

Snake Bites and Herbs

There is one topic that usually frightens even the most experienced wilderness medicine folks: Venomous snake bites. I have practiced and taught wilderness first aid, first responder and emergency medicine for well over 2 decades, and the general approach for this curriculum as handed down from high is usually some variant of “keep the victim calm and evacuate to higher medical care,” with a few common sense pieces of information thrown in like, “don’t elevate the snake bite higher than the heart,” and “don’t let the victim run or get excited,” and “if the snake has been killed, transport the snake along with the victim for positive identification of species.”

In every Wilderness First Aid Certification class that I teach, I am peppered with questions about details and folk medicine regarding snake bites. In this chapter I would like to approach this subject as I do with most every wilderness herbal medicine class I give. That is, assuming the worst. Assume there is no higher definitive care. Not now, not in a week and not in 6 months. This is the entire concept of all of the courses in my school (The Human Path) and all of the real-world missions of my non-profit organization (Herbal Medics). Assume that you are the medic and that you are the higher definitive care for any given person who needs your help. This means you are the medic for the first few hours, you are the “nurse” tending to long-term supportive care, you are the “doctor” making the most difficult medical decisions that may be well beyond the scope of anything you have ever had training for. This is the role of the medic in a remote, medically underserved or post-disaster environment, and this chapter is at least a brief exploration into this role when faced with a venomous snake bite.

To address the treatment of snakebites using only wilderness first aid and herbal medicine is something that requires some conjecture due to the lack of practical experience, but that does not mean that it is beyond the scope of deep consideration. Quite the contrary. It is precisely the fact that this is such unknown territory (at least in the modern day, first world medical environment we live in) that requires an herbalist to at least consider all of the issues, methods and plants that would be usable in this kind of situation. In this chapter I would like to at least superficially address some of the primary considerations for the field herbalist when presented with a venomous snakebite. For instance, what is the immediate first aid response and is there plant medicine that can assist the victim’s body in recovering from a poisonous snake bite when in an environment lacking antivenin or any type of higher definitive (allopathic, surgical, etc.) care?

Overview of snakes, venom, signs and symptoms

As with all acute illness and injury, it is often wise to start with the pathophysiology and its components that contribute to (usually extreme) homeostatic imbalances. What kinds of venom are we faced with in North America and what does these venoms actually do?

Snake venom is a mixture of various zootoxins – mostly proteins, as well as non-toxic compounds. Different genera and even species of snakes have different types of venom, and to classify venom as only

neurotoxic or hemotoxic is not completely correct, because although a specific venom may have an overriding effect, all venoms tend to exert varying degrees of neurotoxic, cytotoxic and hemotoxic effects.

For the sake of this chapter, we will consider pit vipers (Rattlesnake, Cottonmouth, Copperhead) and coral snakes. Out of this group, the rattlesnakes (*Crotalus* and *Sistrurus* genera) are statistically the most dangerous common of all North American snakebites.

First, being bit by a snake does not equal envenomation. Nor does full envenomation equal death. Not in the least. At least one-fifth of all rattlesnake bites are “dry” (containing no venom), and another 30%-40% of rattlesnake bites are light envenomation because the snake decided not to waste venom or the venom was lost in the air on its way to or back from the bite. The remaining bites are moderate to heavy envenomation. Again, assuming we are possibly the only primary caretaker of the bite victim, then right off the bat there are a number of signs and symptoms we need to watch very carefully for that will give us some idea of the severity of the bite for the person who has been bit. The vast majority of snake bites in the wild are on the lower extremities, with most of the rest of them occurring on the upper extremities.

- Was the snake poisonous? – This isn’t a chapter on identification of the different species, but it is easy to find this kind of information concerning the four general types of poisonous snakes (which include several species) in North America: Rattlesnake, Cottonmouth, Copperhead, and Coral Snake.
- Size and age of the victim. The amount of poison will have proportionate effects based on the size of the person who has been bitten, so young children are going to be particularly vulnerable
- The immediate area around and superficial to the bite (clean the area off, looking carefully for venom which can be clear to yellowish).
- Immediate swelling in the area? Keep track of the circumference of the extremity every 15 minutes.
- Pain (local and systemic)?
- Bruising that is growing (outline bruise patterns with a marker if possible)
- Weakness?
- Nausea or vomiting?
- Tingling or numbness of extremity?
- Fainting or dizziness?
- Coagulopathy (lack of blood clotting around wound) – specifically with pit vipers?

First aid treatment of venomous snake bites in North America

The most critical response to the snake bite right off the bat is to keep the victim calm, clean and monitor the bite area closely, treat for shock, keep weight off the extremity, and try to keep the victim’s heart rate normal. There are numerous proposed field first aid treatments of poisonous snake bites that I would like to address briefly:

- 1) Keep the bitten extremity lower than the heart: This may be helpful, or may not. On the one hand, it keeps the toxin from becoming systemic too quickly (shock and systemic issues). On the other hand it pools the toxin in the extremity where it can and will do more damage locally (compartment syndrome and tissue death).
- 2) Treat with ice: While short term (< 10 min) treatment with ice might help (a little) with initial swelling and pain, you do not want to limit circulation to connective tissue and muscle, possibly exacerbating tissue damage due to lack of circulation, clotting and other toxic reactions that are already occurring.

- 3) Pressure immobilization: In other words, placing a pressure bandage around the area (ACE or other compression wrap) and then splinting and immobilizing the extremity: This has been shown to be effective in Australia with sea snakes and other Elapids (Elapidae family), of which the coral snake is a member. This technique may be effective field first aid treatment for coral snake bites, but bear in mind several things: 1) It is important to understand and achieve the proper amount of pressure for an effective wrap of this type, 2) The limb must be immobilized and cannot be used to bear weight, so this victim must be carried if moving, 3) Research in the USA with rattlesnake venom has shown that it is effective at preventing full systemic involvement, but creates a higher incidence of compartment swelling (compartment syndrome) than with a non-wrapped extremity and 4) The effectiveness in Australia has been only in field environments where the compression wrap was then removed in a hospital setting carefully and during antivenin administration. Sooner or later, the pressure wrap has to come off, and at that point the venom will start to spread and become systemic.
- 4) Snakebite extraction kits: The Sawyer Extractor Pump has been touted as an effective method of treating venomous snake bites by many. However, there have been at least three independent studies available on the National Institute of Health's resource site that have (within the limitations of their own experiments) shown the Sawyer Extraction kit to be ineffective at the bite-site shortly after a bite, of extracting venom. With all that said, however, there is no research to my knowledge that shows the pump to be harmful. Therefore it probably wouldn't hurt, and might even help if applied quickly enough after the bite.
- 5) Venous tourniquet: Similar to the Pressure immobilization, but untested and likely more dangerous.
- 6) Electric shock: Causes greater tissue damage to the area and may have no effect in "neutralizing" venom. This method was reported in an outdoors magazine several decades ago as a method used successfully for snakebites in South America. Whether an electric shock administered quickly after the bite would denature the venomous proteins (along with all the healthy proteins in the area that we need as well), is a question worth researching, but I would not rely on it as a treatment, personally.
- 7) Incisions around or above (proximal) to bite area and sucking out toxin: Causes tissue damage, possible bleeding that will be difficult to stop because of toxin in the area, and unlikely to actually extract venom that has already permeated the surrounding tissue.

I've been researching snake bite treatment for years, and it is always depressing when looking at western field-medicine literature, listening to classes, medical advice from toxicologists, doctors, etc., because there never appear to be any actual answers outside of keeping the victim calm and transporting to the hospital where they can be treated with antivenin which, by the way, is extremely expensive (plan on an absolute minimum of \$10K), extremely painful, itself is not a 100% guarantee of a cure, and can cause severe reactions as well. The situation where a person may be 24 hours or more away from a hospital or perhaps there is no hospital anywhere that could deal with the bite, seems to be consistently ignored as a possibility, which is precisely why this situation needs very careful consideration.

Plant Medicine for Snake Bites – the Pathophysiology of the bite:

Where can we turn for some answers regarding field snake bite treatment in a situation where there is no hospital to transport to, or there is no antivenin treatment available? There are a few good resources for this information. One is historical information from Native Americans and herbalists in North America prior to the early 20th century. Another lies in ethnobotanical data from current indigenous tribes around the world who are using plants for similar types of venom found in the families and genera of poisonous snakes in North America.

Finally, we can turn to research in countries other than the USA that deal with austere medicine issues as a part of their health care system (such as India) and where research is often conducted for the purpose of finding answers rather than profitability.

Before moving into specifics of certain plants for toxic snakebites, let's address the pathophysiologies of the bite that we'd like to deal with. Snake venom produces damage to the muscle tissue and blood (hemotoxins), to the nerves (neurotoxins) and to cells (cytotoxins). The general rule of thumb is that the pit vipers produce more hemotoxins and the coral snake more neurotoxins. However, all venom varies not only from species to species, but within the species based on the age of the snake and probably based on other factors that have not been "discovered" yet. One of the biggest exceptions to the pit-viper hemotoxin rule is the Mojave Rattler (*Crotalus scutulatus*) which primarily produces a very potent neurotoxin.

What actually happens at the point that you become envenomated by a snake? The venom leaves the snake and makes its way rapidly into the damaged tissue. There are several enzymes and proteins that assist with this movement of venom through the system, but the most common one is arguably a hydrolase called hyaluronidase. Hyaluronidase creates a great deal of tissue permeability by breaking down extracellular substance. This allows any type of venom to come into contact with blood vessels, cells and nerve tissue.

There are systemic and local complications that at the worst can result in compartment syndrome (muscle swelling inside the fascia to the point that circulation is stopped and the tissue becomes necrotic) or death from shock-related, systemic issues. However, these are the exception, not the rule, as worst-case scenarios and it is certainly possible to deal with a venomous snakebite even without higher medical care, using basic first aid, common sense and plant medicine.

Snakebite Treatment Steps

First, we'd like to pull as much poison out of the wound as possible. We need to deal with and prevent as much tissue destruction (myotoxicity) as possible, inhibit the toxic enzymes in the poison and counter any of the hemo-toxicity (anti-coagulation and/or pro-coagulation) we can. We also want to delay or counter local inflammation. Finally, we need to support the liver and the kidneys as much as possible. Lymph support would not be amiss either. This is a very tall order, especially since there is no chance to test what we're doing in modern medicine (at least not in the USA) so that as usual we find ourselves flying blind as herbalists in the face of disaster or emergency medicine when there is no other alternative.

Drawing the Poison

Is it possible to draw the poison out? The independent studies on the Sawyer extractor seem to indicate that this is not possible using only physical suction. However, what about adsorption, hydrophilic tissue softening and even osmotic pressure? Before moving to herbs, let us remember our old friend, activated charcoal. In the case that a snakebite wound is open enough and fresh enough that charcoal could be applied as a poultice with water, this may be worth trying for an hour or so - especially in absence of immediate availability of other plants that work as a drawing poultice. If it were possible to create contact between all damaged tissue and the charcoal to absorb the poison, charcoal would be a fantastic resource to clean out the snakebite wound. However, because of the small size of the wounds and the rapidity with which the toxin begins to create tissue permeability, inflammation and spread, the actual efficacy of a charcoal poultice is questionable. However, if the wound was large enough and exposed enough already to allow for charcoal to come into direct contact with the envenomated

tissue, an immediate charcoal poultice for 30-60 minutes would be helpful. Alternatively, a charcoal “bath” can be made by mixing charcoal with water into a thin slurry to soak the bite in for 30-60 minutes, which has a better chance of penetrating the size of wounds that a snake fang creates.

Other toxin-drawing plants we know and use as herbalists are Plantain (*Plantago spp.*), Prickly Pear cactus (*Opuntia spp.*), Mullein leaf (*Verbascum thapsus*). These herbs, applied locally are capable drawing herbs and could probably be used with some success for the first hour or so.

It is possible that applying drawing poultices or charcoal on the bite after the first hour would still be useful, but one strong reason to not work with charcoal unless you either have no other alternative or know you are indeed creating contact between the charcoal and the envenomated tissue, is that there are several plants that have anti-toxic effects on the hemo-, cyto- and neurotoxic proteins and enzymes in snake venoms. These plants would be more useful on counteracting the hyaluronidase and other tissue damage than charcoal would be, once the venom has made its way into the tissue. In fact it is exactly the enzymes and proteins in the venom that cause the venom to spread so easily that we can counteract with herbs.

Tissue Damage and Wound Inflammation

What medicinal plants can counteract the effect of both tissue damage and wound inflammation around the bite site? Here are some plants either native to North America or well known in their usage even though they may not be native. Included are some of the constituents in each plant that have some snakebite-specific research behind them, regarding the prevention and reversal of the tissue damage of many of the compounds found in any snake venom, as well as the specific toxin(s) they affect.

- *Echinacea angustifolia & pallida* – alkylamides, cichoric acid, echinacoside, ketoalkenes, polysaccharides (increase of fibroblast activity, anti-hyaluronidase effects)
- *Casearia sylvestris*, *Quercus spp.*, *Punica granatam (rind)* – ellagic acid (venom-induced edema due to phospholipase A2, a neurotoxin found in the coral snake as well as the Mojave rattler)
- *Hemidesmus indicus* – 2-hydroxy-4-methoxy benzoic acid, lupeol acetate (neutralizes general pit viper hemotoxic venom effects)
- *Curcuma longa* – ar-turmerone, turmerine (inhibition of phospholipase A2 (PLA2))
- *Polygonum cuspidatum* – resveratrol (endothelin antagonist)
- *Quercus spp.* (galls) – polyphenols, tannins (inhibition of the hemorrhagic and dermo-necrotic activity, inflammation)
- *Levisticum off.*, *Camellia sinensis*, *Opuntia spp. (fruits)*, *Vaccinium myrtillus* – quercetin (inhibition of PLA2, proteases, hyaluronidase and L-amino acid oxidase)
- *Pluchia Hemidesmus* - β -sitosterol, stigmasterol (hemotoxic venom neutralization)
- *Prunella vulgaris* - β -sitosterol, rosmarinic acid, ursolic acid (angiogenesis, capillary and endotelial tissue repair, NO and eNOS stimulation in the case of anti-coagulation proteins)
- *Andrographis paniculata* – andrographolide (highly anti-inflammatory against snake venom edema from pit vipers)

Discussion

Arguably one of the most relevant references for herbal treatment of rattlesnake bites can be found in the history of *Echinacea angustifolia*. The Sioux Indians used *Echinacea* for this purpose, and in the late 1800's an

eclectic herbalist by the name of Dr. H. C. Myers claimed his “Myers Blood Purifier” (containing *Echinacea angustifolia* root, *Humulus lupulus* and *Artemisia* spp. – possibly the original snake oil and a nifty blend by any account for a wide array of health issues) would cure everything “from rattlesnake bites to typhoid fever.” He was confident enough in his use of *Echinacea angustifolia* root (claiming to have used it for over 600 rattlesnake bites) to successfully allow himself to be bitten by a rattlesnake and demonstrate the efficacy of *Echinacea* both as an external poultice and taken internally in large doses.

Echinacea undoubtedly has an incredible ability to clear toxic heat. I have used it for brown recluse bites and ulcerated (diabetic) wounds on the extremities with profound and very rapid results. This may be directly related to echinacoside (present in *E. angustifolia* and *E. pallida*, but barely present in *E. purpurea*) and its anti-hyaluronidase activity which greatly decreases inflammation and cellular permeability that also leads to tissue structure weakness and massive proliferation of the snake venom.

In my own personal herbal first aid kit, I carry activated charcoal powder (finely ground) and tinctures of *Echinacea angustifolia/purpurea* mix (both a high percentage alcohol and water/heat extraction, mixed together), *Prunella vulgaris* a *Quercus/Punica* formula, *Vaccinium myrtillus*, *Andrographis paniculata* and *Hemidesmus indicus*. I carry them for reasons that don’t necessarily have anything to do with snakebites (very potent wound healing, anti-bacterial and other properties), but as is the case with all plant medicine, these herbs are very much multi-purpose and highly useful for snakebite treatment. If you live in snake territory (as I do), I think it prudent as part of an herbal snakebite kit to also carry the powdered, dried versions of at least the *Echinacea angustifolia* and/or *pallida*, if not one or more of the other herbs I just listed – either encapsulated or as a raw powder. This would allow for poultices which are vitally important in the treatment of a snakebite. All of the herbs listed so far would be best applied topically as well as taken internally.

Here is a summary of how I would approach a venomous snake bite assuming no higher definitive care within hours, days, weeks or no higher definitive care ever. Note that this protocol uses a lot of *Echinacea angustifolia* or *pallida* root:

- 1) Make sure the scene is safe. The snake has either been killed and is somewhere that it cannot bite again (even after dead, reflexively).
- 2) Identify the species of snake if at all possible. At least identify whether venomous or not.
- 3) Clean the wound and inspect it thoroughly. Monitor the victim for all of the symptoms and signs of a venomous snake bite listed earlier in this chapter.
- 4) Keep the victim calm and comfortable. Monitor for shock, communicate consistently. Have them hydrate very well. If the bite was venomous, the kidneys are going to be a concern to us.
- 5) If the fang marks are large enough to get charcoal into the wound itself and come into contact with the venom, consider a charcoal slurry or plaster for the first 15-20 minutes.
- 6) In place of the charcoal (or following the charcoal), consider Prickly Pear (*Opuntia* spp.) 2 - 3 plasters (do not apply heat) directly on the bite site changed out every 5-10 minutes (total of 15-30 minutes).
- 7) Place an *Echinacea angustifolia* and/or *pallida* root plaster or poultice directly on the bite site. Change it out every 2 - 3 hours.
- 8) Start taking *Echinacea angustifolia* and/or *pallida* internally. Tincture form would be simplest, and of a strong (1:2 or 1:3) tincture, somewhere in the range of 0.5mL per kilogram of body weight of the victim per day. So for a 100 kg (~220 lb.) adult, this would be about 50 mL per day. If the victim become nauseous immediately after taking the *Echinacea*, then back off the dosage.

- 9) Offset by at least an hour or two from any internal herbal dosages, consider giving the victim charcoal internally once per day. As mentioned before, this has nothing to do with getting “charcoal into the bloodstream,” but rather to deal with the remnants of venom that may be fat soluble and make its way into the gastrointestinal tract eventually (after it has made it into the bloodstream, liver and other target tissues).
- 10) A formula (1:1) of Milk thistle seed (*Silybum marianum*) and Plantain leaf (*Plantago spp.*) to support the liver. Adult dosage of 3-5 mL of strong (1:3-ish) tincture every 2 -3 hours.
- 11) Consider kidney support that includes Joe Pye Weed (*Eupatorium purpureum*) along with one or more of the following: Nettles root (*Urtica dioica*), Cornsilk (*Zea mays*), Watermelon seed (*Citrullus lanatus*), Pumpkin seed (*Curcubita pepo*).

The obvious first question is: “How long should we continue this protocol?” If it were me, I would base that entirely on symptoms, but also bear in mind that venom can take a long time to move through different layers and types of tissue. As an example of this, I have had the experience of working with a brown recluse bite and getting rid of the infected, ulcerated bite area within a matter of a few days. However, even though it looked great and healed over very quickly, didn’t mean the venom was completely gone. A week later, this client began to get neurological symptoms because of the venom that had (in my estimation) eventually made its way to the closest nerves to the bite site. So my recommendation is to err on the side of conservative and continue this or some form of herbal protocol for at least several days past the point that symptoms have subsided.

As a final, common-sense note, it is important to note the statistic that well over 50% of all snakebites in the USA occur while a person is handling or otherwise interacting with a snake. If you are aware and careful where you tread, where you put your hands if you’re climbing and what is around you, you can accomplish far more than with any herbal remedy or antivenin by avoiding being bitten in the first place.

As an additional herbal point on the subject of handling snakes, *Eryngium yuccifolium* (Rattlesnake Master) most likely got its common name from the accounts of an Indian Trader who recounted watching Native Americans chew and spit the plant on their hands before handling rattlesnakes without being bitten. It was not used as a rattlesnake remedy that I have ever found. However, this plant (*Eryngium yuccifolium*) and at least two close cousins to this plant *Eryngium maritimum* (Sea Holly) and *Eryngium campestre* (Field Eryngium), would all be useful taken internally in the same way that Joe Pye Weed (*Eupatorium purpureum*) is useful – in helping detoxify the kidneys.