

NEWS FROM THE PIT

Arizona Poison and Drug Information Center



Icing Out Cryotherapy

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Growing up a lot of my ailments could be solved with one easy solution: ice. Whether it was a bump on the head, mosquito bite, or even a burned finger, my mom had me use an ice pack. Essentially, if the pain was caused by some external factor, I had my “go to” treatment all picked out. Even in pharmacy school we learned that if a patient has a minor tissue injury, the suggested initial treatment is R.I.C.E (Rest, Ice, Compress, Elevate). Snake bites often cause swelling and pain to the affected area, so it makes sense to put ice on it, right? So, why not use some form of cryotherapy in snakebites? Let’s talk about it.

Unlike some of the other first-aid measures we have talked about in previous newsletters, cryotherapy is considered more of a modern treatment in medicine. Cryotherapy got its roots in the medical world in the mid-1800s as a treatment for conditions ranging from pain to cancer. In the early 1900’s dry ice was the cryotherapy of choice for several dermatological ailments. With the commercial availability of liquid nitrogen following World War II, the possibility of cryotherapy as an available treatment for a variety of conditions was magnified. By the 1960’s doctors started using it as a method of treating snake envenomation.

NEWSLETTER HIGHLIGHTS

Historical use of cryotherapy in rattlesnake envenomation treatment and why it is not recommended at present day.

Image 1: Black-tailed Rattlesnake
(*Crotalus molossus*)

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The thought was since snake venom contains various enzymes, by cooling the affected limb you would be able to slow or halt the enzymatic action of venom from occurring. By doing this, it would not only slow the progression of venom spreading into systemic circulation, but it would also give our bodies more time to break down the many components found in venom. In theory, this is a very logical way of thinking, however, is this logistically possible? In order to inhibit enzymatic activity, one would need to bring the affected area's temperature from 98.6°F to about 37°F. The temperature would then need to be maintained for at least 24 hours, if not longer. This circumstance poses serious concern as hypothermic conditions this severe and over this period of time are not compatible with human life.

The ability to meet these conditions alone is a problem. In getting to the target of 37°F, immersion of the affected area would be required. If the bite occurs anywhere above the elbow or knee, it is going to be too difficult and dangerous to immerse the site. Additionally, having the means to be cooled effectively would require access to effective cooling agents and equipment. At best, if the bite occurs at home you will have access to mom's famous ice packs. However, ice packs at home would not be sufficient in bringing the temperature down to the required temperature to change enzymatic activity.

Logistics of performing cryotherapy aside, let's take a gander at the potential dangers of this intervention in rattlesnake envenomation. Various animal studies have shown not only is there no benefit of cryotherapy use, but there is harm associated with its use. Canine studies have shown long periods of cryotherapy (4-10 days) resulting in severe tissue injury such as ischemia, necrosis, and gangrene. One prevailing theory on why this may occur in areas receiving aggressive cryotherapy is that it produces a delay in the return of blood flow. Ultimately, this results in tissue ischemia and progresses to the other symptoms mentioned previously. One human study done in the 1970's found a correlation between patients who used cryotherapy and an increased risk for amputation. Losing limbs to the treatment and not the disease itself is bad news. Not to mention, once the area is rewarmed, any venom that has not been neutralized will still be contained to the area. Upon bringing the temperature back up, the histolytic factors in the concentrated area will become more active and thus, causing additional tissue destruction. Meaning, if the patient uses cryotherapy and is rewarmed before receiving an adequate amount of antivenom, it's likely a sudden, profound amount of tissue injury and other consequences of venom will follow.



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There have been recent case reports and studies that have popped up recently showing benefits of cryotherapy. One study done in Mexico had 20 patients using cryotherapy (Group A) and 18 patients not (group B) [1]. Both groups received standard of care using antivenom, but Group A received interval cryotherapy via application of a plastic bag filled with crushed ice wrapped in a towel, every 20 minutes with new bags being replaced every 4 hours. This was then done for no less than 24 hours and a max of 48 hours. In the group receiving cryotherapy, there was a decrease in vials of antivenom used and length in hospital stay. While this study shows promising results, there are some inherent flaws. The study population in both arms were exposed to prehospital treatments such as incision, suction, tourniquets, topical creams/traditional medicine. Also, the Group B population (no cryo) had comorbidities of hypertension, type 2 diabetes, or both while Group A did not. There is also a slight issue in terms of repeat antivenom dosing. The study's indication to give more antivenom was if there was “...no decrease in swelling and pain in the affected limb at 24 h, more vials were administered until the patients showed improvement”. Stable tissue damage is not necessarily a sign of active venom, rather a marker of the damage that has already occurred and while pain may be an indication that something is occurring, it's rather subjective. The authors also fail to mention any consistency in how many vials are to be used in the methods, leaving subjectivity in treatment decisions.

While cryotherapy is not the “heal all” I thought it was as a child, it should be avoided in the acute stage of rattlesnake envenomation. Fear not though, there is something you can still do if you get bit: Call 911 and get to your local hospital! The best treatment currently for envenomation is quick access to antivenom as time is tissue. And if you get bit and lose your cool, you can always call Poison Control at 1-800-222-1222 and we can help you chill out.

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References:

- Canul-Caamal MA, Madrigal-Anaya JDC, Pastelin-Palacios R, Escalante-Galindo P, Moreno-Eutimio MA. Cryotherapy as a coadjuvant in crotaline snakebite management with F(ab')₂ antivenom: A randomized pilot study. *Complement Ther Med*. 2020 Nov;54:102569. doi: 10.1016/j.ctim.2020.102569. Epub 2020 Sep 14. PMID: 33183672.
- Marilyn Jenkins, Findlay E. Russell, Physical Therapy for Snake Venom Poisoning, *Physical Therapy*, Volume 54, Issue 12, December 1974, Pages 1298–1300, <https://doi.org/10.1093/ptj/54.12.1298>
- BSc, N. B, & Freiman, A. (2005). History of cryotherapy. *Dermatology Online Journal*, 11(2). <http://dx.doi.org/10.5070/D34f62h9v>
- Lavonas, E.J., Ruha, AM., Banner, W. *et al*. Unified treatment algorithm for the management of crotaline snakebite in the United States: results of an evidence-informed consensus workshop. *BMC Emerg Med* 11, 2 (2011). <https://doi.org/10.1186/1471-227X-11-2>
- Frank HA. Snakebite or frostbite: what are we doing? An evaluation of cryotherapy for envenomation. *Calif Med*. 1971 May;114(5):25-7. PMID: 5087879; PMCID: PMC1501983.
- STAHNKE, H. L., & McBRIDE, A. (1966). Snake Bite and Cryotherapy. *Journal of Occupational Medicine*, 8(2), 72–76. <http://www.jstor.org/stable/45003939>
- Gill KA. Cryotherapy in the treatment of snake envenomation. VOL. 8, No. 9. *PubMed*. 1968;18(9):1-15. <https://pubmed.ncbi.nlm.nih.gov/5723817>
- Russell FE, Quilligan JJ, Rao SJ, Shannon FA. Snakebite. *JAMA*. 1966;195(7):596–597. doi:10.1001/jama.1966.03100070140058

