the snake is poisonous, leave it alone! Getting close enough to identify pits or scales is dangerous. You might then be able to also examine the fang marks on your body!

THE "THREE NASTIES:"

There are three species worth extra attention if you frequent their ranges. These all have the venom to make you pay *dearly* should you upset them. Different sources give different assessments of the dispositions of the eastern diamondback and the Mojave rattler. Some list them as short tempered and quick to strike humans while others say that they are not very aggressive. There is, however, general agreement that both of these plus and western diamondback pack a nasty wallop if they do bite. It is useful to know if you are in their range and be able to recognize them in order to get proper treatment should someone get bitten. Their bites are not sure death but are more likely to cause death than other North

American venomous snakes.

While a major distinguishing feature of both diamondbacks (at least in the adult snake) is their size, this may be an unreliable indicator. Even experts have a difficult time estimating the size of a live snake, a problem compounded when a novice unexpectedly encounters one. Size estimates are typically quite generous to say the least. If the snake is dead and can be measured you can get useful information. Most of the danger of a diamondback comes from its size and the quantity of venom anyway. It won't make much difference if it is a juvenile diamondback or an adult of some other species (except the Mojave).

If you can safely kill a snake which has bitten someone, do so. You can then measure the length and take the snake with you to the hospital for expert identification. Be careful to avoid reflex bites - either from an intact dead snake or from a detached head. I do not advocate killing a snake unless it has actually bitten a person.

You will notice some discrepancies in the following descriptions. While all authorities agree that the eastern diamondback is our largest rattler, the guidebooks list a greater length for the western version. I attribute this to the fact that the descriptions come from different books. Probably one author is more conservative than the other. Either diamondback can be impressive - they are known to swallow cottontail rabbits whole! (And there are less reliable reports that they do the same with jackrabbits.)

Different authors also do not agree on which is the most dangerous, some claiming this "honor" for the eastern diamondback, some for the western version. The eastern version is larger and has more venom but its western cousin has a more potent venom. In my opinion the Mojave rattlesnake is also a good candidate for the most dangerous snake in the U.S. - its very potent venom with the delayed action make it a real danger. I'm not sure it matters much, I would not

want to be bitten by any of the three. My (partially educated) opinion is that the western diamondback is the most dangerous since it is probably the most likely to bite a person. Next would be the Mojave, less likely to bite but likely to administer a *nasty* dose of venom, the most dangerous venom load of any North American snake. The eastern diamondback would be third, probably no more likely to bite than a Mojave and a less severe (but still quite dangerous) venom load.

EASTERN DIAMONDBACK (Crotalus adamanteus)

(Thanks to Curt for emailing this since I couldn't find the books referenced in our library.)

According to Conant's Reptiles & Amphibians of Eastern/Central U.S., "33-72"; record 96"(!). An ominously impressive snake to meet in the field. The diamonds, dark brown or black in color, are strongly outlined by a row of cream-colored or yellowish scales. Ground color olive, brown, or almost black. Pattern and colors vivid in freshly shed specimens; dull and quite dark in those preparing to shed. Only rattler within its range with 2 prominent light lines on face and vertical light lines on snout.

At home in the palmetto flatwoods and dry pinelands of the South. Occasionally ventures into salt water, swimming to outlying Keys off the Florida coast. Some snakes will permit close approach without making a sound, whereas others, completely concealed in palmettos or other vegetation, will rattle when dogs or persons are 20 or 30 feet away. Many stand their ground, but when hard pressed they back away, rattling vigorously but still facing the intruder. Frequently they take refuge in burrows of gopher tortoises, in holes beneath stumps, etc. Rabbits, rodents, and birds are eaten.

Range: Coastal lowlands from se. N.Carolina to extr. E. Louisiana;

all of Florida, including the Keys."

According to Audubon's herp guide (not very good for identification of unknowns, but has good info and pictures):

"Our largest rattler. Heavy-bodied with large head sharply distinct from neck. Back patterned with dark diamonds with light centers and prominently bordered by a row of cream to yellow scales. Prominent light diagonal lines on side of head. Vertical light lines on snout. Scales keeled, in 27-29 rows."

Range and habitat same as above, but get this,

"Give it a wide berth; most dangerous snake in North America! Venom highly destructive to blood tissue. Stumpholes, gopher tortoise burrows, and dense patches of saw palmetto often serve as retreats. Their numbers have been substantially reduced by extensive land development and by rattlesnake hunters. Eats rabbits, squirrels, birds"

(The following descriptions, Mojave and western diamondback, taken from Stebbins's book)

WESTERN DIAMONDBACK RATTLESNAKE (*Crotalus atrox*)

Identification: 30-89 inches. The largest western rattlesnake. Above: gray, brown or pink with brown diamond or hexagonal blotches on the back and fainter smaller blotches on the sides. Markings often indefinite and peppered with small dark spots, giving an overall speckled or dusty appearance. Tail set off from the rest of the body by broad black and white rings, about equal in width; hence sometimes called the "coontail" rattler. A light diagonal stripe behind the eye intersects the upper lip well in front of the corner of the mouth. Young: 9-14 inches, markings more distinct than in

adult.

Frequents a variety of habitats in arid and semiarid regions from the plains into the mountains - desert, grassland, brushland, woodland, rank growth of river bottoms, rocky canyons, and lower mountain slopes. Crepuscular and nocturnal, but also abroad in daytime. Perhaps the most dangerous North American serpent, often holding ground and boldly defending itself when disturbed. Live-bearing.

Range: SE California to E Oklahoma and E Texas, south to Isthmus of Tehuantepec. Old records for central Arkansas and Trinidad, Las Animas Co., Colorado. Sea level to 7000 feet.

MOJAVE RATTLESNAKE (*Crotalus scutulatus*)

Identification: 24-51 inches. Well-defined, light-edged dark gray to brown diamonds, ovals, hexagons down middle of back; light scales of pattern usually entirely light-colored. Ground color greenish gray, olive green, brownish, or yellowish. A white to yellowish stripe extends from behind the eye to a point behind the corner of the mouth except at extreme southern end of range. Tail with contrasting light and dark rings; dark rings narrower than light rings. Enlarged scales on snout and between the supraoculars.

Chiefly inhabits upland desert and lower mountain slopes, but ranges to about sea level near the mouth of the Colorado river and to high elevations in the Sierra Madre Occidental. Habitats vary--barren desert, grassland, open juniper woodland, and scrubland. This rattler seems to be most common in areas of scattered scrubby growth such as creosote bush and mesquite. Not common in broken rocky terrain or where vegetation is dense. Eats kangaroo rats and other rodents; and probably other reptiles. AN EXTREMELY DANGEROUS SNAKE--EXCITABLE AND

WITH HIGHLY POTENT VENOM.

Range--S. Nevada to Puebla, near southern edge of Mexican Plateau; western edge of Mojave Desert, Calif. to extreme w. Tex. From near sea level to around 8300 feet.

In case of a bite it may be important to distinguish between the diamondback and the Mojave. The ranges of the species overlap and if you are in the area of overlap you may not know which was the culprit. The distinction is important in the case of a bite with little or no local reaction. In a diamondback bite this indicates that envenomation did not occur. However if a Mojave was the culprit no such assumption can be made and systemic reaction may occur 12-16 hours later. The two species are very similar in appearance. The relative width of light and dark tail bands may be the best way to distinguish between the two. If uncertain, assume the snake was a Mojave and treat accordingly.

Other similar snakes include the speckled and western rattlesnakes (there are several sub-species of the speckled). Their ranges also overlap those of the Mojave and diamondback. Similar problems exist - that is for all except the Mojave lack of local reaction indicates no envenomation. Again, unless you can positively identify the snake as not a Mojave, assume that any bite was administered by the Mojave if in its range.

Mojave venom can be up to 20 times the as potent as diamondback venom although quantity will typically be about 1/6 that of a diamondback. Specific references to Mojave and its unusual venom are:

The Venomous Reptiles of Arizona, (Arizona Game and Fish) pp55-56

Journal of Herpetology, Vol 23 no. 2, pp 131ff (1989)

One other note on the Mojave: There is a central Arizona version which can be considered a subspecies. As far as I know, nobody has yet found any differences between it and its more widely distributed cousins except that its venom is very similar to the diamondback venom. This of course makes it less dangerous than the standard version. There are also "hybrids" which have components from both venom types. Hybrids present the particular danger of a local reaction which may fool victims and medical personnel into believing the culprit was a diamondback until the systemic reaction due to neurotoxin sets in later. Even experts can't tell the difference between different varieties of Mojave except by analyzing the venom. Obviously all Mojave (or suspected Mojave) bites should be treated for the worst case.

PREVENTION:

Obviously the best prevention is to avoid getting bitten. This is facilitated by the fact that humans are not the natural prey of any venomous snake. We are a bit large for them to swallow whole and they have no means of chopping us up into bite size pieces. Nearly all snakebites in humans are the result of a snake defending itself when it feels threatened. In general snakes are shy and will simply leave if you give them a chance. The basic rule is to be sure the snake knows you are coming. Walk heavily, they probably sense ground vibrations better than sound. If they sense your presence they will almost always leave before you even know they are there. (This may not apply in other parts of the world. Some of the more potent snakes may protect their territory as well as their bodies.)

If you do unexpectedly confront a snake, stay calm, back away and do nothing to threaten it. (This assumes of course that the

surprise didn't cause you to jump well beyond the snake's reach. It's amazing what the human body can do in such circumstances.)

Don't run around barefoot in snake country, especially after dark. During warm weather snakes will be most active at night and will defend themselves if stepped on or if you walk too close and they sense danger. MFM lists going barefoot and gathering firewood after dark as two of the more common activities leading to snakebite. Going barefoot not only exposes you but also makes your footsteps quieter so you are less likely to be felt. You could invest in a pair of "snakeproof" boots but any high top leather boot is probably adequate. Long pants will also help since the snake has difficulty distinguishing between clothing and you. Venom injected into a fold of your clothing won't hurt you much.

Remember that snakes like to hide under rocks, logs, brush etc. to protect themselves from sun or cold. Be **very** careful in snake country about moving such objects or reaching into anywhere a snake might hide, or even walking by them. They might well perceive your actions as aggressive and defend themselves. This is probably the most dangerous situation since there may be more than one snake in the same place and, taken by surprise, they will strike without warning. Furthermore they will be more likely to bite your unprotected hand, not a leg or foot protected by clothing.

Rock climbers should be careful in snake country. Snakes like to sun themselves on ledges and it can be a real eye-opener to poke your head up and stare one in the eyes. And while you won't find them in the middle of a 5.12 face you may find them in cracks near ledges etc. Remember, the mice and rats which inhabit many cliff areas mean food to a snake and so attract them.

It is also a good idea to protect yourself while sleeping. Snakes won't come looking to bite you, but when the temperature starts

to drop they often do look for a warm place to spend the night. That sleeping bag with you inside can be very attractive. Use insect netting or something else to keep them out (unless you relish the thought of waking up to find a snake in bed with you). There is a bit of controversy about if they will actually crawl into bed with you, but I would want to take precautions. Also check the sleeping bag before you get in to be sure it isn't already occupied. The same goes for your boots in the morning.

Be careful entering old buildings such as mining cabins. They make nice homes for snakes.

Obviously you should not handle or tease poisonous snakes. Less obvious is the danger of handling them when they are dead. A reflex strike from a dead snake can be just as dangerous as a bite by a live one. This also applies to detached heads of dead snakes.

TREATMENT:

Now, what about treatment? What do you do if you or a member of your party becomes one of the unfortunate few to actually get bitten?

The first thing is to remain calm. Remember, snake bite is **not** usually deadly in spite of all the hype about it. Even without treatment you will almost certainly recover. If you can identify the snake do so. It is better if you can safely take it with you to the hospital to be sure of getting the right anti-venom. However do not risk more bites to do so. Remember the first rule of rescue: Do not create any more victims or risk further injuring the current victim.

Treat for microbial infection. Bacteria which cause tetanus and gas

gangrene have been isolated from the mouths of poisonous snakes. Cleanse the wound and if possible disinfect with Betadyne or other effective antiseptic. Cleansing and disinfecting the wound is the single most effective treatment you can give in the field. The victim should also be sure his tetanus vaccine is up to date.

Definitive treatment requires a physician who will administer anti-venom as well as other treatment. Most antivenom is made with horse serum so try to find out if the patient has any allergy to it and if so be sure the doctor is informed of that fact. Keep the patient as quiet as possible and evacuate quickly to medical facilities.

A word about the Mojave: Most of the snakes of this species have a venom high in neurotoxin as described above. This is particularly difficult to treat, both in the field and in a medical facility. The standard antivenom is less effective against it than against venoms with a higher percentage of hemolytic toxins. It is especially important to start treatment quickly for a Mojave bite. The bitten limb must be immobilized and spread of the venom slowed as much as possible. This is one case where it would be worth an extra effort to remove the venom if the conditions below can be met. Also be extra diligent to in transporting the victim quickly to a hospital. Be prepared to provide breathing assistance.

A victim alone should try to evacuate himself to medical facilities, even if this includes walking. Obviously he should do no more exercise than absolutely necessary.

If the victim is accompanied by only one other person that person should do as much treatment as can be done quickly, then go for help. Larger groups should send someone for help while others stay to provide as much treatment as they can, or start to evacuate the patient if possible. The object is to get the victim to a medical facility quickly with as little rough handling or movement on his part as

possible. Helicopter evacuation is preferred but even having an ambulance at the trailhead is a great help.

Try to slow the spread of the venom. Use constricting bands above and below the site of the bite. These should **not** be tight enough to cut off circulation, all you want to do is slow down the movement of the fluids under the skin. Keep watching these bands, they should not be on a swollen area and you may have to move them as swelling increases. To re-iterate: **Do*not*cut*off*circulation**.

A more recent development for immobilizing the venom is to wrap the area snugly with fabric and immobilize the limb with a splint. Any type of fabric, including elastic bandages, works well. Just be sure it is not tight enough to cut off blood circulation and watch for swelling which might make it too tight.

The bitten limb should be immobilized, especially if bitten by an elapid such as a coral snake. Treat it like a fracture.

You will not be able to remove very much of the venom, almost none in an elapid bite where the chewing will have dispersed it. However, you should try if **all** of the following criteria are met:

1. You can start venom removal within 10 minutes (thereafter it tends to be so dispersed that you will not likely be very effective)
2. You have appropriate suction devices to remove it. This means a syringe style suction device, the rubber suction cups often sold in "snake-bite kits" do not develop enough suction to do the job. It is not necessary to cut the wound to suck out venom, it went in through the fang marks and can come out the same way. In my opinion you should not try to suck it out with your mouth. That is not likely to be effective, risks venom getting into your blood via an open sore,

and most importantly is likely to further contaminate the wound. If you lack an appropriate suction device, forget it.

3. The bite was inflicted by a pit viper.

If you do try to remove the venom, place the suction device over the fang marks. They may not always be obvious if the snake has bitten hard enough to leave marks from other teeth also. Be aware that you are not going to get out much of the venom. Removal of 5 to 15% would be about all you can expect. The sooner after the bite you start the more effective you will be, the venom disperses quickly.

There is some controversy over the idea of cutting into the flesh around the fang marks. While this can facilitate removal of venom it is also very dangerous. Unless you really know what you are doing you may do more damage than the snake did. Muscles, nerves, and blood vessels may all be in the area and you can damage them, sometimes permanently. Most classes I have attended do not recommend cutting. MFM recommends it under certain conditions, namely:

1. The "surgeon" knows enough to avoid cutting anything vital. In my mind this eliminates most of us, including myself, from doing this cutting. The cuts need to be quite deep, about an eighth to a quarter of an inch, and I don't think most of us remember enough anatomy to do that safely, especially during the tense times which accompany a snake bite.
2. The culprit is positively identified as a pit viper. (Antivenom is the only effective treatment for elapid bites, including the coral snake.)
3. The victim is 3 hours or more from the nearest medical facility and incision and suction will not delay evacuation.

Keep in mind that MFM is aimed at a readership which includes some highly trained medical people, physicians etc. It may make sense for them to perform some procedures which most of us should not even think about attempting. You will do no damage with an appropriate attempt to suck venom out of the same wound it went in. However you can do a *lot* of damage when you start cutting. Leave the surgery to those trained and licensed to do it.

(MFM mentions cold therapy only to *strongly* advise against its use. It is *not* effective and, particularly in the case of a pit viper bite, will impede recovery. Cold will restrict circulation already compromised by the damage to blood vessels. Furthermore, the body's principle detoxifying mechanism appears to be the action of antibodies against the venom. Lowering of the temperature retards access of antibodies to the toxins. Cold therapy apparently was proposed on the assumption that the venom is an enzyme. In fact most are peptides which cooling does not inactivate.)

How about a "snake-bite kit?" Obviously you want to be prepared for emergencies which are likely to happen but I don't think that necessarily means buying a kit and carrying it all the time. Except for a suction device you should already be carrying everything you need in your standard first aid kit. Snakebite is so rare that I don't think I would even bother with a suction device unless a bite by one of the "three nasties" is a reasonable probability. Items which ought to be in your first aid kit and are useful in case of snake bite are:

1. A good antiseptic (eg. Betadyne) to cleanse the bite.
2. Elastic bandage or gauze ("cling") to use in making constricting bands or wrapping the area to immobilize the venom.

3. Splinting materials to immobilize the limb bitten.

(Written by Hal Lillywhite. Last update: 14 February 1994)

>From "Last Chance to See"

"Oh, you don't have to worry about identifying Tasmanian snakes. They're all poisonous."

...

"So what do we do if we get bitten by something deadly, then?" I asked.

He blinked at me as if I were stupid

'Well what do you think you do?' he said. 'You die of course. That's what deadly means.'

'But what about cutting open the wound and sucking out the poison?' I asked.

'Rather you than me,' he said. 'I wouldn't want a mouthful of poison. All those blood vessels beneath the tongue are very close to the surface so the poison goes straight into the bloodstream. That's assuming you get much of the poison out, which you probably couldn't. And in a place like Komodo it means you'd probably quickly have a seriously infected wound to contend with as well as a leg full of poison. Septicaemia, gangrene, you name it. It'll kill you.'

'What about a tourniquet?'

'Fine if you don't mind having your leg off afterwards. You'd have to because it would be dead. And if you can find anyone in that part of Indonesia who you'd trust to take your leg off then you are a braver man than me. No, I'll tell you: the only thing you can do is apply a pressure bandage direct to the wound and wrap up the whole leg up tightly, but not too tightly. Slow the blood flow but don't cut it off or you'll lose the leg. Keep the leg or whatever bit of you it is you've been bitten in, lower than your heart and your

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head. Keep very, very still, breathe slowly and get to a doctor
immediately. If you're in Komodo that mean a couple of days,
by which time you'll be well dead.

'The only answer, and I mean this quite seriously, is *don't get
bitten.* There is no reason why you should. ... No, the things you
really need to worry about are the marine creatures.'

'What?'

'Scorpion fish, stonefish, sea snakes. Much more poisonous than
anything on land. Get stung by a stone fish and the pain alone can
kill you. People drown themselves just to stop the pain.'

...

'Is there anything you do like?'

'Hydroponics.'

'No I mean are there any venomous creature you're particularly
fond of?'

He looked out of the window for a moment.

'There was,' he said, 'but she left me.'

--Douglas Adams, Chapter 2 "Here Be Chickens," in Last Chance to See

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