

Rattlesnake Envenomation in Arizona

By Geoffrey Smelski, PharmD, DABAT
Clinical Education Director



Outline

1. **Biology & Mythbusting**
 - Rattlesnake Behavior
 - Venom
2. **Public Health Surveillance & Education**
 - AzPDIC
 - Snake Season
3. **Pre-Hospital Interventions**
 - Do's & Don'ts
4. **Inpatient Course**
 - Diagnosis: Laboratory vs Clinical
 - Treatment: Antivenom & Supportive Care
 - Discharge Criteria
5. **Outpatient Follow-Up Care**
 - Venom Recrudescence Monitoring
 - Physical Recovery
 - Psychiatric Sequelae
 - Financial Burden





Who is the AzPDIC?



- **Physicians / Pharmacists / Public Health: 24/7/365**

- **Clinical Care:** 14 counties, 63 hospitals

- Medications / chemicals / radiation
- Drugs of abuse
- Environmental / occupational
- Bites & stings / plant / mushrooms
- Exposure during pregnancy / lactation

- **Public Health:** surveillance / education

- **Clinical Education:** students / residents / fellows

- **Research:**

- Over 200 publications, posters, abstracts and newsletters on rattlesnakes to date.
- Participated in clinical trials for both FDA approved rattlesnake antivenoms as well as the current PLA2 Inhibitor.



AzPDIC Research

Spring 2020, work began developing a Toxikosurveillance network and data registry for rattlesnake bites.

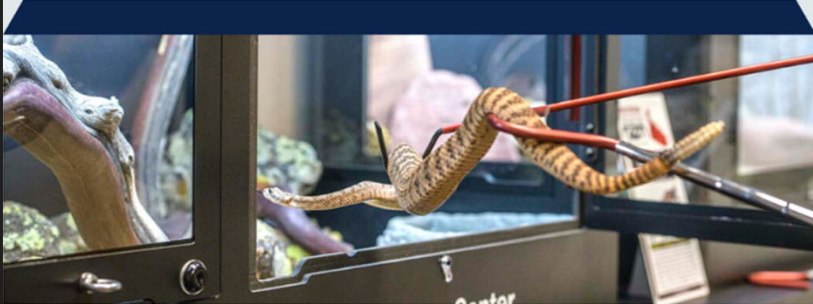
To date, **≈ 4,500** cases reviewed, spanning a quarter century of data.

For comparison, phase 2 & 3 studies for Crofab & Anavip, included a combined total of **156** patients.



NEWS FROM THE PIT

Arizona Poison and Drug Information Center



MONTHLY NEWSLETTERS

▼ 2022

January - Bleeding Out (hemotoxicity from rattlesnake venom)

February - The Things We Do For Blood (management of bleeding in rattlesnake envenomations)

March - Keeping Thin (antiplatelets and anticoagulants in rattlesnake envenomation)

April - Platelets and Pain (NSAIDs in rattlesnake envenomation)

May - *Bothrops lanceolatus* (the snake that literally gives you a heart attack)

June - It's in the Blood: DIC and VICC

July - Thick and Thin (treatment of thrombosis in snake envenomation)

August - Platelets and Fibrinogen

September - Antivenom Index



azpoison.com/content/news-pit



Western Diamondback
Crotalus atrox



Mojave Rattlesnake
Crotalus scutulatus



Arizona Black
Crotalus cerberus

Sidewinder
Crotalus cerastes



Black-tailed
Crotalus molossus

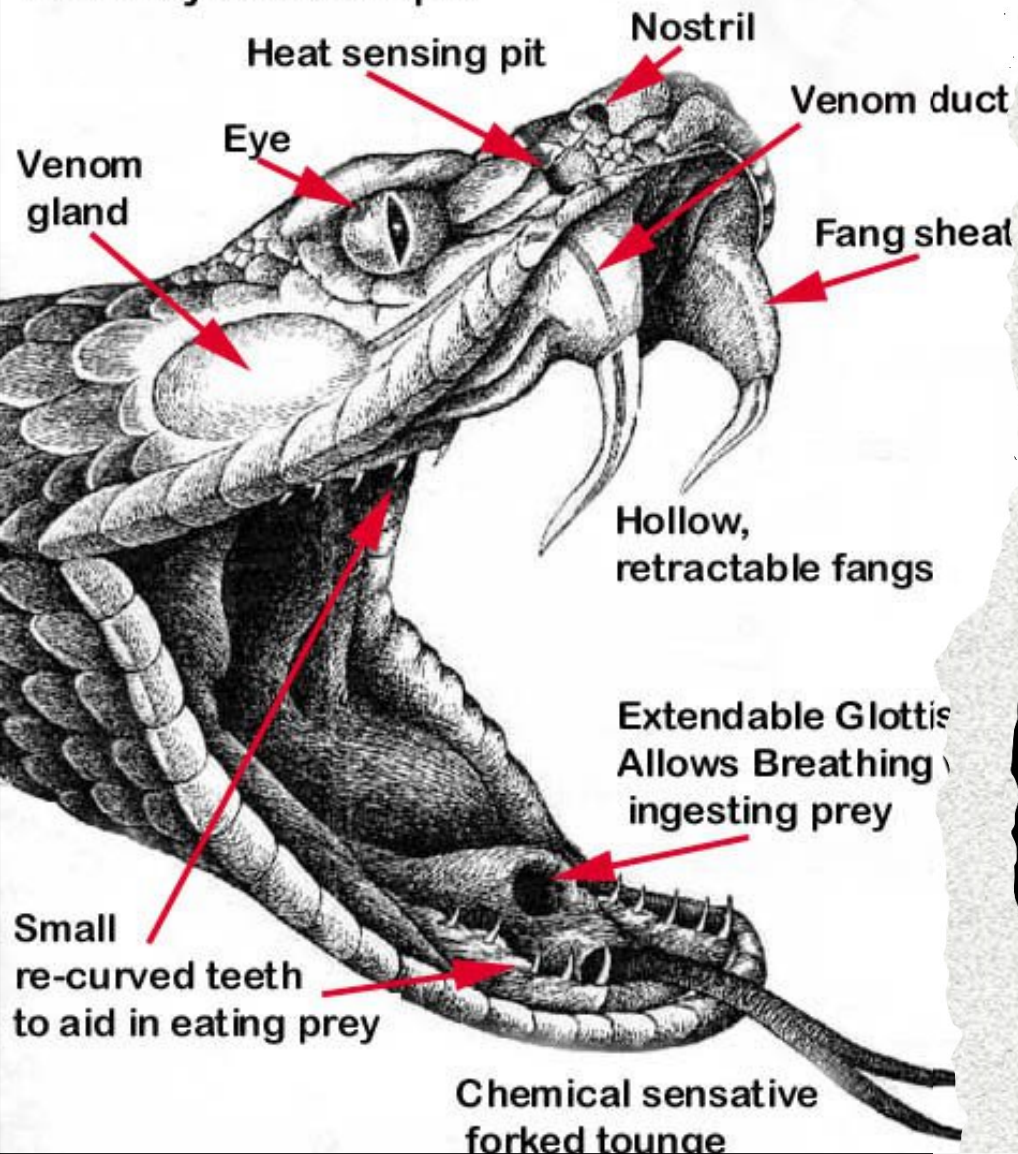


Rock Rattlesnake
Crotalus lepidus



Tiger Rattlesnake
Crotalus tigris

Anatomy of a Pit Viper



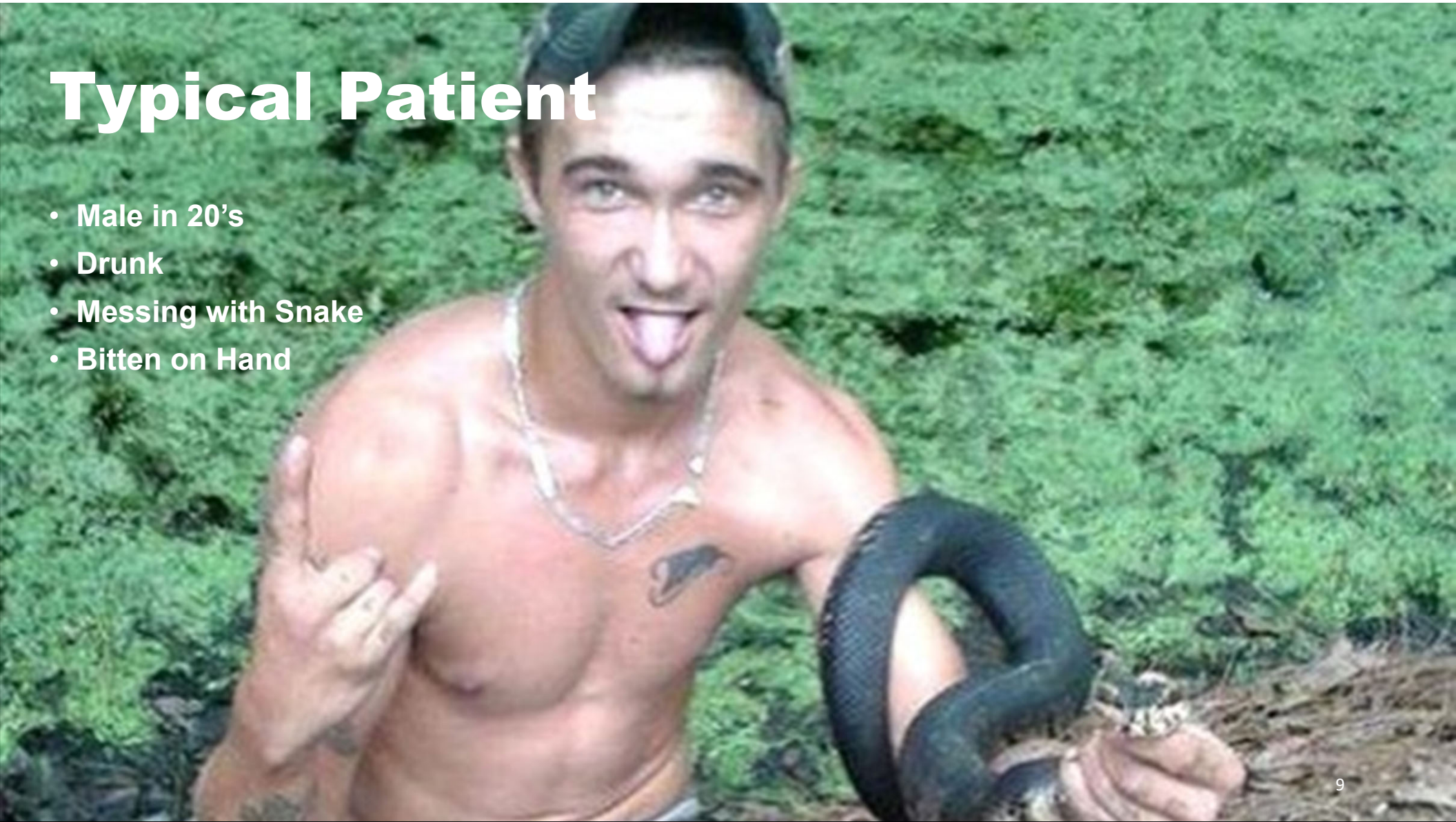
Rattlesnake Features

- Triangular Head
- Elliptical Pupils
- Heat Sensing Pits
- Fangs
- Forked Tongue
- Rattle

PMID: 35221167

Typical Patient

- Male in 20's
- Drunk
- Messing with Snake
- Bitten on Hand

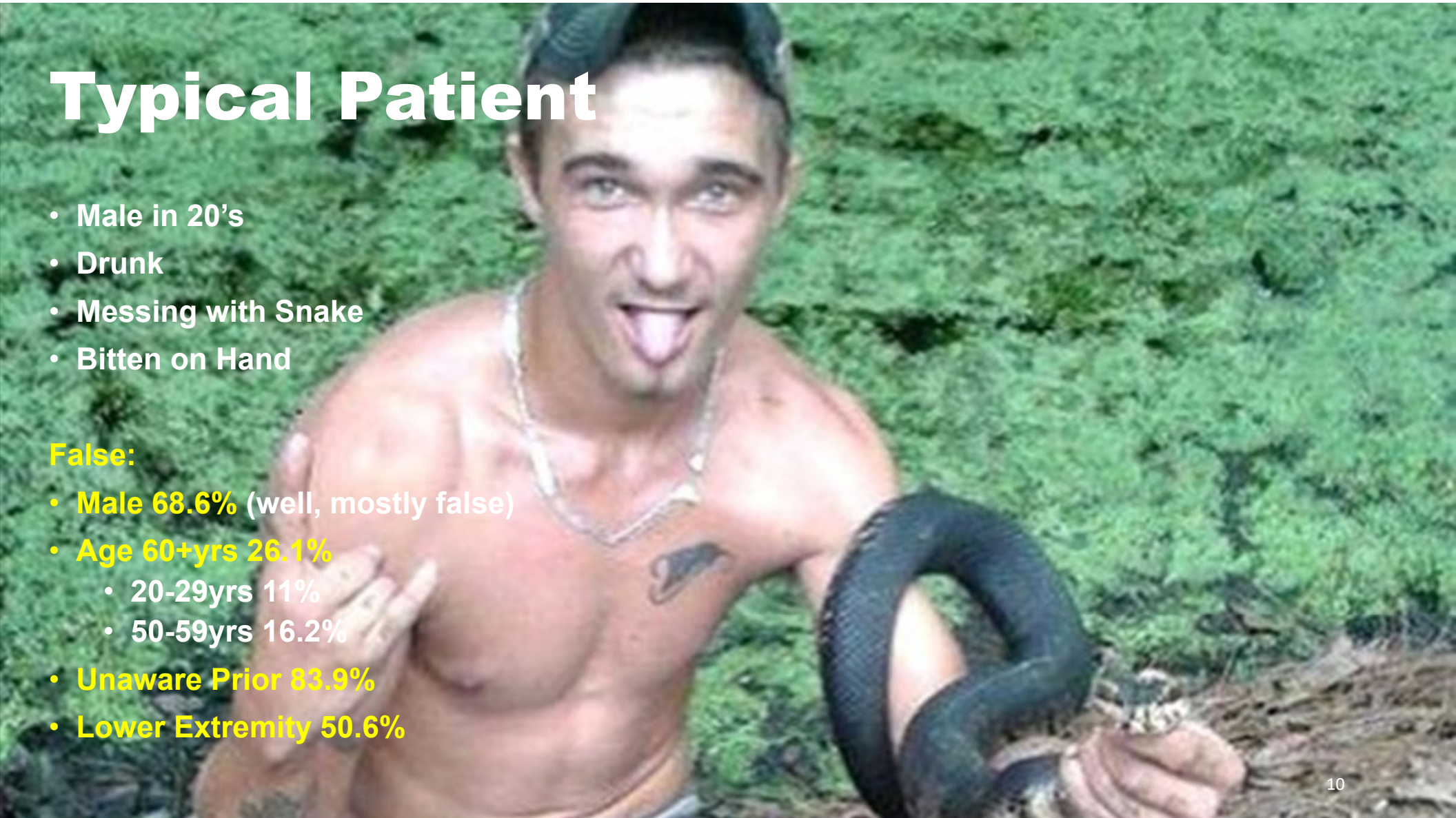


Typical Patient

- Male in 20's
- Drunk
- Messing with Snake
- Bitten on Hand

False:

- **Male 68.6%** (well, mostly false)
- **Age 60+yrs 26.1%**
 - 20-29yrs 11%
 - 50-59yrs 16.2%
- **Unaware Prior 83.9%**
- **Lower Extremity 50.6%**



Rattlesnake Aggression

“Rattlesnakes are aggressive predators, attacking humans.”

“If you are lucky, you will encounter a nice one that will give you a warning rattle first.”



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False: They are ambush predators and will defend themselves, typically rattling after striking.



ring.com



04/11/2023 19:11:42 MST

The Life of a Rattlesnake

- Predator Avoidance
- Breeding Season
- Temperature Dependent
 - Hot -> Shelter
 - Cold -> Hibernate
 - Warm -> Bask
 - Rain -> Drink
- Ambush Predator
 - Strike, Release, Track, Eat
 - Venom Immobilizes Prey

PMID: 26433731



When Do Snakebites Happen?



When Do Snakebites Happen?

Time of Day

16:00-22:00 **49.5%**

Time of Year

Aug-Sept **39.3%**

Location

At Home **60.8%**

ANIMALS

Why August is birthing season for mother rattlesnakes

The monsoon storms signal to mother snakes that now is the time to give birth to their babies.



Avoid Being Our Next Patient.....

Situational Awareness

- Don't put your hands or feet in places that you can't clearly see
- Keep doors to your house / garage closed
- When you see one, leave it alone or have it professionally removed

Baby Snakes

“Bites are worse because they are not able to control how much venom they inject.”



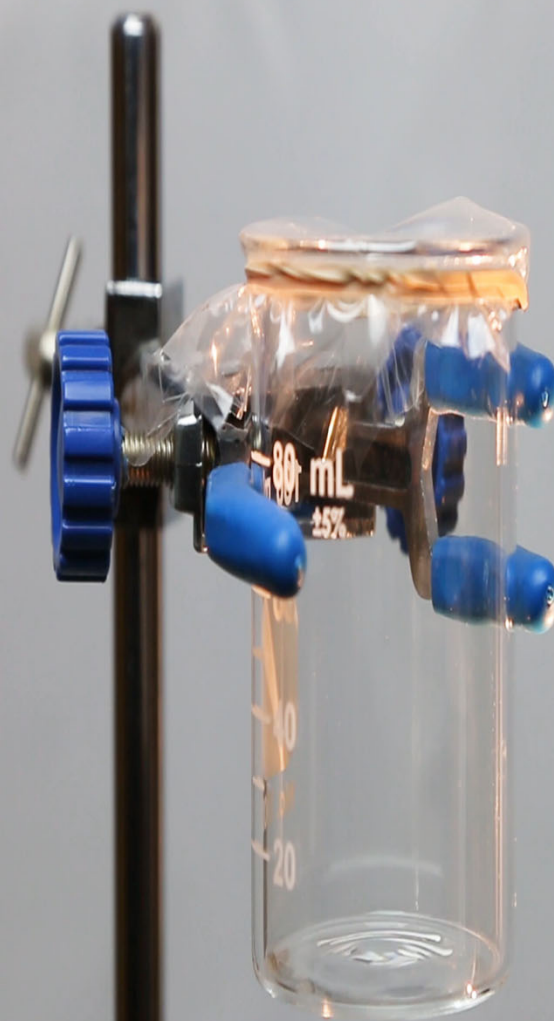
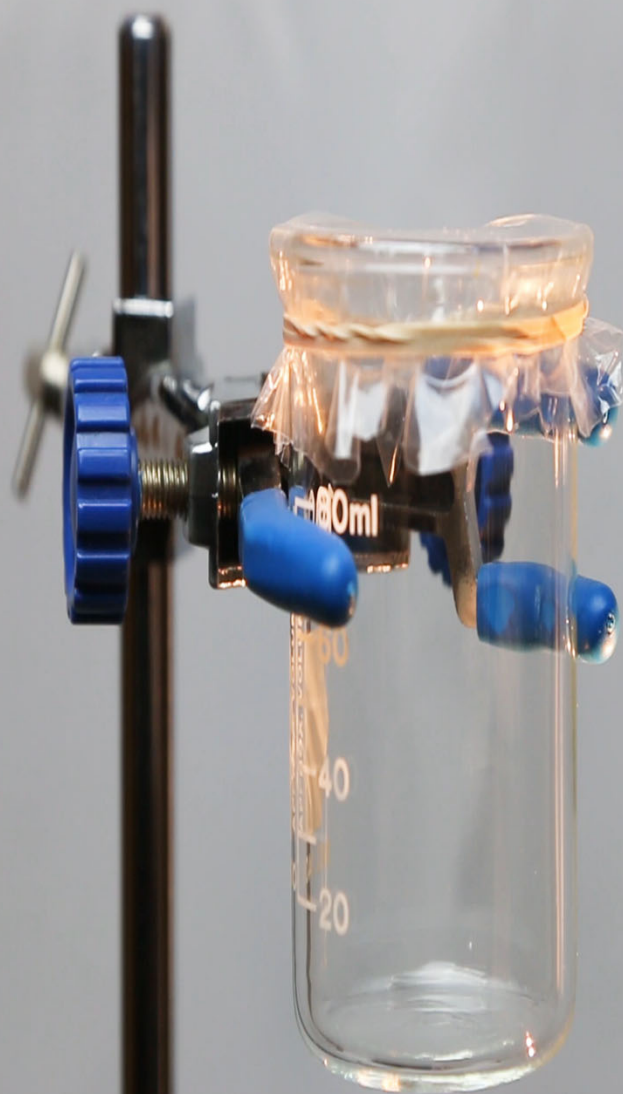
Baby Snakes

A close-up photograph of a small, young snake with a distinctive diamond-shaped pattern of dark brown and black markings on a light tan background. The snake is coiled on a dry, sandy surface composed of fine grains and small pebbles. To the right of the snake's head, a US quarter coin is placed flat on the ground to provide a sense of scale. The snake's head is positioned towards the bottom right of the frame, and its body extends towards the top left.

“Bites are worse because they are not able to control how much venom they inject.”

False: Venom results in dose dependent toxicity, more venom equals worse symptoms.

PMID: 20591373





What exactly is
snake venom?

Venom Composition

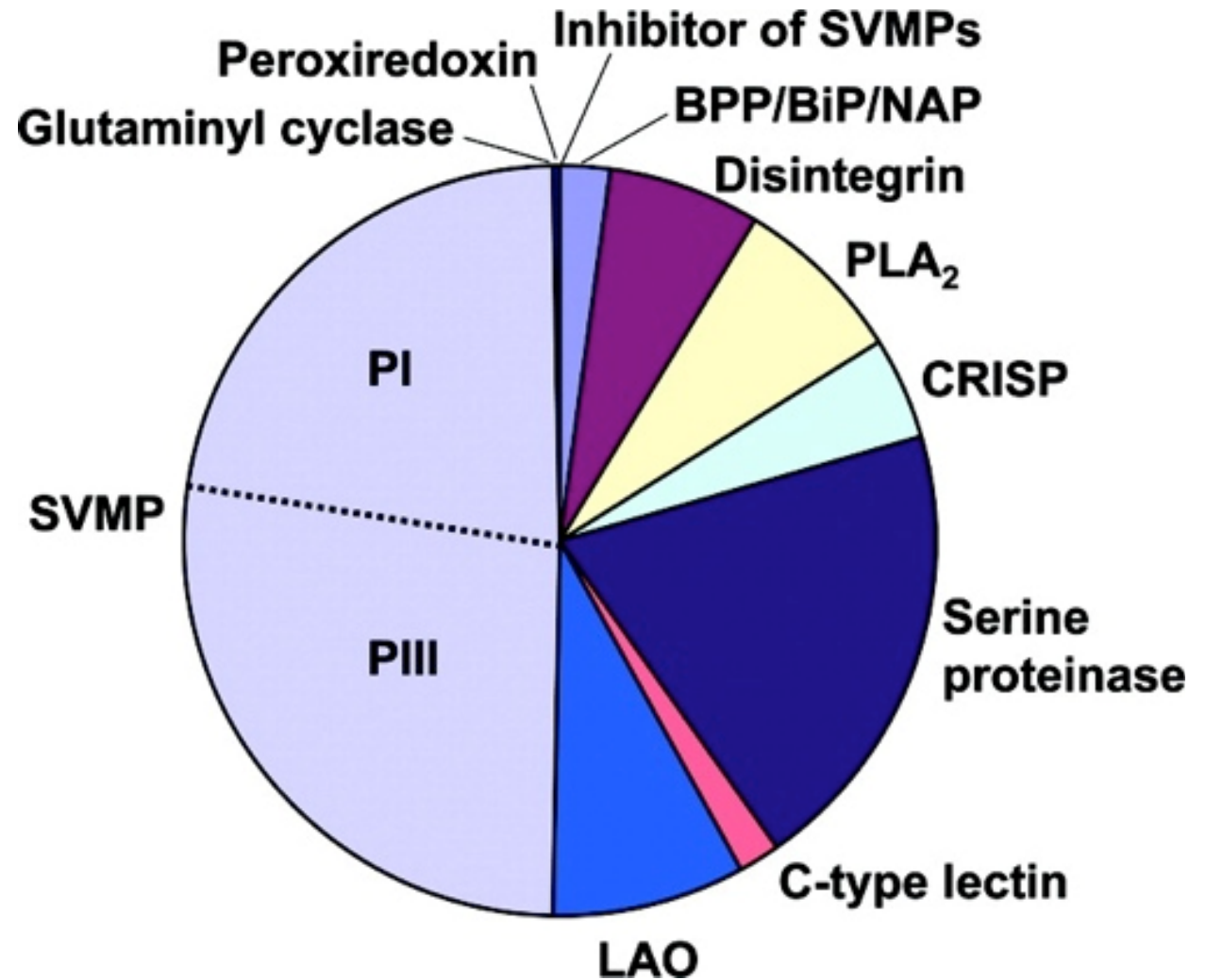
Varies by species, diet, age, and geography.

Enzymatic toxins mimic endogenous enzymes or generate oxidative damage.

Non-enzymatic toxins disrupt cell signaling.

Dose Dependent Toxicity

PMID: 22446891



**No Venom =
Dry Bite**

**Little Venom =
Minor Bite**



**No Antivenom
Needed, Right?**



*Just waiting for whatever
is about to go wrong.*

True Dry Bites = No AV \approx 5%

Minor Bites:
ARE NOT PREDICTABLE

Case History

- Arrived at hospital < 1-hr
- AV held 4hrs for “minor” bite
- Rapid decompensation
- Necessitating transfer
- AV first given at 8hrs

AV IS PREVENTATIVE

Winnemucca toddler dies after being bitten by rattlesnake

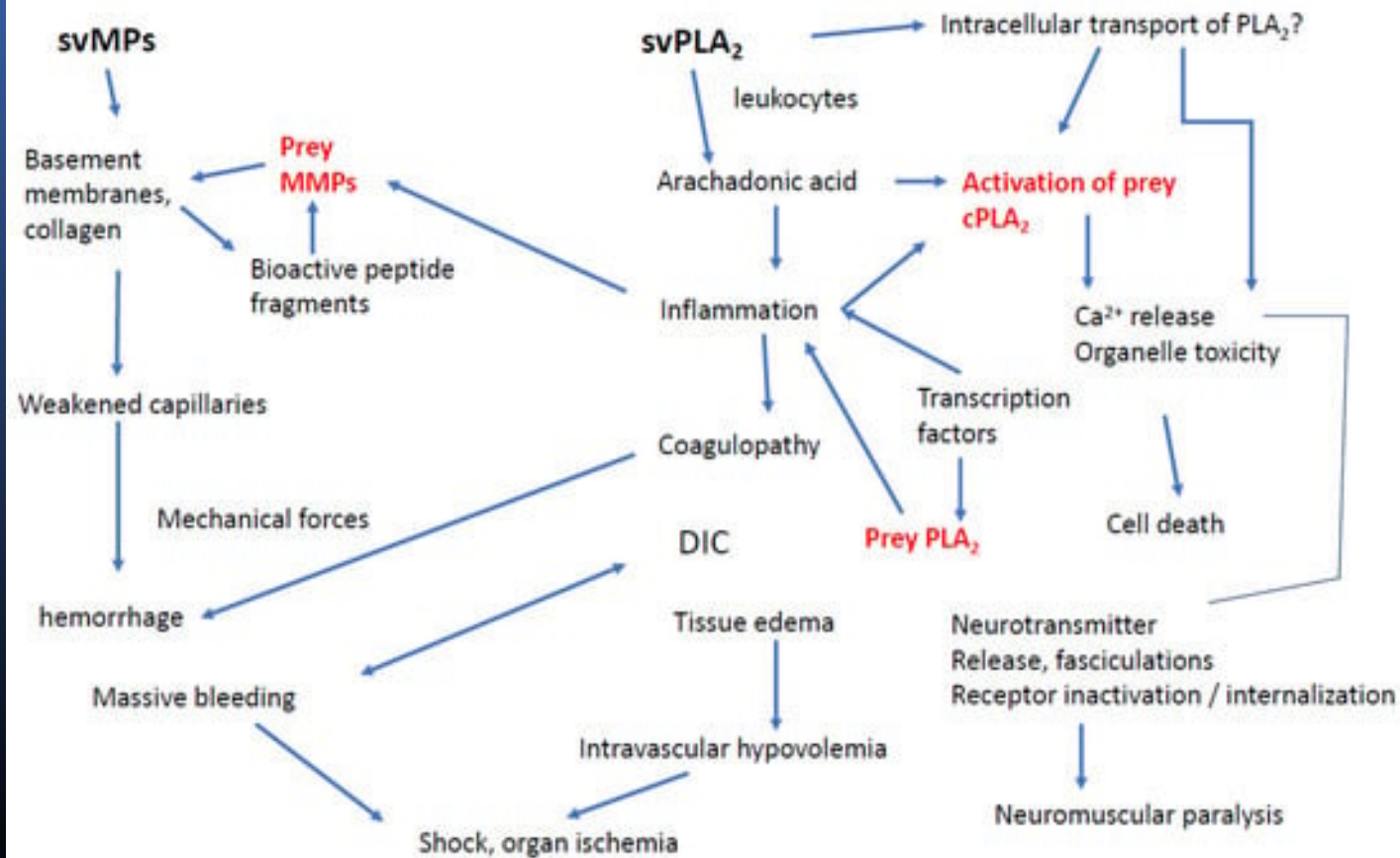


Three-year-old Alyssa Johnson died after being bitten by a rattlesnake in the Sonoma Canyon recreation area.

[atumble](#)
[Wednesday, May 20, 2020](#)

Venom Amplification

Amplification of snake venom metalloproteinase and phospholipase toxicity by endogenous signaling systems



PMID: 31979014



RATTLESNAKES
MAY BE FOUND IN THIS AREA

GIVE THEM DISTANCE
AND RESPECT

Pre-Hospital Care

Proposed “Treatment” Modalities

- **Restrict Venom**
 - Tourniquet
 - Pressure Bandage
 - Ice
- **Remove Venom**
 - Suck it Out
 - Cut it Out
- **Destroy Venom**
 - Electricity
 - Heat
- **Not Sure.....?**
 - CBD Oil



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**Increase
Tissue
Injury**



“Self Treatment”
is **NOT** an option

