Venomous Critters:

Things That Bite and Sting

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Overview:

- Things That Bite:

-Spiders
-Venomous Snakes

Overview:

- Things That Sting

-Scorpions
-Hymenoptera
    -Bees
    -Wasps
    -Ants

Think these Critters are Trouble?

The Venomous Little Buggers

Which is the deadliest in the United States?

One reason "Why Animals Attack"

Scorpions

- 1,750+ species of scorpions known worldwide
- All have venom, but only ~25 species are considered dangerous to humans
- 18 species native to Texas, most stings are from to *Centruroides vittatus*, the striped bark scorpion

-*Centruroides sculpturatus*, the only scorpion native to the US considered dangerous to humans, is occasionally found in the vicinity of El Paso

Scorpions

- Most significantly toxic species are in the family Buthidae
  - -Centruroides (North America)
  - -Tityus (Caribbean, Central & South America)
  - -Leiurus (Middle East/Africa)
  - -Androctonus(Middle East/Africa)
  - -Buthus (Middle East/Africa)
  - -Parabuthus(S. Africa)
- Non-Buthidae: Hemiscorpiidae
  - -Hemiscorpus lepturus (Iran)

Scorpion stings in Texas:

- Most scorpion stings are not significantly toxic
  - -*C. vittatus* is the most commonly implicated species
  - -Painful, about as serious as a bee sting
  - -Local tenderness and inflammation common
  - -Local paresthesia can occur
  - -Rarely see any systemic signs/symptoms
- Treatment: Ice, analgesics, check tetanus status

Approximate U.S. distribution of the Arizona Bark Scorpion (*C. sculpturatus*)

Vetter et al, American Entomologist V 64 No 2, pp 79-82

Centruroides sculpturatus

- Venom mainly neurotoxic, causes severe local pain but little local inflammation
  - -Tap Test-Not clinically proven, but commonly used
  - -Max severity in about 5 hours
- Cranial nerve dysfunction/somatic skeletal neuromuscular dysfunction/autonomic dysfunction
  - -HTN, tachycardia, CHF-like symptoms, blurred vision, roving eye movements, hypersalivation, tongue fasciculations, dysphagia, dysphonia, hyperthermia, restlessness, severe involuntary shaking/jerking motions
- Respiratory arrest can occur

C. sculpturatus

- Pain control + mild symptom control can be done with IV fentanyl (less histamine release) and short-acting benzo's
- Severe stings: Antivenin (Anascorp) is available
  - -FDA approved since 2011
  - -Equine-origin F(ab')2 antivenin
  - -Low incidence of allergic reactions
  - -3 vials IV initial dose
    - -1 vial every 30-60 min if needed x 2
- Watch the airway!

Centruroides under UV light

Other (non U.S.) Scorpions

- Venom causes release of catecholamines
  - -Significant pain at sting site
  - -HTN
  - -Pulmonary Edema
  - -Sz can occur
  - -Encephalopathy, pancreatitis, priapism have been reported

--Yes, scorpion sings can be a cause of pancreatitis

Treatment

- Symptomatic Treatment usually effective
  - -Pain Control (analgesia+sedation)
- Some areas (Saudi Arabia) go with antivenin very early
- India: Prazosin effective in treatment of Sx of severe Mesobuthis envenomation (pulmonary edema and hypertension)

Hymenoptera

Hymenoptera

- Apis (Bees)
- Vespids (Wasps)
- Formicidae (Ants)

- Sting is modified ovipositor
  - -Venom:
    - -Histamine, serotonin, melittin, Ach
    - -Adolapin-has antiinflamatory properties

Hymenoptera

- Most stings are minor, local treatment only
- How Painful? Western Honeybee: 2/4 on the Schmidt Scale *("Burning, corrosive, but you can handle it. A flaming match head lands on your arm and is quenched first with lye and then sulfuric acid.")*
- Anaphylaxis to hymenoptera stings
  -Estimated 0.4-0.8% of children, 3% of adults
  -90-100 deaths per year from insect sting anaphylaxis
- Desensitization therapy is successful about 85-95% of the time with bees, not as good with fire ants

Hymenoptera

- Anaphylaxis Treatment:
  -Remove stinger
  -Epinephrine (IM, not Sub Q!), airway, fluids, H-1 and H-2 blockers, steroids
  -Observe!
- Allergy consult, epi kit BEFORE discharge!

New Design EpiPen

AUVI-Q

Hymenoptera

- Large local reaction
  - -Swelling/erythema 15 cm beyond sting site
  - -Persisting over 24 hours
- Type IV reaction (Cell-mediated)
  - -Systemic reactions rare
  - -Consult Allergy/Immunology

Hymenoptera

- Africanized Honeybee:

  -Remember Monty Python:

RUN AWAY! RUN AWAY!

Hymenoptera

- Massive hymenoptera stings:
  -40+ Vespid/200 + Apis stings, 500+ Fire Ant stings

  -Anaphlactoid reactions can occur
  -N/V/D, edema, dyspnea, hypotension
  -MI's can result
  -Rhabdomyolysis can occur

- Treat symptoms, consider admit if pt is old/young or poor health

Hymenoptera

- Massive stings (40-50+ vespid)

  -IV H-1 and H-2 blockers
  -IV Steroids
  -Treat shock/oliguria/myoglobinuria

Hymenoptera-Formicidae

- Fire Ants (*Solenopsis invicta*):
  -Bites, then swings around, stinging multiple times
  -Venom is mainly piperidine alkaloids, causes histamine release and necrosis
  -Sterile pustules form, usually within 24 hours
- Anaphylaxis is a concern
- Treatment is symptomatic
- 1 out of 4 on the Schmidt Scale. *("Sharp, sudden, mildly alarming. Like walking across a shag carpet and reaching for the light switch.")*

Fire Ant Distribution, U.S.

Most Painful Sting in the US: Tarantula Hawk (*Pepsis* Spp)

Getty Images

National Park Service

4/4 on the Schmidt Scale: "If stung, lie down and start screaming"

"Blinding, fierce, shockingly electric. A running hair drier has just been dropped in your bubble bath."

Spiders

- Main Species of Concern:
  -Latrodectus (neurotoxic)-Worldwide
  -Atrax (neurotoxic)-Australia
  -Loxosceles (necrotic)- *L.reculsa* most commonly problematic

- -Occasional problems with Phoneutria spp

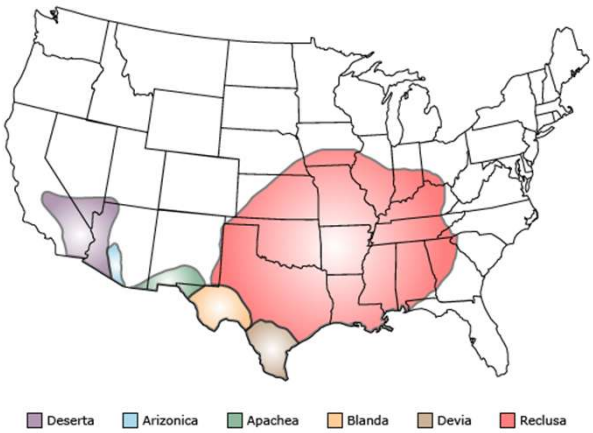
Spiders-*Latrodectus*

- Symptoms onset within 1 hour:
  -Severe muscle spasms, anxiety, diaphoresis, HTN, salivation
  -Severe cases: Ptosis, weakness, fasciculations
- Control symptoms with IV opiates and benzo's: Symptoms may last 2-3 days
- Antivenin is available, not usually needed
  -In one case report, AV was effective 44 hours after envenomation
  -Reserve antivenin use for severe cases refractory to other treatment?

Spiders-*Loxosceles*

- Loxosceles: 5 species in the US implicated
  - -Necrotic Arachnidism
  - -No useful AV for species found in the U.S.
  - -Majority require routine wound care
  - -Dapsone 50-100 mg QD (Dose BID, start early)
    - -Controversial-No good human studies
      - -My opinion: Don't use
  - -Other Methods: Surgery, HBO, Steroids
  - -Hemolytic anemia, DIC, hemoglobinuria, renal failure can occur (relatively rare)
- Incidence **greatly** overestimated:
  - -"It's MERSA unless you see the spider bite you…"

Geographic distribution of verified widespread populations of six native Loxosceles species in the United States



Verified bite of brown recluse spider (Loxosceles reclusa)

Reproduced with permission from William Stoecker, MD.

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Day 3

Day 4

Brown Recluse Bite or MERSA?? Both?

Day 6

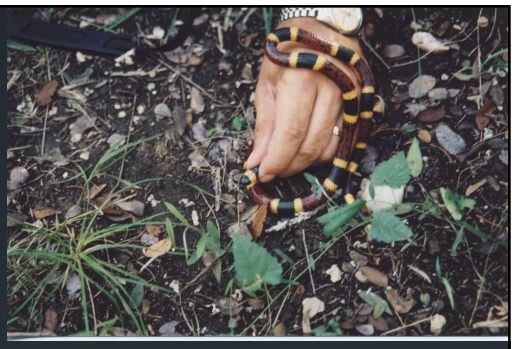
Day 9

Day 10

Famous Last Words:

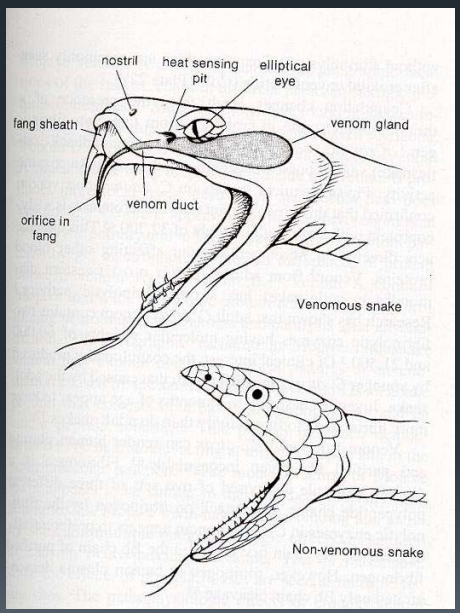
"Hey, Bubba! Hold My Beer and Watch This!!"

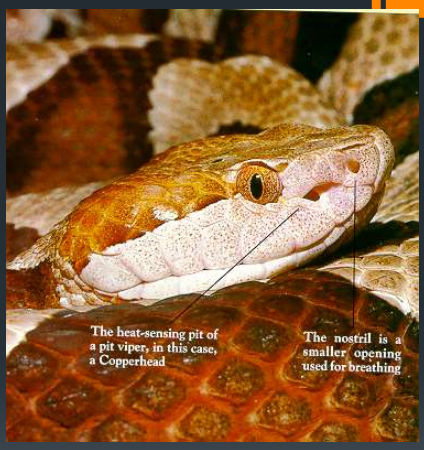

Southwest

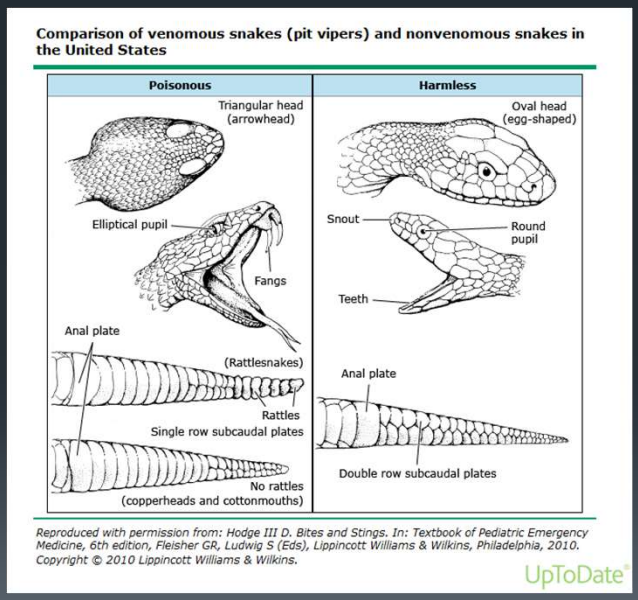


Prevention

- #1: Don't Play With The Snake
- #2: Control Rodents (snake food)
- #3: Don't Mess With The Snake
- #4: Don't Reach or Step Into Unseen Areas
- #5: Don't Tease, Annoy, Fiddle With or Otherwise Scare The Snake







Snakebite First Aid

- #1: Don't Panic
- #2: Don't Make Things Worse
- #3: Get To Medical Care As Quickly As Possible

Snakebite First Aid
Things That Don't Work:

- Alcohol (External or Internal)
- Electrical Shock (Stun Gun)
- 'Cut and Suck'
- Tourniquets
- Ice

Cutter Kit: Do not use this kit!

Snakebite First Aid

- 'Extractor Pump'

  -One study showed effective if applied within 5 minutes of bite

  -Recent Studies shows it is **not** effective, and may lead to increased necrosis at bite site

First Aid

- Pressure-Immobilization Technique
  -Appears to work in elapid, sea snake, most Australian snakes (i.e. neurotoxic-predominant venoms)

  -NOT recommended for bites by species with hemo/cytotoxic predominant venom (i.e. Pit Vipers)

  -IS recommended first aid for coral snake envenomation

First Aid

- Remove rings, any constricting items
- Immobilize at heart level
- Keep patient at rest as much as possible
- Bring in the snake?
  -Not only no, but #$!@!! NO!

Venom Types

- All snake venoms have neurotoxic and hemo-cytotoxic components
- Vipers, including old world vipers and pit vipers (crotalids) tend to have hemo/cytotoxic predominant components
- Elapids (including the Coral Snake) tend to have neurotoxic-predominant components

Venom Types

- Elapids (cobras, kraits, coral snakes) sea snakes, and most Australian snakes have neurotoxic predominant venom
- No hard/fast rules: King cobra bite can cause serious tissue destruction, several species of crotalids have significant neurotoxic effects
  -Most infamous: *C. scutulatus*, the Mojave Rattlesnake (AKA, the 'Mojave Green')

Get Help!!

- National Poison Information Hotline:

1-800-222-1222

Clinical Evaluation

- Not all bites result in injection of venom
- Not all envenomations require antivenom treatment
- Most snakebite victims will survive
- Death from snakebite typically takes hours to days

Clinical Evaluation

- Hemo/cytoxic predominant venoms usually show:

-Moderate to severe swelling, starting at bite site
-Moderate to severe pain at the bite site
-In crotalid bites, decreased platelets are one of the early signs of systemic envenomation.

Clinical Evaluation

- Neurotoxic predominant bites:

-Can be almost painless
-Show no symptoms for hours, followed by rapid deterioration
-Bulbar paralysis, generalized weakness, salivation, weak respirations

-If any neurologic signs/sx present, treat as a significant envenomation

Clinical classification of United States Crotalinae* envenomation to guide FabAV administration

Category	Tissue effect	Systemic signs	Coagulopathy and bleeding
Minimal	Swelling, pain, and ecchymosis adjacent to the bite site	None	Normal coagulation parameters¶; no bleeding
Moderate	Swelling, pain, and ecchymosis less than full extremity or less than 50 cm if bite on head, neck, or trunk	Present but not life-threatening (eg, nausea, vomiting, diarrhea, oral paresthesia, unusual tastes, tachycardia, tachypnea, mild hypotension [systolic BP >90 mmHg in an adult])	Abnormal coagulation parameters¶; no bleeding or minor hematuria, gum bleeding, and/or epistaxis
Severe	Swelling, pain, ecchymosis involving more than the entire extremity; greater than 50 cm if bite on head, neck, or trunk; threatens the airway; OR signs of compartment syndrome	Present and life-threatening (eg, respiratory insufficiency, marked tachycardia for age with severe hypotension, obtundation, seizures)	Markedly abnormal coagulation parameters¶ with serious bleeding

FabAV: polyvalent Crotalidae ovine immune Fab (Crofab, Protherics); BP: blood pressure.
* Includes bites by rattlesnakes, water moccasins (cottonmouths), and copperheads.
¶ Coagulation parameters include platelet count, prothrombin time (PT), partial thromboplastin time (PTT), fibrinogen, and fibrin degradation products (fibrin split products [FSP]).

Data from: Goto, CS, Feng, SY. Crotalidae polyvalent immune fab for the treatment of pediatric crotaline envenomation. Pediatr Emerg Care 2009; 25:273.

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Treatment

- Institute life support measures: Manage the ABC's
  -Monitor, 2 IV's, fluids if needed for hypotension
  -Labs: CBC, glu, BUN/creat, 'lytes, coags, UA, draw for T+C
  -EKG, ETOH, ? Tox screen

Treatment

- Treat the wound

-Clean/irrigate
-Address tetanus status (tetanus-prone wound)
-FB (fang) in wound?
-Antibiotics: Usually not needed, do not give unless infection obviously present

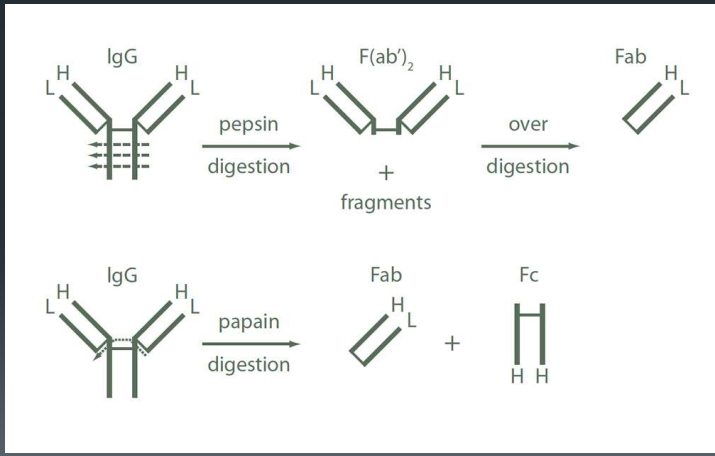
Antivenin Required?

- Moderate to Severe envenomations usually require antivenin
- Mild may or may not require antivenin
- In cases of neurotoxic-predominant bites, any significant neurological sign/sx is reason to treat with anitvenin

Antivenin Administration

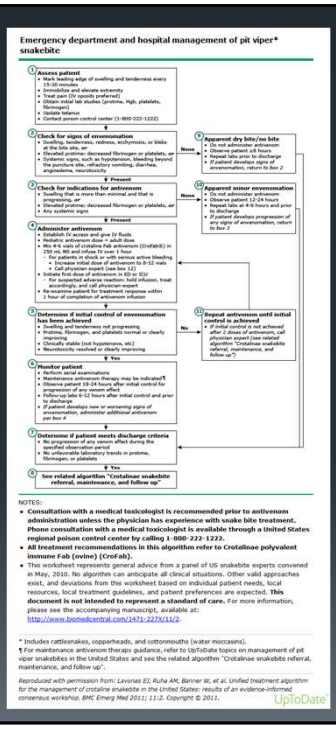
- Have EVERYTHING you need to deal with a severe allergic reaction AT THE BEDSIDE
  - -IM Epinephrine
  - -IV Diphenhydramine
  - -IV Steroids
- Mix antivenin by swirling, not shaking
- Dilute antivenin 1:5 or 1:10 in NS, administer first 10 cc's VERY slowly, observing for allergic reactions
- If no reaction, increase rate to give first dose over 60 minutes

F(ab) Vs. F(ab')$_2$



CroFab

- Crotalid Polyvalent Antivenin, Fab fragment
- Give 4-6 vials over 1 hour and observe.
- If symptoms still present, give additional doses of 4-6 vials until symptoms controlled.
- After initial dose, give 2 vials every 6 hours for 18 hours
  -Fab fragments cleared from circulation fairly rapidly, need to re-dose to prevent recrudescence of symptoms



Emergency department and hospital management of pit viper* snakebite

1. Assess patient
   - Mark leading edge of swelling and tenderness every 15-30 minutes
   - Immobilize and elevate extremity
   - Treat pain (IV opioids preferred)
   - Obtain initial lab studies (protime, INR, platelets, fibrinogen)
   - Update tetanus
   - Contact poison control center (1-800-222-1222)

2. Check for signs of envenomation
   - Swelling, tenderness, redness, ecchymosis, or blebs at the bite site, or
   - Elevated protime; decreased fibrinogen or platelets, or hypotension, or tachycardia, or edema beyond the puncture site, refractory vomiting, diarrhea, angioedema, neurotoxicity

   None → 2a. Apparent dry bite/no bite
   - Do not administer antivenom
   - Observe patient ≥8 hours
   - Repeat labs prior to discharge
   - If patient develops signs of envenomation, return to Box 2

   Present ↓

3. Check for indications for antivenom
   - Swelling that is more than minimal and that is progressing, or
   - Elevated protime; decreased fibrinogen or platelets, or
   - Any systemic signs

   None → 3a. Apparent minor envenomation
   - Do not administer antivenom
   - Observe patient 12-24 hours
   - Repeat labs at 4-6 hours and prior to discharge
   - If patient develops progression of any signs of envenomation, return to box 3

   Present ↓

4. Administer antivenom
   - Establish IV access and give IV fluids
   - Pediatric antivenom dose = adult dose
   - Mix 4-6 vials of crotaline Fab antivenom (CroFab®) in 250 mL NS and infuse IV over 1 hour
     - Do not mix with D5W; may cause active bleeding
     - Increase initial dose of antivenom to 8-12 vials
     - Call physician expert (see box 12)
   - Initiate first dose of antivenom in ED or ICU
     - For suspected adverse reaction: hold infusion, treat reaction, restart infusion when stable
   - Re-examine patient for treatment response within 1 hour of completion of antivenom infusion

5. Determine if initial control of envenomation has been achieved
   - Swelling and tenderness not progressing
   - Protime, fibrinogen, and platelets normal or clearly improving
   - Clinically stable (not hypotensive, etc)
   - Neurotoxicity resolved or clearly improving

   No → 5a. Repeat antivenom until initial control is achieved
   - If initial control is not achieved after 2 doses of antivenom, call physician expert (see related algorithm "Crotalinae snakebite referral, maintenance, and follow up")

   Yes ↓

6. Monitor patient
   - Perform serial examinations
   - Maintenance antivenom therapy may be indicated¶
   - Observe patient ≥8 hours after initial control for progression of any venom effect
   - Follow-up labs 6-12 hours after initial control and prior to discharge
   - If patient develops new or worsening signs of envenomation, administer additional antivenom per box 4

7. Determine if patient meets discharge criteria
   - No progression of any venom effect during the specified observation period
   - Stable or improving laboratory trends in protime, fibrinogen, or platelets

   Yes ↓

8. See related algorithm "Crotalinae snakebite referral, maintenance, and follow up"

NOTES:
- **Consultation with a medical toxicologist is recommended prior to antivenom administration unless the physician has experience with snake bite treatment. Phone consultation with a medical toxicologist is available through a United States regional poison control center by calling 1-800-222-1222.**
- **All treatment recommendations in this algorithm refer to Crotalinae polyvalent immune Fab (ovine) (CroFab).**
- This worksheet represents general advice from a panel of US snakebite experts convened in May, 2010. No algorithm can anticipate all clinical situations. Other valid approaches exist, and deviations from this worksheet based on individual patient needs, local resources, local treatment guidelines, and patient preferences are expected. **This document is not intended to represent a standard of care.** For more information, please see the accompanying manuscript, available at: http://www.biomedcentral.com/1471-227X/11/2.

* Includes rattlesnakes, copperheads, and cottonmouths (water moccasins).
¶ For maintenance antivenom therapy guidance, refer to UpToDate topics on management of pit viper snakebites in the United States and see the related algorithm "Crotalinae snakebite referral, maintenance, and follow up".

Reproduced with permission from: Lavonas EJ, 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 2011; 11:2. Copyright © 2011.

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New F(ab')$_2$ Antivenin: Anavip

-FDA Approved for treatment of pit viper envenomation

-Released to market October 2018

-Dose is 10 vials IV over 1 hour, repeat if needed q 1 hour if needed to control symptoms. If symptoms are controlled but re-emerge, give 4 vials over 1 hour

-F(ab')$_2$ has a longer circulating life than F(ab), routine re-dosing not recommended unless symptoms reoccur

Pitfalls

- Kids get same doses of antivenin as adults
- Swelling may be VERY impressive: Compartment syndrome in snakebite is uncommon, do not perform fasciotomy unless elevated compartment pressure is documented

Pitfalls

- Be ready for any/all allergic reactions
- Fear/anxiety can mimic some neurological signs
- Fab antivenins are less likely to cause severe reactions, however it CAN happen, so be prepared!

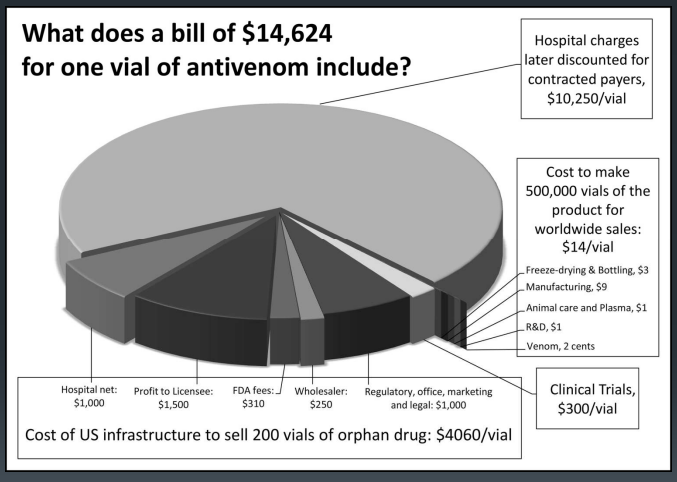
Cost of Antivenin

- Crofab: $3,184.45 per vial

  -Cost of 12-vial treatment: $38,213.40

- Anavip: $1,214.22 per vial

  -Cost of 10-vial treatment: $12,142.20



The American Journal of Medicine 2015 128, 1265-1267DOI: (10.1016/j.amjmed.2015.08.007)

My Front Yard, San Antonio TX, April ’03

3.5-foot *Crotalus atrox*

Allergic reactions to these puppies kill over a 40 people in the US every year…

4 times as many as are killed by venomous snakes