

Are Rattlesnake Vaccines for Dogs Effective?

A company is now selling a rattlesnake venom vaccine. How much can we trust it when it comes to the health and safety of our dogs? Right now, it's too early to tell.

Greg Bishop on March 16, 2018

One of the funny things about living in Southern California is knowing that some people won't go hiking because they are terrified of rattlesnakes. They think as soon as they step foot onto a trail, a horde of vicious, fanged-menaces are going to leap out and inject them with poison. I'm sure the same people avoid the ocean because of sharks too. However unlikely an encounter may be, some people are terrified of coming across a dangerous animal, and especially a snake with built-in maracas. Fear is always an effective marketing tool, and there are a number of ridiculous "[snake-proofing](#)" products on the internet. They run the gamut from ridiculous to plausible, but one of the more interesting products available right now is a rattlesnake vaccine for dogs and horses, available from [Red Rock Biologics](#). But is this vaccine a good idea? Read on pet lover, and we will hopefully [shake](#) out fact from fiction. While encounters are rare, I have to concede that we will occasionally come across a venomous little tube of muscle undulating across the trail. It's exciting and scary, and the best option is always to be respectful and keep your distance, which will make a bite *very* unlikely. But while we bipeds may be careful and cautious, often we're hiking with dogs who can only be described as "[simple-minded](#)". Their eagerness to make new friends and grab things that look like sticks can certainly get them into trouble; it's estimated that [there may be more than 100,000 venomous](#)

[snakebites in dogs and cats in the US each year](#). Fortunately deaths are pretty rare, but treatment is almost always necessary.

If a dog is bitten by a rattlesnake, they need veterinary attention ASAP, no question. If the dose of venom is high enough, then the dog needs antivenom. Antivenom is essentially [pre-made antibodies to a mixture of different rattlesnake venoms](#). Because rattlesnake venom is a complex mixture of proteins (there are [at least 50 different kinds](#)), antibodies are a pretty good neutralizing agent. The antibodies are made by first injecting farm animals with small doses of venom, then collecting and purifying their blood for antibodies. These antibodies, which neutralize the venom, are injected into the bitten patient. Assuming the antivenom matches the injected venom, they should sop up all the toxin and allow it to be removed from the body safely ([except](#) in rare cases of an allergic reaction to the antivenom). It tends to work really well, although it's not cheap (get pet insurance!), and multiple vials are often needed. If there are any delays in treatment, the antivenom may not get in soon enough to prevent permanent damage. Obviously the best case is to not get bit in the first place (and there is [rattlesnake avoidance training](#)), but as we all know, sometimes [stuff](#) happens.

This finally gets me to the rattlesnake vaccine. Is it a good idea to have your pet "immunized" against snake venom? Sounds cool, right? And the idea behind it is interesting. Here's the concept: create antivenom in the bloodstream so that when the snake bites the dog, the antidote is already there, and the venom gets neutralized. Boom. Superdog. So why not just have the dog make its own antivenom rather than rely on purified sheep blood?

Maybe a little Old West analogy will help. Let's say there's a bad guy in town, and we don't know when he's gonna show up and get to causin' trouble (please continue to read in a [Sam Elliot](#) voice). The town is the body, and the bad guy is the venom. Think of a vaccine as a way for us to tell the body to target that bad guy before he gets there, like a "[Wanted](#)" poster that gets everybody in town on alert. In theory, the antibodies (townspeople) will jump on the venom as soon as it hits the body. If there are enough of them, they'll wrangle him up and lock him in jail, and nobody gets hurt (ok you can stop the fun voice if you want to). Like I said, it's a very interesting theory, and in fact, [some squirrel species](#)

[are naturally resistant to rattlesnake venom](#), how cool is that?! So we can basically immunize the dog to the venom, right?
Not so fast.

Here's the big problem with the vaccine: we don't know if it works. Yeah, kind of a tough sell, right? We know that it could, maybe, possibly, under-the-right-circumstances, work. But there are actually quite a few [leaps of faith](#) to we'd need to make to trust it. To stretch our Old West analogy further, let's consider what we know about this vaccine. We know that the vaccine does post wanted posters (i.e. it makes the immune system create antibodies), we know that it riles the townspeople up and that they do react when they see the bad guy (i.e. the antibodies react with and neutralize the venom). It all sounds good until we ask a few important questions. Here's when we should be double thinking that [leap](#). Ready for some monkey wrenches in the plan?

Monkey Wrench #1: What if it's not the right bad guy who's causing a ruckus?

There are about 40 different species of rattlesnake species and the vaccine only produces neutralizing antibodies to one of them for sure. It might have some effect on other venoms, but we really don't have any idea. Are you a good enough herpetologist to know which snake bit your pet?

Monkey Wrench #2: How long do those "Wanted" posters stay up for?

If they get taken down after a week of not seeing our villain, how riled up are the townspeople gonna be? As of right now, we have no idea, meaning we have no idea how long a dog might actually benefit from this vaccine, and when to give boosters.

Monkey Wrench #3: How many bad guys are gonna show up?

If it's just one troublemaker, the small town posse could probably handle him. But what if there's a whole gang them? We often don't know how much venom is injected, and we don't know how many antibodies are produced, so if our math is off by even a little bit, the antibodies can be overwhelmed.

Is there any evidence for this vaccine? A pretty recent study looked at [how well this vaccine worked in mice when tested against a lethal dose of rattlesnake vaccine](#). The researchers injected mice with a lethal dose of venom from three species of rattlesnake after they had been vaccinated. Most of them died. Poor mice, they should have been born

as ground squirrels. The good news is that some of the ones who got the vaccine actually lived, and the vaccinated mice lived significantly longer than unvaccinated mice. There are some “buts”, however, and these are pretty [big “buts”](#). First of all, the vaccine did not work great for all three types of rattlesnakes tested. It worked a little bit for Western diamondback, maybe kinda a tiny bit for Northern Pacific rattlesnake, and not at all for South Pacific rattlesnake venom. So cross-protection was poor.

The other big consideration with this study is that the exposure was controlled. Although they used a whopping dose, they did it at a time when they expected peak antibody levels in the mice’s bloodstream. Who knows how long the antibodies are hanging around at beneficial levels? Nobody. And they even found that some of the vaccinated mice produced very little antibody, so there would presumably be some “non-responders”, just like with any vaccine. This study shows the challenge in extrapolating data in the lab to predictions in the field.

There is actually a pretty recent paper reviewing [a few hundred cases of dogs who had been bitten by rattlesnakes](#) and what factors were important in their outcomes. This is a very small sample (but not bad for a veterinary study). However, there were a number of rattlesnake-vaccinated dogs in the cases. The researchers found “...no measurable benefit could be identified associated with rattlesnake vaccination”. It’s possible that with a much larger sample size a benefit could be found, but with so many unanswered questions about duration of immunity and what levels are required for neutralization, I think the burden of evidence still rests on the vaccine manufacturer.

Could it work? It’s somewhat plausible. I would not trust it to save my dog’s life. I don’t currently recommend it. The only way I would consider using this product would be if rattlesnake avoidance was completely not possible, and even then, I would make sure the owner knows that if their dog is bitten, they need to not expect the vaccine be helpful and get them a veterinarian with antivenom right away. To be fair, the manufacturer says as much in their brochure. They also responded to my phone call about duration of immunity by saying there are ongoing studies. I’m curious to see what is found and what is published. The vaccine does appear safe, but so is homeopathy ([hmm](#), let me rethink that). So if the small but possible chance of benefit is worth the cost to

the owner, it might make sense. If you really concerned about your pet getting bitten by a rattlesnake though, you're better off adopting a ground squirrel, or learning [this move](#) (don't do either of those please).