

Exploring Self Immunization With A Bush Viper Venom

by Derek Morgan

Abstract

The purpose of this experiment was to establish whether or not the venom of the Variable Bush Viper, *Atheris squamigera*, could be used for self immunization. Very diluted venom was injected into the bloodstream on a weekly basis with the solution growing in strength with each progressive injection. Notes and photographs were taken after each injection to document the change of how the body reacted. The beginning injection had a strength of 1/1000 of a drop of venom (.00003 ml) and the final injection was just over one full drop of venom (.03 ml or 28 mg wet). At the end of the experiment, the reaction of the body to the final injection was even less than the reaction to the first injection and disappeared at a much quicker rate. It can be concluded that the body is able to develop quite a strong resistance to bush viper venom and I even tested for cross protection to another species of bush viper, *Atheris ceratophora*. The reaction to 28 mg of *A. ceratophora* venom was the same as if it had been *A. squamigera* venom, and swelling and damage were very little. Next, a bite from an adult male *A. squamigera* was taken to prove that it could be handled without medical help due to strong resistance to the venom and, again, the body handled the venom with little reaction.

Introduction

Self immunization to snake venoms has been proven to work by several individuals who historically have worked with neurotoxic venoms. One example is Tim Friede, who has immunized himself to several species of mamba and cobra venom and he currently has very minor reactions to bites that would kill the average person. Some of the cobra venoms he works with also have necrotic properties to their venom and immunizing with these venoms is much more complicated than immunizing with strictly neurotoxic venom. Not only does his body have to build up antibodies to the neurotoxic properties of the venom, it also has to build antibodies to the necrotic fractions, as well. Some people believe that snakes with hemotoxic venom cannot be used for immunization because the volume of tissue-damaging venom is too great for the immune system to respond quickly enough to eliminate the necrotic fractions prior to damage being done. This is not entirely true and several species of snakes with hemotoxic venoms have been used for self immunization, including some species of rattlesnakes. While large species with large yields of very toxic venom may be difficult for full immunization, small species with smaller venom yields are ideal. One species of hemotoxic snake that is of interest for immunization is the Variable Bush Viper, *Atheris squamigera*, because no

antivenom exists for its genus and they are quite popular in the snake trade business. This species is responsible for at least one death¹, and other symptoms of its bite may include: vomiting, diarrhea, severe pain, blood clotting problems including bleeding from orifices, local swelling and bruising, nausea, impaired breathing, and eventually kidney damage or failure^{2 3}. (Also see comparison photos within journal notes.) By repeatedly exposing the body to minute amounts of bush viper venom and raising those amounts slowly over time, the body should become very resistant to the venom, or even "immune", as some would say.

Methods

The first step with self immunization was to collect the venom. Adult male *A. squamigera* typically produce one drop of venom, while adult females (which are typically much larger than males) may produce one to two drops. These results were consistent except for one errant milking that produced eight drops from an apparently quite irate female snake. After milking the snake, the venom was then applied to self-inflicted scratches to the skin to introduce the venom to the bloodstream. This is an ancient tribal method of immunization that I experimented with at first, but then quickly abandoned as not being precise enough to carry throughout the entire procedure. The method of injecting diluted venom directly into the bloodstream was adopted and used for the remainder of the experiment. The venom was extracted from the snake into a sterile cup and then removed from the cup with a 1cc syringe with the needle removed. One full drop from this needle-less syringe was used for all of my measurements, which is .03 ml of wet venom at a weight of 28 mgs. Norman Benoit's [article on serial dilution](#) was followed for all dilutions preceding injections of the venom. A very weak solution of one part venom to 1000 parts sterile water (1/1000 of a drop of venom) was used as a starting point and the plan was for the dilutions to gradually strengthen over the course of 28 weekly injections until one full drop of venom was injected as the final goal.

The venom and sterile water were mixed in sterile cups and then injected subcutaneously into the inner or outer thigh of either leg, varying the injection site from leg to leg and from inner to outer thigh so that each injection site was used only once a month. Notes were then taken for the rest of the week following the injections to record the progression of the actions of the venom. Photographs of the injection sites were taken on an hourly basis at first to also show the progress. Soon, however, most swollen injection sites resembled others and the photographs were quite redundant, so photos were then limited to an as-warranted basis. Notes were also taken on health status, feelings of euphoria following injections, any sicknesses, and anything else deemed pertinent.

¹ Lanoie L, Branch W. 1991. *Atheris squamiger*: fatal envenomation. Journal of the Herpetological Association of Africa, Stellenbosch, 39:29.

² Mebs D, Holada K, Kornalik F, Simak J, Vankova H, Muller D, Schoenemann H, Lange H, Herrmann HW. 1998. Severe coagulopathy after a bite of a green bush viper (*Atheris squamiger*): case report and biochemical analysis of the venom. Toxicon (Great Britain) 36(10):1333-40.

³ Spawls S, Branch B. 1995. The Dangerous Snakes of Africa. Ralph Curtis Books. Dubai: Oriental Press. 192 pp.

Results

Through a series of 27 injections of ever-increasing strength of raw venom, my body reacted less dramatically and healed quicker despite the increase in venom injected (see journal notes). Injecting one full drop of raw venom with minor bodily reactions was the goal, and this goal was reached and even exceeded. Cross-protection was established, as evidenced by the injection of *Atheris ceratophora* venom with very minimal damage done and merely an equal reaction to the *A. squamigera* venom. At the final stage of the project, I decided to test an actual bite from an adult animal to determine its reactions, and this also went very well with very minimal damage done. None of the symptoms of a serious envenomation were witnessed and only slight swelling and a small bruise resulted from the bite. Full recovery from the bite was around 72 hours.

Discussion

Extremely high resistance can be achieved with *Atheris squamigera* venom. In fact, the human body can become extremely resistant to almost any poison or venom if exposed to it in minute, but ever-increasing doses over a period of time⁴. Antibodies are built up within the immune system that attach to and carry off the dangerous fractions of the poison or venom and render it harmless to the body. As is evident by the bruising and pain that accompanied most of my venom injections, the hemotoxic venom gets into the body and does some minor damage prior to enough antibodies flooding the scene to disperse the venom. Most of the swelling is due to a foreign protein entering the body and the resultant battle that ensues between the venom and the antibodies. Also evident is that it is possible to "overrun" the production of antibodies if the dosage of venom is strengthened too quickly, as I did on my first attempt at one drop of pure venom that resulted in the muscle destruction (see journal notes).

To date, nothing more can be reported on any other benefits of venom injections. While there were several days where a feeling of euphoria was experienced following some venom injections, there were also many times when nothing was felt afterwards and no solid trend was established. Colds were not avoidable during times when many or most people were sick and a couple of infections took place that you may not expect to happen with someone who has a so-called hyperactive immune system. Perhaps some of the health benefits mentioned by other self immunizers will become evident with more time put into the venom injections, but there are none at this time.

However, the primary objective of this experiment has been achieved: to survive a bite from this species with minimal damage. I wanted to protect myself should an accidental bite occur that was potentially life-threatening. It is often quoted that it is much easier to simply avoid a bite in the first place, but there is also a well-known saying that it's not a matter of "if" a keeper of venomous snakes will be bitten, but a matter of "when". Once bitten, the typical person then runs the gamut of dealing with doctors who have no

⁴ Benjamin E, Coico R, Sunshine G 2003. Immunology: A Short Course. John Wiley & Sons. Hoboken, New Jersey. 2-10.

experience treating snake bite and may administer inappropriate treatments, some of which are quite serious, such as fasciotomies or even amputation. Often times, insurance companies will not cover the expenses for treatment of a bite from a captive animal and the bite victims are left with extensive hospital bills, some reaching over \$50,000. To avoid the likelihood of having a serious envenomation altogether seems like a logical solution and makes the dangers associated with self immunization less significant and more of a calculated risk; perhaps as calculated as the risks of keeping venomous snakes in a captive environment in the first place. If one is well prepared and their practices are as sterile as possible, I believe that the risks associated with self immunization are somewhat overstated.

What follows is a journal that I kept during my injections:

Scratch #1

5/29/2009 4:00 PM Two Scratches w/ Fresh Venom

I decided to try the scratch method first because it seemed safer and was much less scary than thinking about injecting venom. When you have been taught all your life to avoid venom like the plague, it is extremely difficult to suddenly try to willingly expose yourself to it. I applied two 1/8 of an inch scratches to my left forearm that were just deep enough to draw blood. I then applied one drop of fresh venom to the surface and rubbed it in. I waited three seconds and then wiped it off with a wet towel. Immediate tiny swell, like a small bee sting. Stings a little.

@1 hour--nothing. No pain, no swelling.



5/29/09 Two scratches with little to no reaction

Scratch #2

5/30/2009 4:30 PM Two Scratches w/ Fresh Venom

I applied two scratches to my left leg and applied one drop of venom for 20 seconds. Immediate tiny swell. Stings a tad, but may be from the scratches.

@1 hour--nothing.

@24 hours--blood spots under skin at scratch site. Tender and hard under scratches.

@4 days--healing slower than scratches from first time.



5/30/09 Two scratches with minor reaction

Injection #1

6/3/2009 5:00 PM 1/1000 Dilution Right Thigh Fresh Venom

Okay, time for the first injection. The scratch method just seemed too random for me and I couldn't control how much venom was absorbed. I need more control to feel comfortable with increasing doses of venom. I used Norman's serial dilution method to dilute the venom to 1/1000 strength. Instead of using a pipette, as Norman did, I am using a syringe for the drops of venom and water. I injected one drop of 1/1000 dilution into my right thigh and there was a slight burning sensation immediately.

@1 hour--not much reaction

@24 hours--1" x 1" very light colored bruise.
@48 hours--2" x 2" bruise a little darker now.

*Noticed that with these syringes a bit of liquid is trapped in the end of the syringe that is not injected, so I did not get the full 1/1000 with this injection.

Injection #2

6/5/2009 8:30 PM 1/1000 Dilution Left Thigh Fresh venom

Trying same dilution to make sure nothing weird happens. Slight burn immediately.

@1 hour--large swell like someone punched me hard in the leg.

@24 hours--bruise much bigger than last time--swell is 3" x 3".

@48 hours--bruise is now 3" x 3"--much darker than before.

@9 days--swell gone, but bruise lingers.



6/5/09 Injection 1/1000 dilution @ 48 hours



6/5/09 Injection 1/1000 dilution @ 9 days

Injection #3

6/9/2009 4:00 PM 2/1000 Dilution Left Thigh Cold venom

I started storing venom in the fridge for future use.

Immediate sting--but not much swelling.

@24 hours--bruise not significant, nor swelling.

@48 hours--bruise worse and swelling evident--broader--bruise travels downward this time, away from injection site. There's a dark purple bruise around the injection site with a lighter brown bruise outside of that.



6/9/09 Injection 2/1000 dilution @ 48 hours



6/9/09 Injection 2/1000 dilution @ 4 days

Injection #4

6/15/2009 4:00 PM 3/1000 Dilution Right Outer Thigh Cold venom

I used a drop from the syringe after taking the needle off of it this time. This creates more liquid so I can mix it better, but it also makes for a larger injection. I took one drop of the 1/10 solution, added 9 drops of sterile water, and injected .07 ml of this solution=.003 dilution.

*WRONG! Check the math and that equals 3/100 solution, NOT 3/1000!

@1 hour--swelling starting.

@24 hours--HUGE swell, pain, itch. Swell is 10" x 8"--pink spot in middle is 4" x 5". Slight bruise.

@4 days--swell subsiding--no bruise.

@7 days--gone, but still itches a little. No visible evidence.



6/15/09 Injection 3/100 dilution @ 48 hours

Injection #5

6/22/2009 5:00 PM 4/1000 Dilution Left Inner Thigh Cold Venom

Double checked the solution this time!!! I'm going to try an intramuscular injection instead of subcutaneous like I've been doing. Injection was big--.13 cc. OUCH! Feels like I hit a nerve and it hurts like crazy.

@24 hours--Pink swell-- 2.5" x 2.5"--itches like crazy.

@3 days--same pink swell as usual, but secondary light pink swell on entire side of leg.

ITCHES

@7 days--still a little swollen.

Injection #6

6/29/2009 5:00 PM 5/1000 Dilution Right Inner Thigh Cold Venom

I mixed it stronger this time so the injection would be smaller. Back to subcutaneous, too! Injection was only .05 cc and felt great.

@4 hours--small swell.

@24 hours--large swell and pink.

@48 hours--big swell--big pink spot--no bruise--*ITCHES*

@7 days--still a little swollen.

Injection #7

7/6/2009 6:30 PM 6/1000 Dilution Left Outer thigh Cold Venom

Feels good!

@24 hours--typical pink swell.

ITCHES but otherwise nothing remarkable.

Injection #8

7/11/2009 6:00 PM 7/1000 Dilution Right Outer Thigh Cold Venom

Nice, but nothing remarkable.

Swell lasted only three days!!!

Injection #9

7/19/2009 3:00 PM 1/100 Dilution Left Inner Thigh Cold Venom

Decided to jump quicker since injections are going well. I skipped 8/1000 and 9/1000.

@24 hours--normal swell--normal pink spot.

@3 days--gone!

Injection #10

7/26/2009 6:00 PM 2/100 Dilution Right Inner Thigh Cold Venom

usual stuff here. Did have some light bruising--haven't seen a bruise in a few weeks. Pink and swell last only three days now instead of five days.

Injection #11

8/2/2009 9:30 PM 3/10 Dilution Left Outer Thigh Fresh Venom

I chatted with Norman and he mentioned that a challenge dose may be beneficial to test the immune response, so here goes nothing! I also tried the new snake from the other locality. GOOFED! I was mixing the solution in the syringe and I spilled a little. Hell, it is still WAY stronger than what I have been using, so I used it anyway. So, this is less than 3/10 solution. Immediate sting! Swell is huge.

@24 hours--8" x 8" swell.

@48 hours--hot to the touch, pink--but a little better?

@3 days--already much better--swell is almost gone, pink is gone, 3" x 3" area around injection site is firm and hard to the touch. Itching is starting.

Itching is much more minor with this injection. Swell and pink disappeared very quickly.

@4 days--light bruising showed up, but didn't stay long.

@7 days--still have small hard spot on leg at injection site.

Injection #12

8/9/2009 7:00 PM 3/10 Dilution Right Outer Thigh Fresh Venom

I want to try the same dosage since I goofed it last time. I also want to try another locality of snake, just for curiosity's sake. I think that new locality of squam may have weaker venom since I didn't react as harsh as expected last week. Injection feels good. Not much of a sting.

@3 hours--swell is at least one inch thick and 3" across--tough to sleep on that side.

@12 hours--swell is not as thick, but is 6-8" across--big welt.

@24 hours--swell is much broader and is spreading out--maybe 10" x 8" wide, light pink, warm to the touch, but not as hot as the last injection. I feel INCREDIBLE today! I'm not sure if that is just coincidence or not. I also feel as if the swells are coming on faster, but not lasting as long. I feel incredible physically and very upbeat today. Had problems sleeping on that side last night and didn't sleep well in general, but woke up feeling rested.

@36 hours--Didn't sleep well again last night--woke up at 4 AM and stayed up. Swell is largely gone. Still light pink.

@48 hours--looking better still--almost gone.

@72 hours--very light pink, very light swell, small light bruise appeared at injection site--area is firm, but not brick hard like last time. The previous 3/10 injection still has a small hard spot in it to date, but this one does not. Less itchy this time!

Injection #13

8/16/2009 10 PM 5/10 Dilution Left Inner Thigh Frozen Venom

No more cold venom--I don't think it's sterile enough. Either freezer or fresh. I decided to skip 4/10 since the last injection went so well. Took one drop of venom, added two drops of water, injected half of the solution. STINGS! Hurt like I hit a nerve! I limped all night.

@1 hour--small swell and bruise--before bed time I noticed a small area of raised bumps on that leg--slight allergic reaction???

@8 hours--Large swell and becoming pink--sore--limped all day.

@24 hours--very swollen, warm, light pink, have a 2" x 2" bruise at injection site--have another red area 4" from injection site...have no idea what caused it. Did not jog today because leg was too sore.

*Did not feel euphoric today, as I did with last injection.

@36 hours--still limping, still very sore and swollen, bruise much more pronounced. Bruise is 6" x 3" and wraps around leg. Weird pink spot still there.

@48 hours--pink is fading some and temperature is down--still swollen from crotch to knee. Did not jog today--too sore.

*Have chiggers out the wazoo on this leg from knee to ankle. I saw chiggers on both legs after mountain bike riding, but only this leg reacted--and SEVERLY. Does this have anything to do with venom reaction? (This reaction actually could not have been chiggers because it lasted for weeks and didn't look like any chiggers I have ever seen. It actually took several months for the leg to heal one hundred percent and I still am unsure what it was. It may have been a weird reaction to the venom, or it may have been an allergic reaction to a plant I encountered while biking.)

@3 days--swell noticeably better. *No Itching!!*

@6 days--almost all visible signs are gone--slight discoloration at bruise site and there's a hard spot at the injection site. Hell yeah, 5/10 kicked my butt!



8/16/09 Injection 5/10 dilution @48 hours

Injection #14

8/23/2009 4:15 PM 6/10 Dilution Right Inner Thigh Frozen Venom

Feels great! Immediate small swell.

@4 hours--very painful and swelling a lot. I limped all night long

@12 hours--couldn't jog this morning--too swollen and hurts like hell--limped all day.

@24 hours--a little better.

@30 hours--much better--no limping. Swell is big, but very little pink and no bruise, hot to the touch.

@48 hours--no pink, little pain, jogged fine and actually made record time, worked legs in gym with no problems. Swell is still noticeable and large, area is firm around injection site, but heat is gone.

@3 days--jogged fine, swell is way down

*No bruise this time and only minor itching. I felt really good this week--almost euphoric.

Injection #15

8/30/2009 9:00 PM 7/10 Dilution Left Outer Thigh Frozen Venom

One drop of venom plus seven drops of water--popped seven units of that. Feels good.

@1 hour--short, thick swell at least an inch off the skin and 2" across. Not much pain--certainly not like 6/10 solution.

@12 hours--rain=no jog. But I could have. Light pink, bigger swell to about halfway down my thigh--little pain.

@48 hours--geez, it's already almost gone!

@3 days--is more or less gone. Hard tender spot at injection site still slightly swollen. Small bruise showed up today--maybe 2" x 2". Little itching.

*Seems like injections to outer thighs hurt less.

7/10 was way easier than 6/10 injection.

Injection #16

9/13/2009 10:30 PM 8/10 Dilution Right Outer thigh Fresh Venom

Skipped one week due to vacation. Thought about jumping to full drop this week, but it seems too risky. Did one drop of venom to four drops of water, dumped .02 cc and injected the rest. Feels good.

@1 hour--small lump about the size of a quarter.

@8 hours--good size swell about the size of a mini Nerf football cut in half.

@19 hours--a little more swollen, but WAY less swollen than 6/10 and even less than 7/10 injections. Zero pain, minimal heat, not pink at all. I expected more reaction, especially with fresh venom.

@24 hours--a little pink

@31 hours--GONE!!!! You literally cannot tell that anything happened there, unless you already knew it. It is slightly pink, slightly warm, and very slightly swollen--WOW.

@48 hours--nada--I can barely tell where I injected the venom.

*Meanwhile, I still have a small lump from two weeks ago at the injection site of the 7/10 solution, but nothing at the 8/10 site. Full drop next week!!!

Injection #17

9/20/2009 7:00 PM Full Drop Dilution Left Inner Thigh Fresh Venom

Feels good--slight sting.

@1 hour--small 1" x 1" swell.

@2 hours--2.5" x 2.5" swell, pink, hot to touch--hurts some, but feels good.

@4 hours--swell is bigger--maybe 4" x 4".

@12 hours--nice long swell with particular lump towards front of leg--still warm, pink.

@24 hours--leg is swollen for about 12" of thigh, but pink has lessened, still warm--looks pretty normal until you compare it to other leg. Much less swelling than with 5/10 or 6/10 injections. No itching at all so far and no bruising.

@36 hours--Still swollen, but somewhat less so. Jogged no problem. No pink and not very warm.

@48 hours--still fairly swollen, hard spot at injection site, no bruise, no pink, not warm.

@3 days--still 50% swollen.

@4 days--swelling is gone, but left a hard swell at injection site.

@5 days--ouch--looks like half an egg at injection site--red, swollen, tender.

@6 days--big pimple-like swell--is definitely infected or something--hard around edges, but soft in middle--I hope I can ride it out. Will hold off injections until this heals.

@8 days--Tim says this is from the venom and it needs to be lanced. Hurts like hell right now--will try to lance it tonight. Knife wouldn't cut it, so I used a large gauge needle and extracted 3 cc's of nasty brown liquid--feels much better.

@9 days--hurt like hell again when I got home from work--extracted 6 cc's with needle--feels a ton better. Pressure had built up again.

@10 days--injection hole from needle is large enough that it started to drain on it's own and I squeezed it to get out a ton of liquid throughout the day. Did it 4-5 times at night.

@11 days--more of same--squeeze to release pressure.

@12 days--more or less done draining.

@13 days--don't need bandage anymore--done draining. top layer of skin sloughed off.

10/10/2009--almost back to normal now--spot is still hard and discolored a little, but otherwise normal. Does not appear that it will leave a scar.

1/26/2010--Did leave a permanent scar! There's a 1" x 1.5" oval purple spot that is slightly concave where the tissue was damaged below. Tim says this is due to a fraction within the venom not being broken down by my antibodies and it created muscle damage, which then came to the surface and needed to be released. I jumped too fast with the dilutions and this is what happened.



9/20/09 Injection of one full drop @ 4 days



9/20/09 Injection of one full drop @ 5 days



9/20/09 Injection of one full drop @ 9 days--3cc extraction of fluid



9/20/09 Injection of one full drop @ 10 days



9/20/09 Injection of one full drop--showing scar as of 5/31/2010

Injection #18

10/15/2009 9:00 PM 5/10 Dilution Right Outer Thigh Fresh Venom

I'm taking a step back and working with it slowly. Feels good--little sting, blood spot.

@1 hour--small swell 2" across.

@2 hours--bigger 3" across swell--couldn't sleep on that side.

@12 hours--whole right side of thigh swollen, red, warm.

@24 hours--going away fast.

@36 hours--more or less gone--hard spot at injection site.

@48 hours--gone

@7 days--hard spot gone.

Injection #19

10/22/2009 6:00 PM 5/10 Dilution Left Outer Thigh Cold Venom

Stings--swelled quickly.

@24 hours--regular swell--almost gone.

@48 hours--totally gone.

Bruised! Bruise gone on 10/29.

Injection #20

11/1/2009 9:30 PM 8/10 Dilution Right Outer thigh Frozen Venom

Stings, normal swell, no bruise. Gone in 36 hours.

*I discovered that I was having neurological problems and I stopped all injections for several weeks while we figured out what was going on. During that time I had no venom injections at all. Once the venom was eliminated from the possibilities of the cause of my ailment, I resumed injections. I wanted to make it to one full drop of venom without having the muscle destruction I had last time, so I decided to hit the upper range slower this time.

Injection #21

1/19/2010 4:30 PM 5/10 Dilution Right outer Thigh Frozen Venom

11 weeks with no injections--let's see how long immunity lasts! I'm back in the game!

@1 hour--3" x 3" swell, pink, stings.

@6 hours--big swell 8" across with smaller pink swell in middle.

@12 hours--pink is gone and swelling is substantially less.

@24 hours--general lightly swollen mass.

@36 hours--gone

Feel great!! I guess my resistance is still strong.

Injection #22

1/24/2010 8:00 PM 8/10 Dilution Left Outer Thigh Fresh Venom

Stings a little. Big swell starting.

@3 hours--HUGE swell and very pink.

@24 hours--still big, but ill-defined.

@36 hours--still here

@48 hours--more or less gone down, but has a hard discolored area in the middle that's 2" across. It's also firm around this hard spot--maybe 6" x 6" total.

@3 days--swell gone, but hard spot still here.

@7 days--hard spot still here and is bruised looking

@14 days--still have small hard spot.

*Think 8/10 is close to blowout number.

Injection #23

2/7/2010 10:30 PM 8/10 Dilution Right Outer Thigh Frozen Venom

I skipped a week due to being sick. I want to be well while I try to beat this.

@24 hours--good swell.

@48 hours--swelling is almost gone. Have a small hard spot at the injection site again--just like last time. As a matter of fact, they look like twin bruises on my legs right now.

@14 days--lump is finally gone, but the lump from the 1/24 injection is still here slightly, so this one disappeared faster, at least.

Injection #24

2/21/2010 9:00 PM 9/10 Dilution Right Inner Thigh Frozen Venom

Took another week off to allow time for things to heal up.

Very large pink and warm swell. Haven't seen a hot swell like this in some time.

@24 hours--HUGE

@48 hours--looks smaller, but still big

@3 days--still somewhat swollen and pink--developed faint yellow 4" x 4" bruise

@7 days--bruise gone, but left hard spot at injection site.

Injection #25

2/28/2010 6:00 PM 9/10 Dilution Left Inner Thigh Frozen Venom

@5 hours--HUGE swell! Looks like elephantitis compared to other leg. Warm and pink.

@12 hours--already lost almost half of the swell--still big though.

@24 hours--swell still big--developed big 3" bruise during the day.

@3 days--swell gone, but bruise lasted another 4 days. No hard spot this time.



2/28/10 Injection 9/10 dilution--showing bruise @ 48 hours

Injection #26

3/7/2010 10:00 PM Full Drop Right Outer Thigh Frozen Venom

Did I work up slow enough this time? Hopefully, by repeating 8/10 and 9/10 injections, this one will be a piece of cake.

@1 hour--yep, swelling nicely.

@12 hours--wow, already subsiding.

@24 hours--swell almost gone--small 1" bruise showed up this morning.

@36 hours--gone! No swell, no pink, no hard spot. Wow, full drop was nothing!

Injection #27

3/14/2010 10:30 PM Full Drop+ Left Outer Thigh Frozen Venom

I injected just a tad more than one full drop just to make sure I got the whole thing.

@12 hours--huge, nice swell, warm, pink. Bruised already! 4" x 4" big.

@48 hours--swell not gone--still noticeable.

@4 days--swell gone, bruise going away. Success!!!

Testing Crossover Protection--*Atheris ceratophora*

5/31/2010 6:00 PM Full Drop+ Right Inner Thigh Fresh Venom

I extracted venom from an adult female snake and got over one drop of venom from two bites to the cup. I was surprised at the size of the extraction because of how small even the adult females are. I added three drops of water to the venom to make it easier to extract the venom with the needle and then injected the entire amount. No pain, no gain! The resulting instant sting was substantial, more so than with *squamigera* venom.

@1 hour--uh-oh, this is swelling a lot and it hurts pretty bad. I was extremely confident about the cross protection, but this has me a little worried. It feels a little weird and I have a tingling sensation throughout my body and especially in the injected leg. Is the venom different, or is that just my nervousness?

@6 hours--swell is substantial--4" x 8" already and it's hot and pink. It quit hurting.

@14 hours--um, I was expecting much more than this when I woke up. Not only did it not swell anymore over night, it actually went down quite a bit. I was going to take photos of it today, but there's not much to photograph.

@18 hours--wow, it's not warm anymore and the pink is going away quickly. Well over half of the swell is gone. Other than a small red spot at the injection site and a slight pink tinge, the leg looks almost normal.

@24 hours--essentially gone! Success! Crossover protection is certain.

Test Bite--*Atheris squamigera* Adult Male Bite to Finger

6/8/2010 7:20 PM Bite To Left Pinky Finger

Yeouch!!! Hurts a heck of a lot worse than the injections to the thigh! Must be due to the bite being deeper and into the muscle, versus into the fat with the injections.

Immediate burning pain and it feels like the tip of my finger is on fire. I tried to get the snake to bite me on the fatty part of my palm, but he missed and got two fangs into the very tip of my pinky=almost the worst place possible. It hurts worse when I hold the hand down, so I am keeping it elevated--the tip of the finger is very sensitive. I didn't take any Benadryl or aspirin so as not to interfere with the reaction.

@10 minutes--serious pain and it's swelling immediately. Two bruises at tip where fangs punctured skin.

@20 minutes--finger is swelling and getting stiff. I can't and don't want to use that finger for anything. Throbbing pain with my heartbeat.

@4 hours--finger swollen and thick. Half of the back of that hand is swelling and I can't see the veins in it any longer. No other symptoms at this time.

@12 hours--wow, I think it's a tad better already! Didn't sleep well last night due to throbbing pain in the finger. Took some aspirin so I could sleep, but it didn't help.

@24 hours--yep, it's definitely getting better and has stopped hurting already. I can bend the finger just a tad and that was impossible this morning. Swelling is down.

@48 hours--zero pain--hand feels normal other than still being somewhat swollen. The tip of the finger is no longer sensitive and the bruises seem to be going away at the tip. The back of the hand is almost normal looking now.

@72 hr--back of hand is completely normal and finger looks pretty normal, too. The bruise at the tip is gone. I started using the finger again today and can grip things with no pain. Essentially a total recovery in 72 hours!



6/8/10 Bite @ 2 hours--showing bruise at bite site



6/8/10 Bite @ 2 hours--swelling to back of hand



6/8/10 Bite @ 3 hours



6/8/10 Bite @ 24 hours



6/8/10 Bite @ 36 hours



6/8/10 Bite at 48 hours



6/8/10 Bite at 48 hours--showing bite site bruise disappearing

Comparison Photos--*Atheris squamigera* Bite

What follows are photographs and a description of a bite by *Atheris squamigera* to a friend of mine who wishes to remain anonymous (he does not practice immunization with any venoms):

"The bite took place just slightly more than three years ago. I suspected that the female was gravid but decided to try to get her to feed on a rat pup. The cage was a tall 15 gallon aquarium (same length and width as a 10 gallon, just taller) and this was on a shelf about 4 1/2 feet high. I had to do a little teasing but she bit the rat pup and then promptly dropped it. It was during my attempted retrieval that I got within striking range and she rewarded me with a quick pop! In an instant a 30 year record of not being bitten was gone! Amazingly no pain, but a small drop of blood was oozing from my index finger on my right hand. I think that the second fang bounced off the knuckle at the next joint. I did try a venom extractor for maybe 30 seconds but it was not accomplishing much. I knew there was no specific antivenom available and that I was just going to have to ride out the bite. I called my physician, who was a pretty good field collector in my herpetology class, just to put him on notice if I ended up in the hospital."



Bite @ 1 hour



Bite @ 2 hours



Bite @ 2 days



Bite @ 1 month



Bite @ 6 weeks