NEWS FROM THE PIT

Arizona Poison and Drug Information Center





Watt's Up with Electrotherapy in Snake Envenomation?

By: Jennifer Ramirez, PharmD

When it comes to the history of treating snake bites, there are quite a few shocking methods people in the past have used. I mean that quite literally, too. In the past 40 years, there have been some people who use electrical shocks as a way to treat snake envenomation. A quick search on Google and you will find websites and social media with people claiming to be experts and swearing by electrotherapy in snake envenomations. At Arizona Poison and Drug Information Center we've had cases of people electrocuting their snake bite with a stun gun and even a car battery. Since the information is readily available and something we see from time to time, let's talk about it.

NEWSLETTER HIGHLIGHTS

Historical use of electrocution in snakebite treatment

Image 1: Western Diamond-backed Rattlesnake

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First, let's take a quick step back and talk about how the idea of electrocuting snake bites even came to be. Electrotherapy entered the medical arena in the mid-1800s and was used for a variety of ailments from cramps caused by "female hysteria" to fatigue. At the turn of the century, electrotherapy as a treatment started falling out of favor for both patients and doctors due to lack of efficacy. This all changed in the world of snake bites when Ronald H. Guderian wrote a letter to the Lancet in 1986. claiming to have successfully treated and cured snake envenomation in Ecuador using electrotherapy¹. The author claimed he got the idea from a news article in Illinois about a local farmer who electrocuted bee stings to alleviate envenomation. This editorial however never acknowledged half the bites in this region were typically dry bites and a formal study was not conducted. Despite unfounded information. the publication caught the eye of many snake enthusiasts, and resulted in pieces being written in magazines (Images 2-4) and local papers recommending to readers the use of electrotherapy in the event they were to get bit by a snake. Proponents of electrotherapy recommend using direct current, high voltage, low amperage shock devices, such as stun guns and motor batteries. Despite taking multiple physics classes, I still get amps and volts mixed up in my head. For those of you who might be like me, think of electricity as water going through a hose. The voltage is the water pressure while the amperage is the rate of flow through the hose. High voltage with low amperage means you will get a lot of electricity coming out, but it doesn't travel very far through the tissue.



Image 2: Drapen. Miracle cure or snake oil? A shocking development in the treatment for snakebite. Backpacker. March, 1989; 17(2):16-eoa.

Image 3: Mueller, L. A Shock Cure. Outdoor Life, 1988; 181(6), 64-65.

Image 4: Mueller, L. A Shocking Cure for Snakebite Part II. Outdoor Life, 1988; 182(1), 45-47, 76-78.

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Now, if what they say is true, how could it work? There are three main hypotheses to try and explain the effects witnessed such as complete relief of pain and inflammation after shocking the envenomation site. The first one theorizes that since venom is positively charged, and human tissue is negatively charged, shocking the bite site would disrupt the membrane charges thus decreasing cytotoxic effects. The second being that an electric charge would influence hydrogen bonds and make structural changes to the venom components and then make venom components impossible to bind human tissue. The last theory states that electrical currents reduce metal ions like zinc, copper, magnesium, etc. to render them unusable as cofactors for enzymatic reactions in the snake venom. Since the time of the Lancet piece, many experiments have been performed to determine the efficacy of electrotherapy in envenomation. Benchtop research has looked at using electroshock to inactivate venom proteins and found no difference in LD50's. Animal models have found similar results with rats showing no difference in mortality compared to those not using electrotherapy.



Apart from potentially not actually countering snake venom, electrocuting yourself is just a bad idea. Aside from the puncture marks gifted to you by the snake, you now also have burn marks from the applied shock. There have also been a couple cases of people finding out they had a cardiovascular problem they were unaware of and having a cardiac event as a result of self-inflicted electrotherapy. Not to mention the issue of feasibility when it comes to shocking the bite site. Since most people do not carry around a stun gun, people end up in a MacGyver situation trying to electrocute themselves, which could lead to a couple of possible situations. First, you could choose the wrong source and instead of it being a direct current, it is an alternating current (like the one that delivers power to your house). Alternating current can have a direct effect on the electrical signaling in the heart, and potentially cause severe and possibly fatal harm. The other option is you choose something with a direct current. It is unlikely that you would have the supplies at hand at a moment's notice, but you would need the correct cables, accurately place said cables, and administer the shock at the desired voltage and amperage. All in all, chances are you're going to do it wrong and just end up with a minor electrocution injury or at worst, meeting your demise. In the event the electricity doesn't do you in, the best-case scenario you would have a minor envenomation and walk away with minimal burns. Worst-case scenario, you have given yourself a false sense of security and delayed time to definitive care at a hospital. Which truly is the worst-case scenario. Antivenom only prevents further damage from occurring, it does not fix what has already been done. This means the longer it takes for you to get antivenom, the worse off you could be.

Image 5: Western Diamond-backed Rattlesnake

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<u>Bottom line: don't electrocute yourself.</u> If you get bitten by a snake your best course of action is to leave the site alone and immediately go to the nearest hospital to determine if you need to receive antivenom. Manipulating the bite site in any way just increases injury to an already traumatized wound. If there is ever any doubt about what you should do after an envenomation, just call your local poison control center at 1-800-222-1222. We are always available and ready to answer any questions. Just don't be too shocked when our advice is to head to your closest hospital to get checked out.



Author, Jennifer Ramirez (Left) holding a vinegaroon (also known as a whip scorpion).