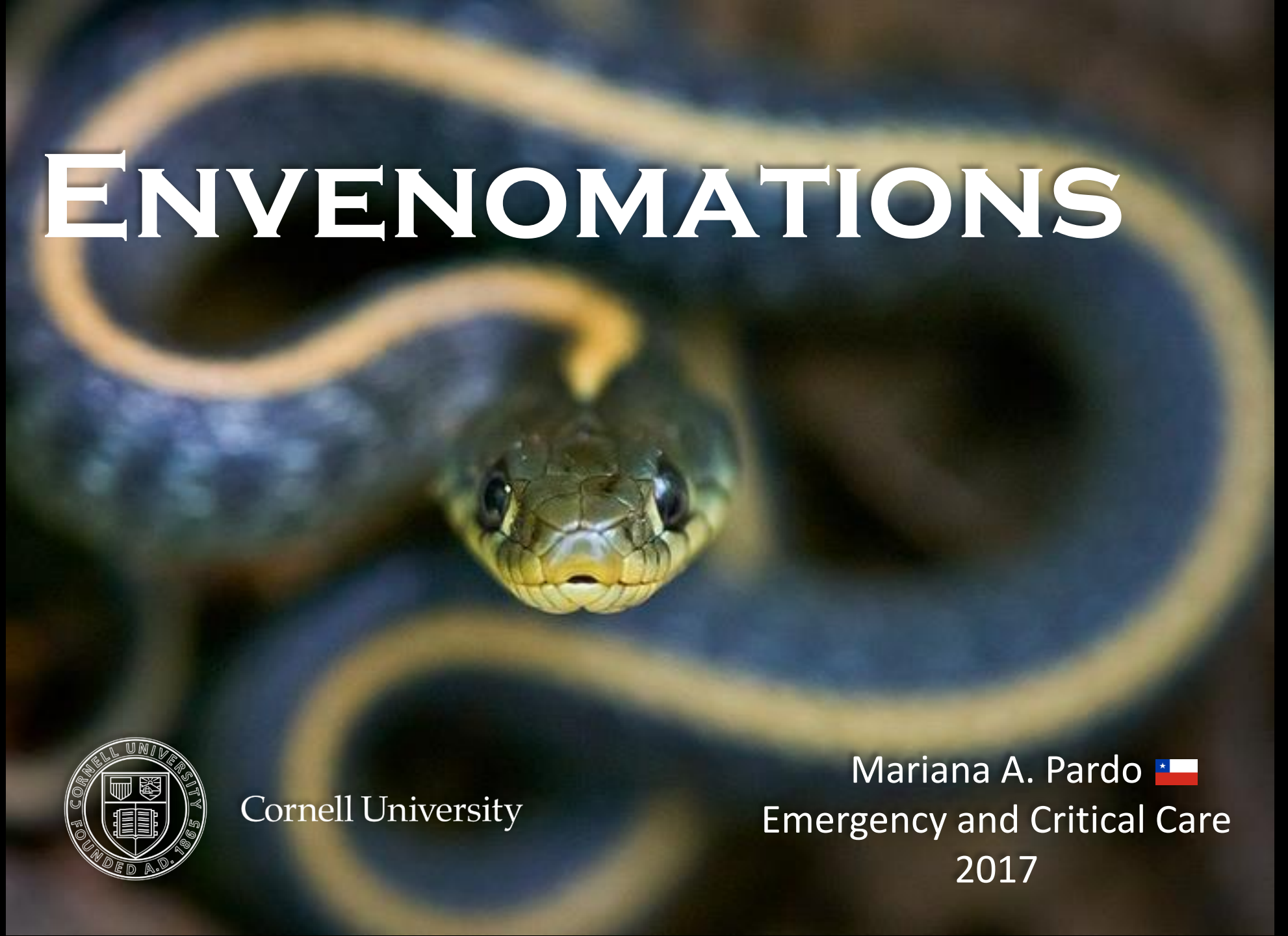
Envenomations

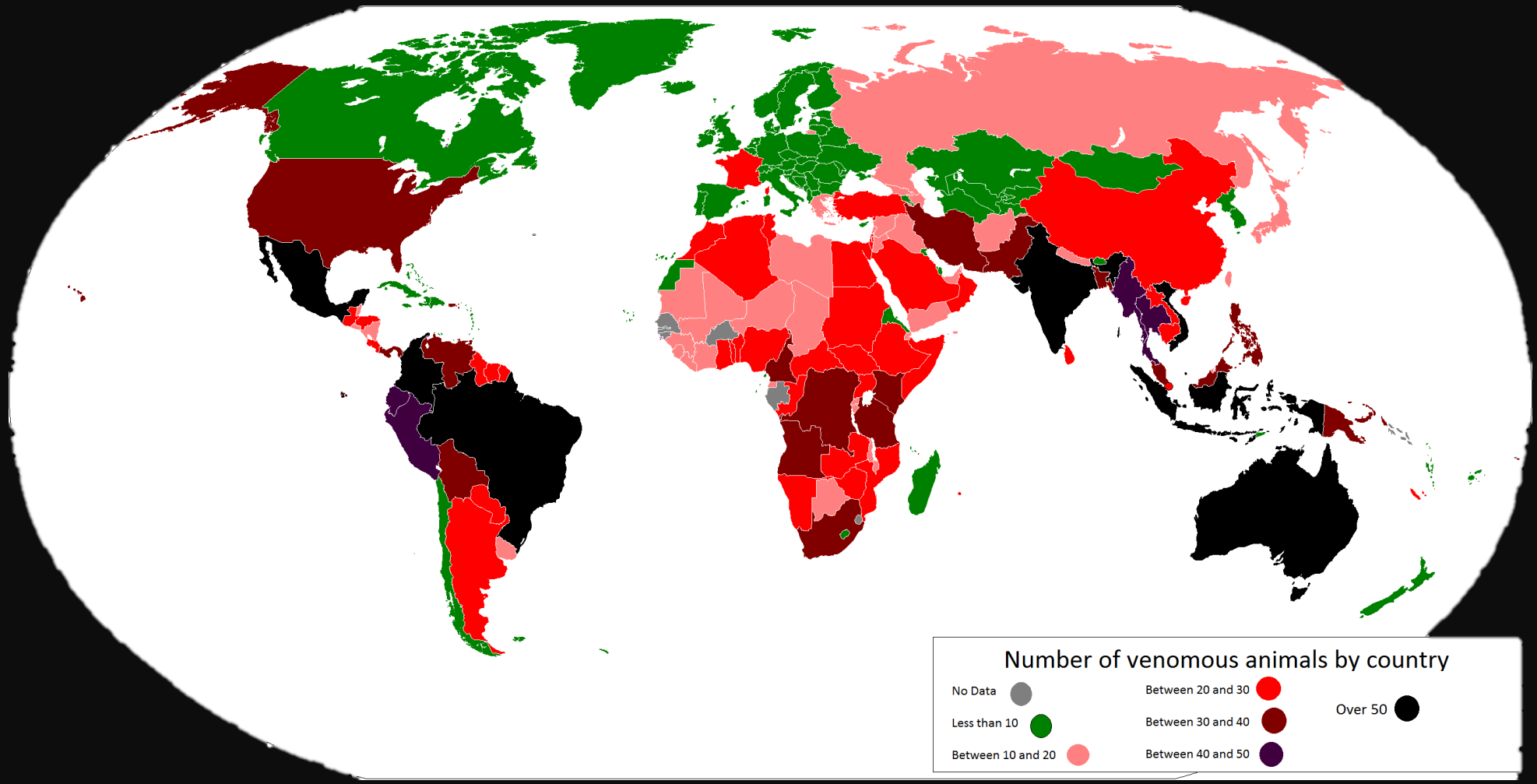


Cornell University

Mariana A. Pardo
Emergency and Critical Care
2017

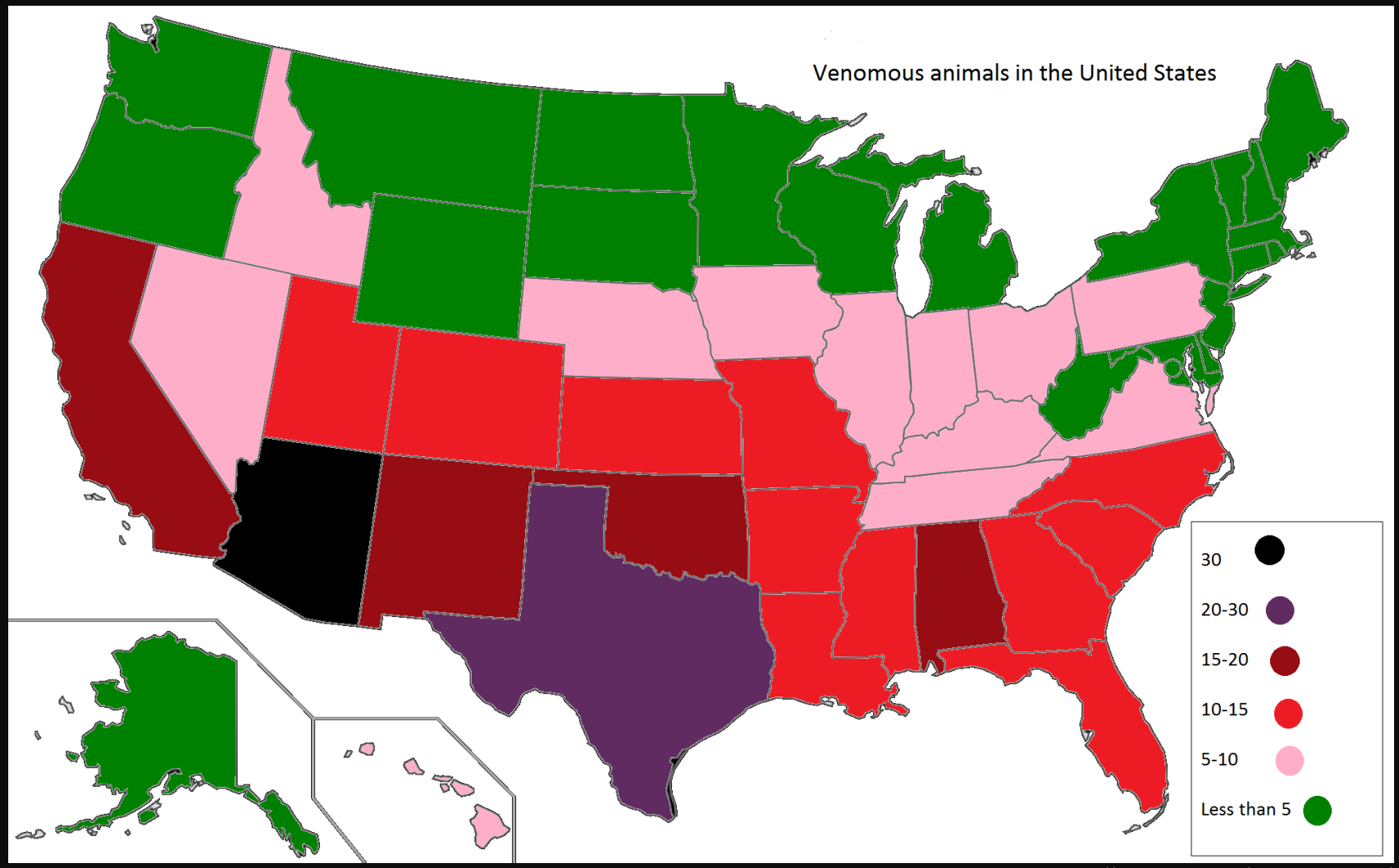
Overview

- Venomous species
- Snakes
  - Crotalids
  - Elapids
- Spiders
- Scorpions
- Hymenoptera
  - Bees
  - Wasps and Hornets
  - Fire Ants
- Bufo Toad



http://brilliantmaps.com/venomous-animals/

Venomous species per state



http://brilliantmaps.com/venomous-animals/

Venomous Snakes

Approximately 150,000 – 300,000 domestic animals a year are bitten by venomous snakes in the US.

Every state except Maine, Alaska, and Hawaii is home to at least one species of venomous snake.

Venomous Snakes

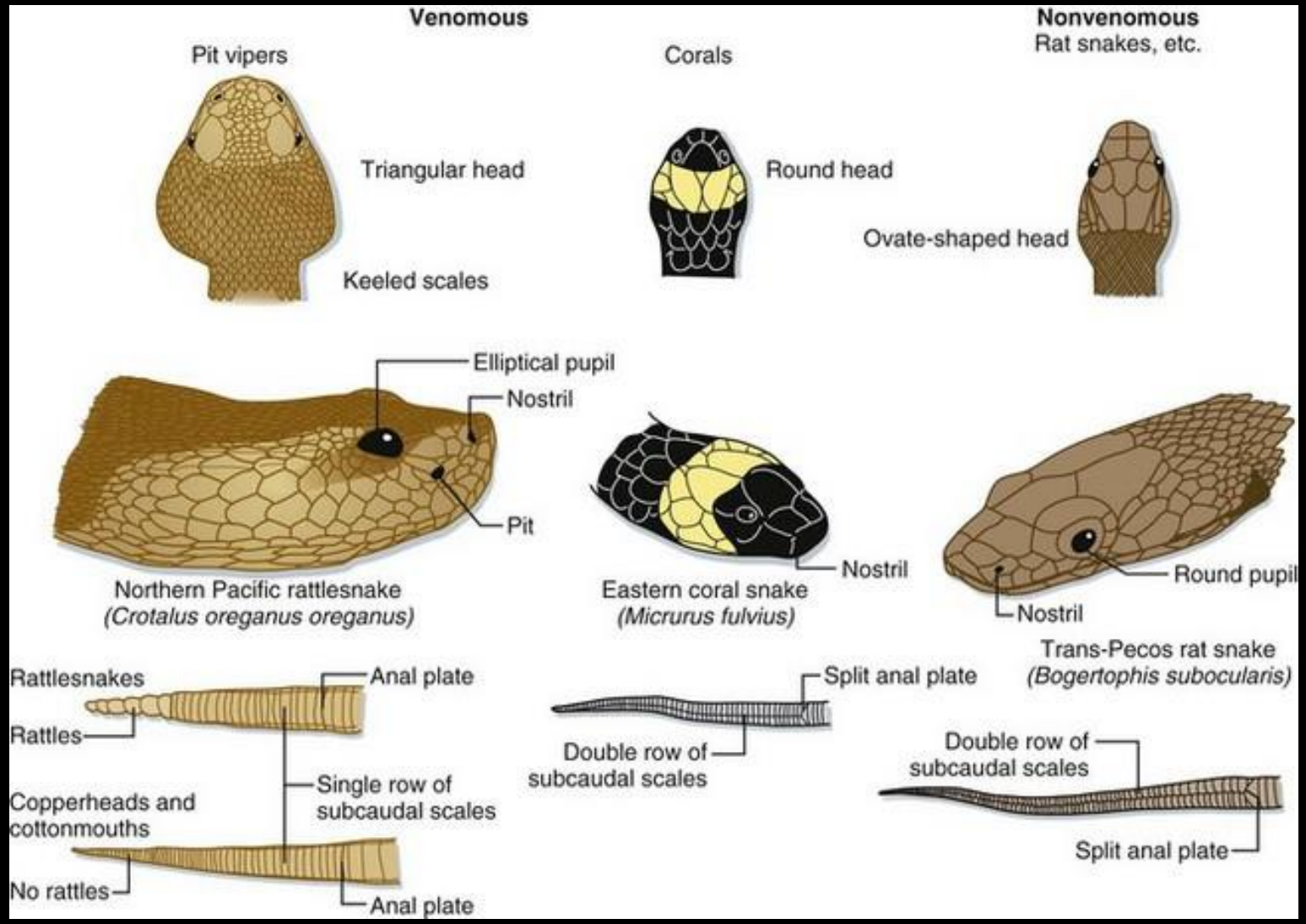
Vipers

- Solenoglyphic - movable front fangs
- Long fangs
- Hemotoxic and myotoxic
- USA - Crotalids

Elapids

- Proteroglyphic - fixed front fangs
- Short fangs
- Neurotoxic +/- cardiotoxic
- USA - Coral snake

Venomous Snakes



http://clinicalgate.com/venomous-snakebites-in-north-america/

Crotalids in the USA

Table 1
Crotalids of North America

Scientific name	Common name	Location
Crotalus adamanteus	Eastern diamondback rattlesnake	United States
Crotalus atrox	Western diamondback rattlesnake	United States, Mexico
Crotalus cerastes	Mojave Desert sidewinder	United States, Mexico
Crotalus horridus	Timber rattlesnake	United States
Crotalus lepidus	Rock rattlesnake	United States
Crotalus mitchelli	Speckled rattlesnake	United States, Mexico
Crotalus molossus	Black-tailed rattlesnake	United States, Mexico
Crotalus pricei	Twin-spotted rattlesnake	United States, Mexico
Crotalus scutulatus	Mojave rattlesnake	United States, Mexico
Crotalus tigris	Tiger rattlesnake	United States, Mexico
Crotalus viridis	Western rattlesnake	United States, Mexico
Crotalus viridis viridis	Prairie rattlesnake	United States
Crotalus viridis abyssus	Grand Canyon rattlesnake	United States
Crotalus viridis helleri	Southern Pacific rattlesnake	United States, Mexico
Crotalus viridis lutosus	Great Basin rattlesnake	United States
Crotalus viridis oreganus	Northern Pacific rattlesnake	United States, Canada
Crotalus willardi	Ridge-nosed rattlesnake	United States, Mexico
Agkistrodon contortrix	Southern copperhead	United States
Agkistrodon piscivorus	Eastern/western cottonmouth	United States
Sistrurus catenatus	Massasauga	United States, Mexico
Sistrurus miliarius	Pigmy	United States

Eastern Diamondback Rattlesnake

Crotalus adamanteus

Largest species of rattlesnake, potent venom

Inhabits dry sandy areas, palmettos, flatwoods, pinewoods, coastal dune habitats

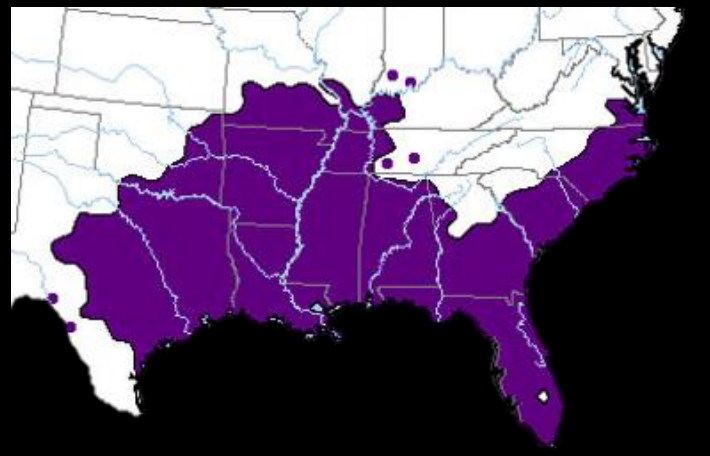
Courtesy of Dr. Jesse Bullock

Water Moccasin/ Cottonmouth

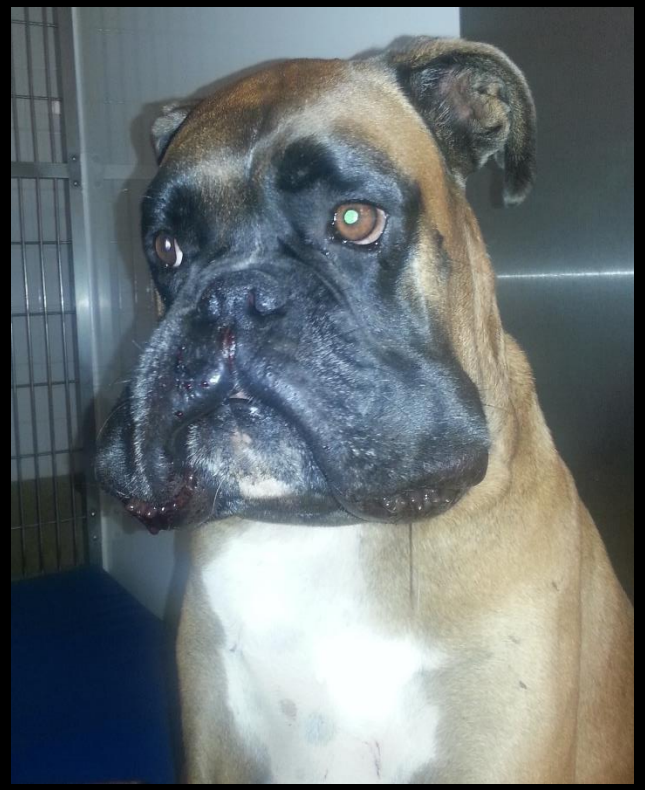
Agkistrodon piscivorus

North America's only venomous water snake

Found swimming in swamps, marshes, drainage ditches, and at the edges of ponds, lakes and streams



http://modernsurvivalblog.com/survival-skills/the-4-deadly-poisonous-snakes-in-america/



Copperhead

Agkistrodon contortrix

Tolerant of habitat alteration and remain common in suburban areas of many large cities

Rarely require antivenin, usually symptomatic treatment

http://modernsurvivalblog.com/survival-skills/the-4-deadly-poisonous-snakes-in-america/

Crotalid envenomation

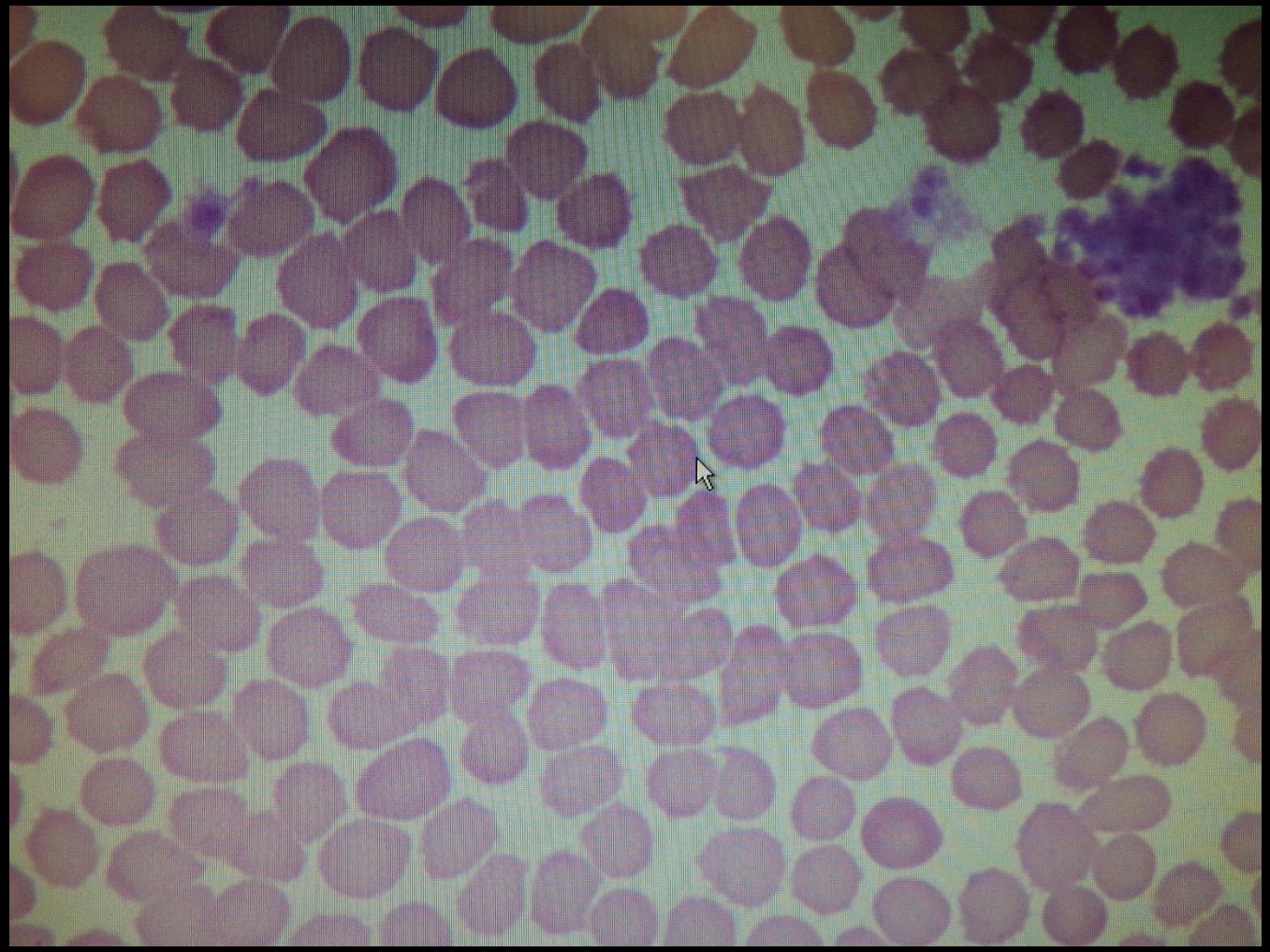
- 25% are dry bites
- The amount of venom released depends on:
  - Snake's last meal – longer it's been > venom
  - Size of the venom sacs – larger > venom
  - Ability to voluntarily compress the venom glands – adults have more control

Snake Venom

Component	Pit Viper	Coral Snake	Effects
Enzymes			
Proteinases	Heavy	Minimal	Tissue destruction, coagulation, anticoagulation
Hyaluronidase	Moderate	Moderate	Hydrolysis of connective tissue stroma
Cholinesterase	Minimal	Heavy	Catalyzes hydrolysis of acetylcholine
Phospholipidase A*	Heavy		Hemolysis may potentiate neurotoxins
Phosphomesterase	Minimal	Heavy	Unknown
Phosphodiestarase	Moderate	Moderate	Hypotension
Non-Enzymes			
Neurotoxins	Minimal	Heavy	Flaccid paralysis
Cardiotoxins	Minimal	Heavy	Depolarizing

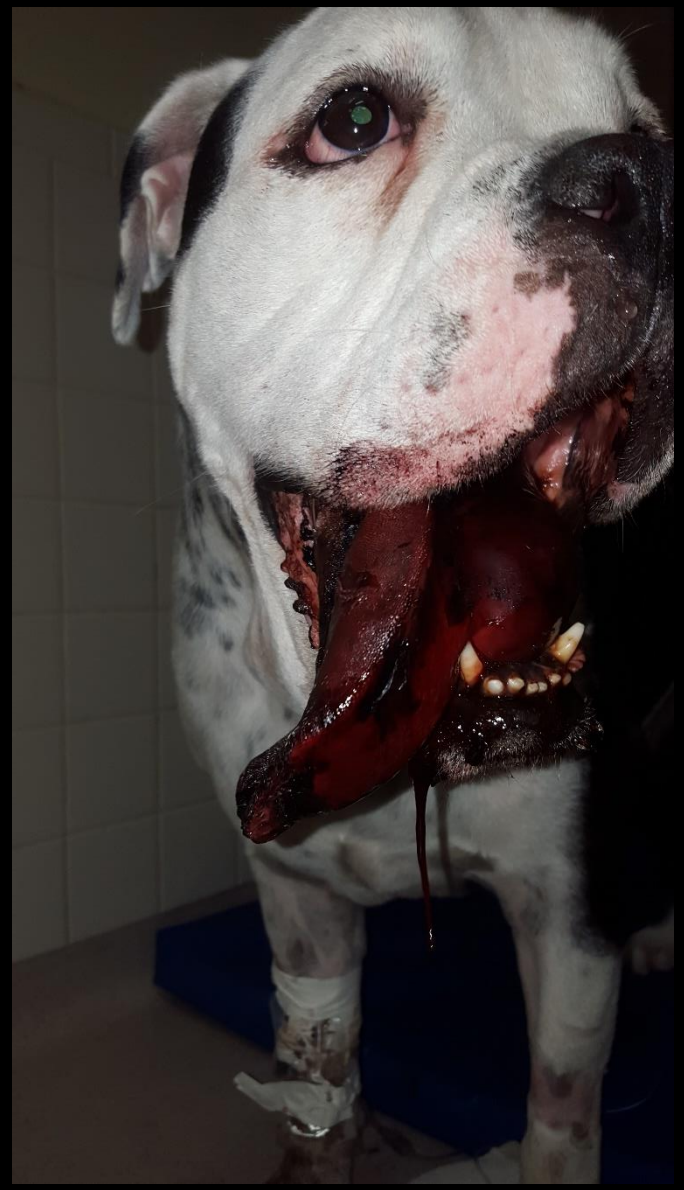
https://www.ebmedicine.net/topics.php?paction=showTopicSeg&topic_id=93&seg_id=1776

Ecchynocytosis



Clinical Signs

- Acute pain
- Marked swelling and edema
- Ecchymosis and bleeding at the bite site
- Cardiovascular compromise:
  - Vasodilation
  - Hypovolemia
  - Tachycardia
- Respiratory distress
- Nausea and vomiting
- Mental dullness
- Muscle tremors



Treatment

- First Aid:
  - Immobilization may delay absorption of venom
  - No other first aid techniques are recommended
- Fluid Therapy:
  - Avoid colloids
- Blood Products:
  - pRBC if anemic
  - FFP if coagulopathic, after antivenin
- Analgesics
- Local wound care
  - Antibiotics
  - Bandaging as needed
  - Hyperbaric oxygen therapy

Snake Antivenin

Antivenin is a “true” antidote

Antivenom is most effective when administered early on

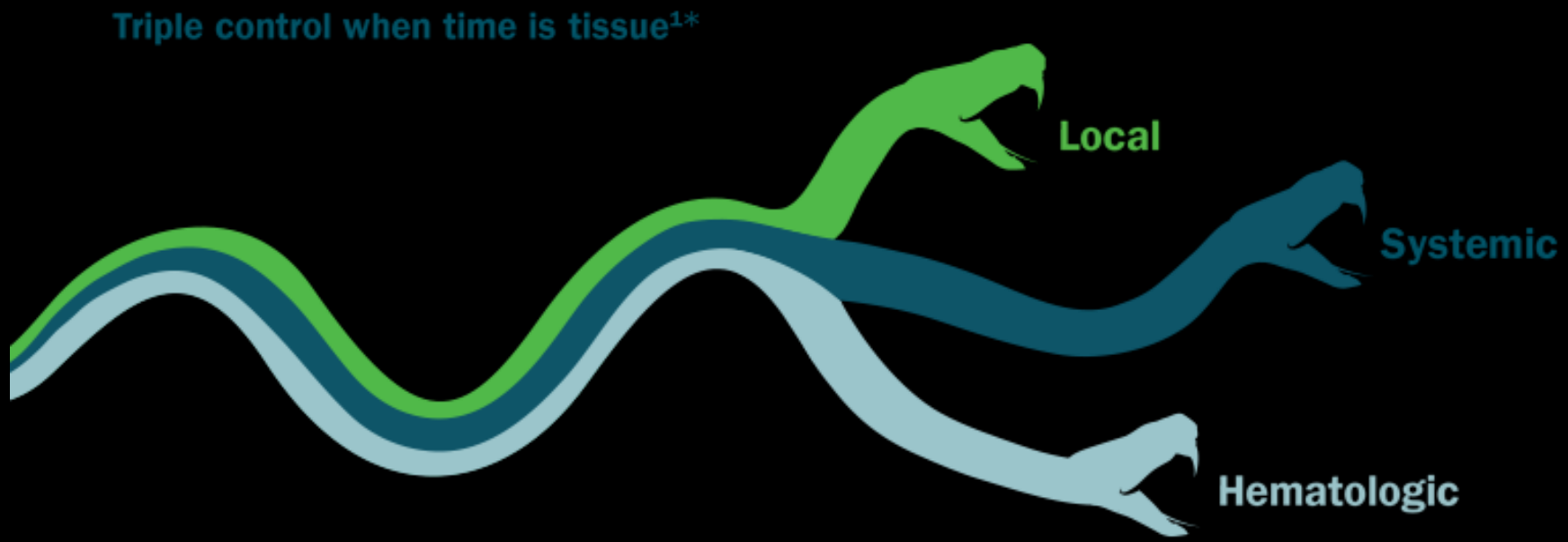
Indications for antivenom

1. Rapid progression of swelling
2. Significant coagulopathy, defibrination, or thrombocytopenia
3. Neuromuscular toxicity
4. Shock

Antivenin

Mainstay of therapy for moderate to severe envenomation

- Limits progression and reverses coagulopathy
- Does not reverse necrotoxic effects



https://www.crofab.com/

Antivenin

Antivenin Crotalidae Polyvalent (ACP)

- Derived from envenomated horses
- Whole IgG and horse serum albumin
- More antigenic
- 1-10 vials/dog depending on the severity

Antivenin Crotalidae Polyvalent (VenomVet)

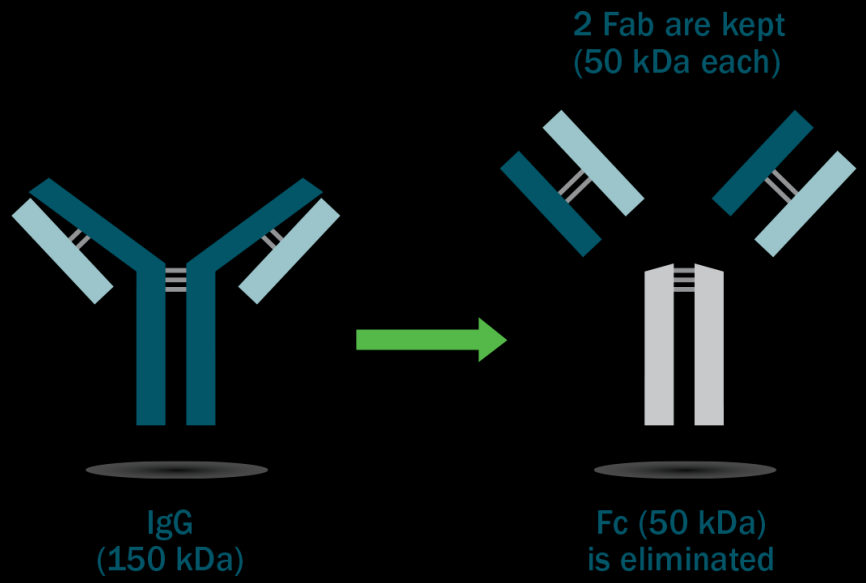
- Derived from envenomated horses
- Fc portion cleaved leaving 2 Fab portions
- Less antigenic
- 3 year shelf life

Antivenin

Crotalinae Polyvalent Immune Fab_1 (Crofab)

- Uses fragments of antibodies
- Fc portion cleaved leaving 2 Fab portions
- Better volume of distribution
- Less antigenic and clinically as effective

https://www.crofab.com/



Antivenin

2 Foreign products effective against North American Pit Vipers, both require a special importer's license

Antivipmyn

- Fab_2 antibody fragment polyvalent product of equine origin
- Cleared from body faster than IgG, but slower than Fab_1
- Mexico

Polyvet-ICP

- Polyspecific whole IgG of equine origin
- No albumin (< antigenic)
- Costa Rica

Effect of antivenin dose on outcome from crotalid envenomation: 218 dogs (1988–2006)

Jennifer L. McCown, DVM, DACVIM; Kirsten L. Cooke, DVM, DACVIM; Rita M. Hanel, DVM, DACVIM, DACVECC; Galin L. Jones, BS, MStat, PhD and Richard C. Hill, MA, VetMB, PhD, MRCVS, DACVIM, DACVN

- Reported mortality rates in dogs range from 1% to 30%, depending on the type of snake involved

- 2 types of antivenin:
  - Horse serum-derived, contains IgG that can neutralize the venom of all North, Central, and South American crotalids
  - Sheep-derived, contains Fab fragments of Ig, rather than the entire IgG molecule. The more immunogenic Fc portion of the antibody is eliminated during purification

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- 218 dogs – UF, NCSU, UMN
- 40% of the bites were identified (Pygmy rattlesnakes 22%, Cottonmouths 13%, Eastern diamondback rattlesnakes 5%)
- Median amount of vials administered 1 vial (1-10)
- Decision to administer antivenin was based on clinician's decision and severity
- Administration of more vials was associated to poorer outcomes

Retrospective Study

Journal of Veterinary Emergency and Critical Care 25(5) 2015, pp 655–659
doi: 10.1111/vec.12349

Retrospective evaluation of the effect of antivenom administration on hospitalization duration and treatment cost for dogs envenomated by Crotalus viridis: 113 dogs (2004–2012)

Julia E. Katzenbach, DVM and Daniel S. Foy, MS, DVM, DACVIM, DACVECC

- 113 envenomed dog by Prairie rattlesnake – Wheat Ridge Animal Hospital
- 2 groups: symptomatic treatment and antivenin treatment group
- Mortality rate 1.8%
- Both the cost and the duration of hospitalization were significantly greater in the group of dogs that received antivenom

Case Report

Journal of Veterinary Emergency and Critical Care **15**(3) 2005, pp 206–212

Serum sickness in a dog associated with antivenin therapy for snake bite caused by *Crotalus adamanteus*

Paul Berdoulay, DVM, DACVIM, Michael Schaer, DVM, DACVIM, DACVECC and Jessica Starr

- Type III hypersensitivity reaction from injection of foreign protein or serum > immune complex formation, few days to 4 weeks after administration
- Urticaria, arthralgias, myalgias, glomerulonephritis, vasculitis and neuritis
- 5y SF Boxer, Diamondback bite receiving 8 vials of antivenin
- Day 3: pitting edema, fever, leukocytosis, hemolysis
- Serum complement assay 60 U/mL (reference range 120–216 U/mL)
- Strong correlation between amount of antivenin given and incidence of serum sickness in people

Snake Severity Score

Snakebite Severity Score

System	Score	Signs
Respiratory	0	Normal
	1	Minimal: slight dyspnea
	2	Moderate: respiratory compromise, tachypnea, use of accessory muscles
	3	Severe: cyanosis, air hunger, extreme tachypnea, respiratory insufficiency or respiratory arrest from any cause
Cardiovascular	0	Normal
	1	Minimal: tachycardia, general weakness, benign dysrhythmia, hypertension
	2	Moderate: tachycardia, hyptension (tarsal pulse still palpable)
	3	Severe: extreme tachycardia, hypotension (nonpalpable tarsal pulse or systolic blood pressure <80 mmHg), malignant dysrhythmia or cardiac arrest
Local Wound	0	Normal
	1	Minimal: pain, swelling, ecchymosis, erythema limited to bite site
	2	Moderate: pain, swelling, ecchymosis, erythema involves less than half of extremity and may be spreading slowly
	3	Severe: pain, swelling, ecchymosis, erythema involves most or all of one extremity and is spreading rapidly
	4	Very severe: pain, swelling, ecchymosis, erythema extends beyond affected extremity, or significant tissue necrosis
Gastrointestinal	0	Normal
	1	Minimal: abdominal pain, tenesmus
	2	Moderate: vomiting, diarrhea
	3	Severe: repetitive vomiting, diarrhea, or hematemesis
Hematological	0	Normal
	1	Minimal: coagulation parameters slightly abnormal, PT < 20 sec, PTT < 50 sec, platelets 100,000 to 150,000/mm3
	2	Moderate: coagulation parameters abnormal, PT 20-50 sec, PTT 50–75 sec, platelets 50,000 to 100,000/mm3
	3	Severe: coagulation parameters abnormal, PT 50–100 sec, PTT 75–100 sec, platelets 20,000 to 50,000/mm3
	4	Very severe: coagulation parameters markedly abnormal with bleeding present or the threat of spontaneous bleeding, including PT unmeasurable, PTT unmeasurable, platelets <20,000/mm3
Central Nervous System	0	Normal
	1	Minimal: apprehension
	2	Moderate: chills, weakness, faintness, ataxia
	3	Severe: lethargy, seizures, coma

Modified from Peterson ME. Snake bite: Pit vipers. Clin Techn Small Anim Pract 2006;21:177–8; with permission.

Clinical Practice Review

Journal of Veterinary Emergency and Critical Care **21**(5) 2011, pp 461–470
doi: 10.1111/j.1476-4431.2011.00677.x

Overview and controversies in the medical management of pit viper envenomation in the dog

Robert A. Armentano, DVM and Michael Schaer, DVM, DACVIM, DACVECC

Antihistamines

- Only if type I Hypersensitivity occurs
- Incidence of hypersensitivity Crofab 14%, ACP 23-56% in humans, 7% in dogs

Glucocorticoids

- No proven benefits during envenomation
- Use in anaphylaxis and serum sickness may be useful

NSAIDS

- Impairs platelet aggregation – worsens coagulopathy

Antimicrobials

- Low incidence of infections from snake bites

Original Study

Journal of Veterinary Emergency and Critical Care 25(4) 2015, pp 546–551
doi: 10.1111/vec.12337

Prospective evaluation of the incidence of wound infection in rattlesnake envenomation in dogs

Amy Carr, DVM, DACVECC and Jennifer Schultz, DVM

- Most common oral flora include gram (-) rods (Enterobacter, P. aeruginosa, Aerobacter, Proteus), Streptococcus, S. aureus, Clostridium and Bacteriodes
- Venom itself may be bactericidal
- 102 envenomated dogs – private practice California
- Only 1 patient developed an abscess, more likely due to compartment syndrome than the bite <1%
- Antibiotics are only recommended if necrosis or abscess is present and based on culture

Original Study

Journal of Veterinary Emergency and Critical Care **24**(2) 2014, pp 174–181
doi: 10.1111/vec.12127

Myocardial injury in dogs with snake envenomation and its relation to systemic inflammation

Rebecca Langhorn, DVM; Frida Persson, DVM; Björn Åblad, DVM; Amelia Goddard, BVSc(Hons), MMedVet; Johan P. Schoeman, BVSc, MMedVet, PhD; Jakob L. Willesen, DVM, PhD; Inge Tarnow, DVM, PhD and Mads Kjelgaard-Hansen, DVM, PhD

- 38 dogs – South Africa
- Cardiac arrhythmias have previously been reported in 9–25% of viper-envenomed dogs
- Dogs with systemic inflammation had significantly higher cTnI than dogs without systemic inflammation
- No difference in cTnI were observed between envenomed dogs without systemic inflammation and healthy control dogs
- Viper may have a cardiotoxic component to their venom or myocardial injury may be cytokine induced

Original Study

Journal of Veterinary Emergency and Critical Care **24**(2) 2014, pp 144–153
doi: 10.1111/vec.12139

Thromboelastographic evaluation of hemostatic function in dogs treated for crotalid snake envenomation

Robert A. Armentano, DVM, DACVIM; Carsten Bandt, DVM, DACVECC; Michael Schaer, DVM, DACVIM, DACVECC; John Pritchett, DVM and Andre Shih, DVM, DACVAA

- Venom-induced consumptive coagulopathy:
  - Thrombocytopenia
  - Prolonged clotting times
  - Depletion of fibrinogen and clotting factors
  - Increased fibrin degradation product concentrations
- 38 dogs - UF
- 74% had abnormal TEGs (↓ G or ↑ Ly30), most common towards hypocoagulable
- Decreased MA and G value on presentation was associated with mortality
- TEG can be used as a monitoring tool to assess antivenin administration and need for additional vials

Coral Snake

American
Coral Snake

50-110 cm long, requires chewing to inject

Most toxic snake in North America in terms of mg of dried weight

Elapid Family - *Micrurus fulvius fulvius*

Venom:

- Postsynaptic α-neurotoxin (block nicotinic ACH receptors of NMJ)
- Phospholipases - minimal effects
  - Hemolysin (inhibits platelet aggregation and plasmin)
  - Myotoxic (muscle swelling and weakness)
  - Cardiotoxic (↓ contractility)

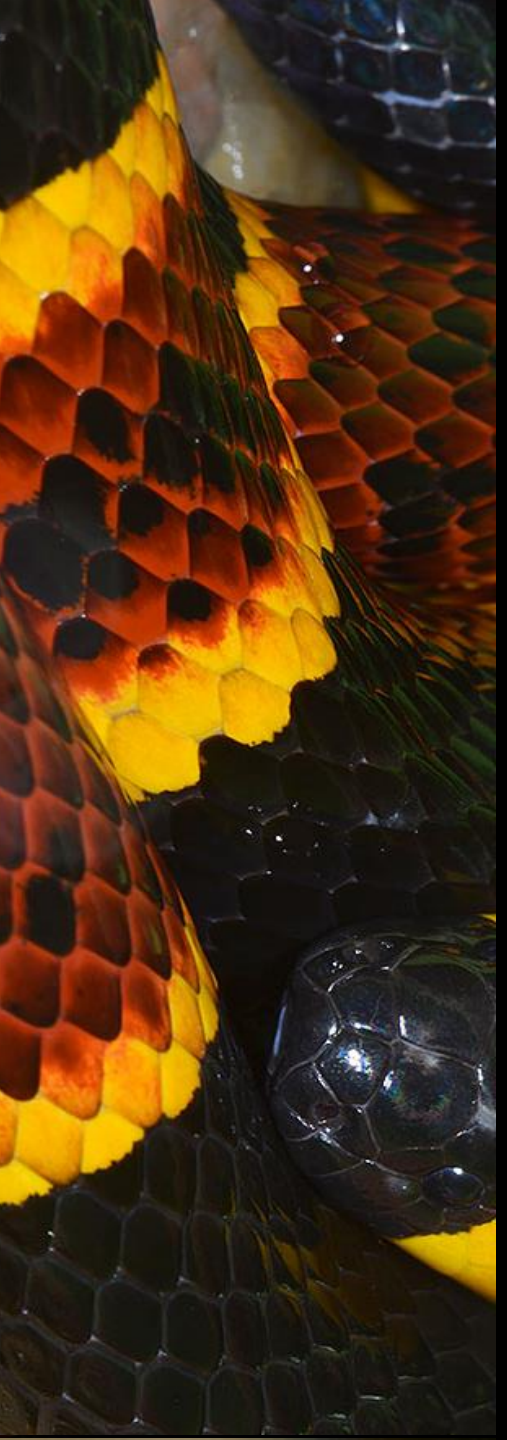
Arizona Coral Snake

Texas Coral Snake

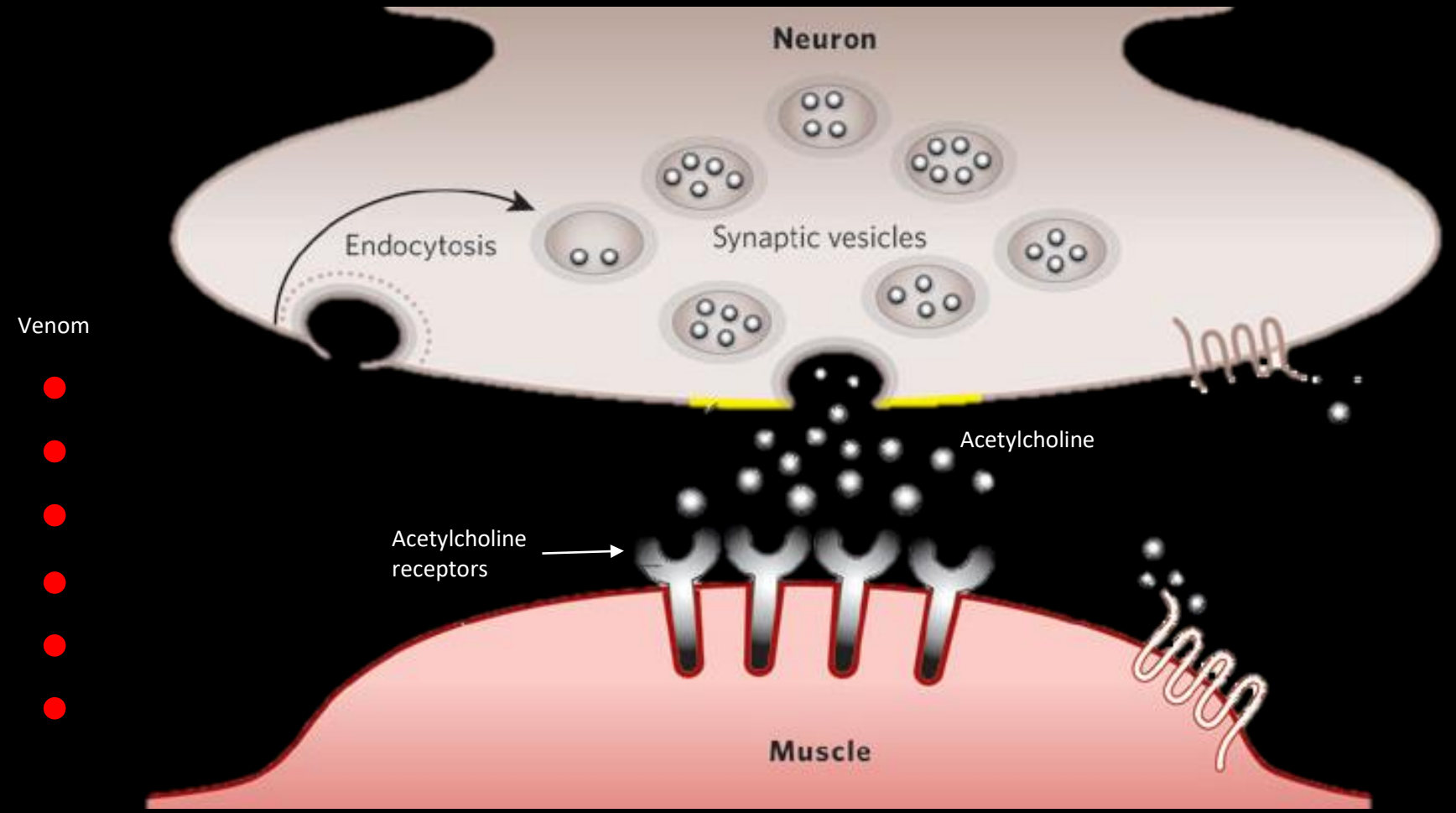
Eastern Coral Snake

https://arizonadailyindependent.com/wp-content/uploads/2015/11/coral-snake-range.png

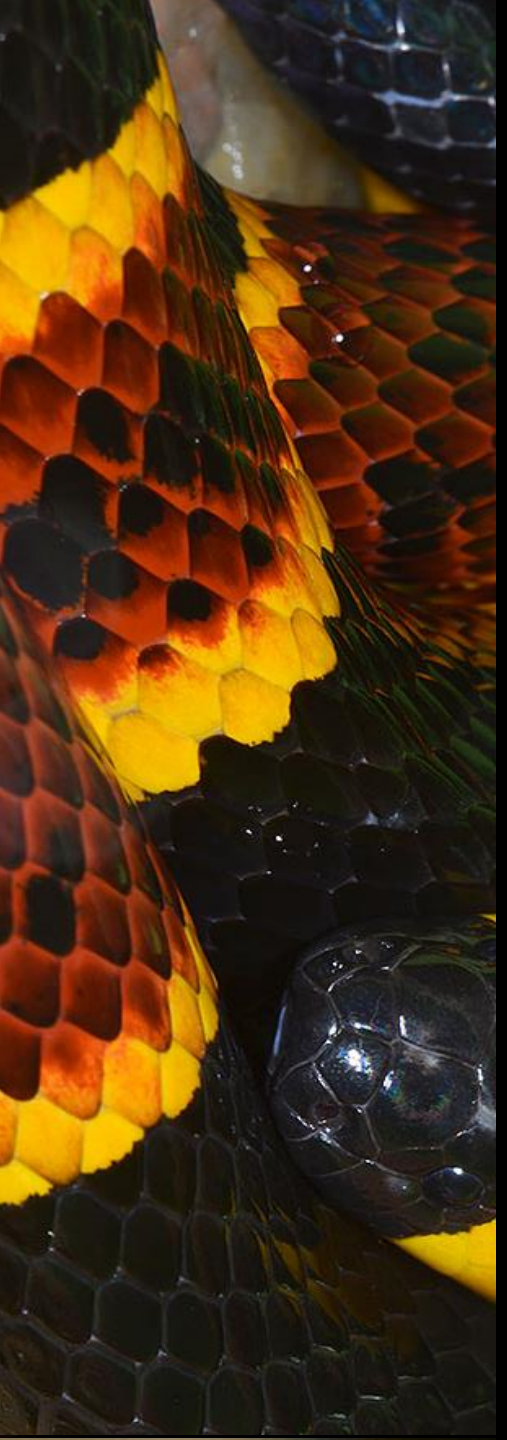
Red on Yellow, kill a fellow
Red on Black, friend of Jack* Only in USA



Coral Snake Venom

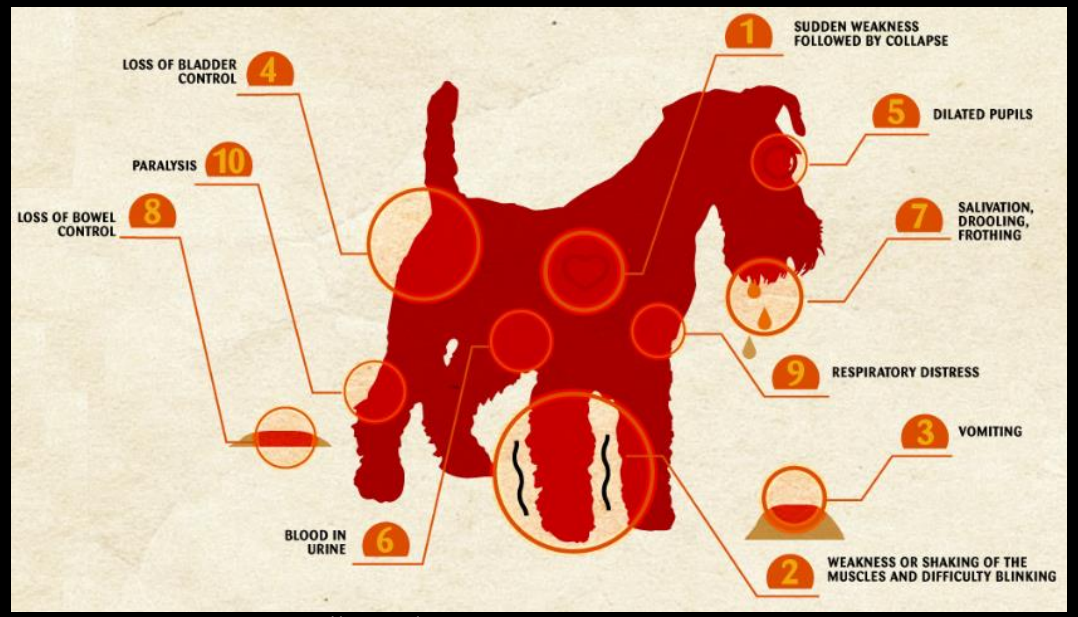


http://www.sareptiles.co.za/gallery/albums/userpics/17766/436473a-f1_2.jpg

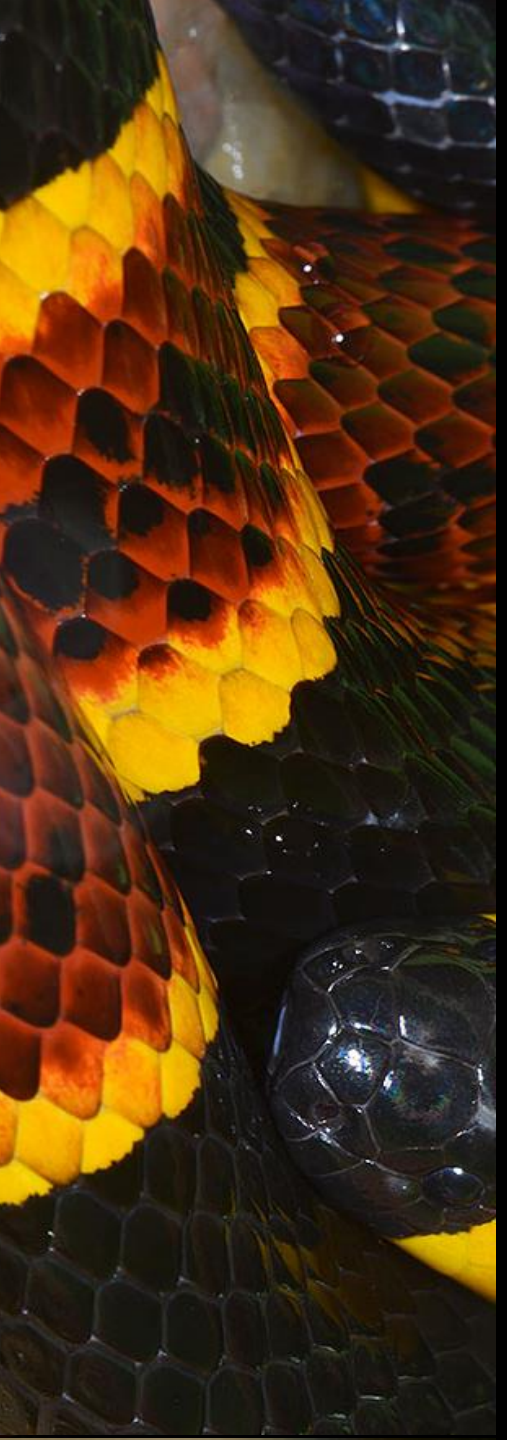


Clinical Signs

- Muscle fasciculations, pharyngeal spasms, ptosis, salivation, drowsiness
- Hemolysis, hemoglobinuria
- Neurological signs: generalized muscle weakness, hyporeflexia, qudriplegia
- Cause of death: respiratory depression and paralysis



http://visual.ly/pets-summer-series-snakebites-family-pets

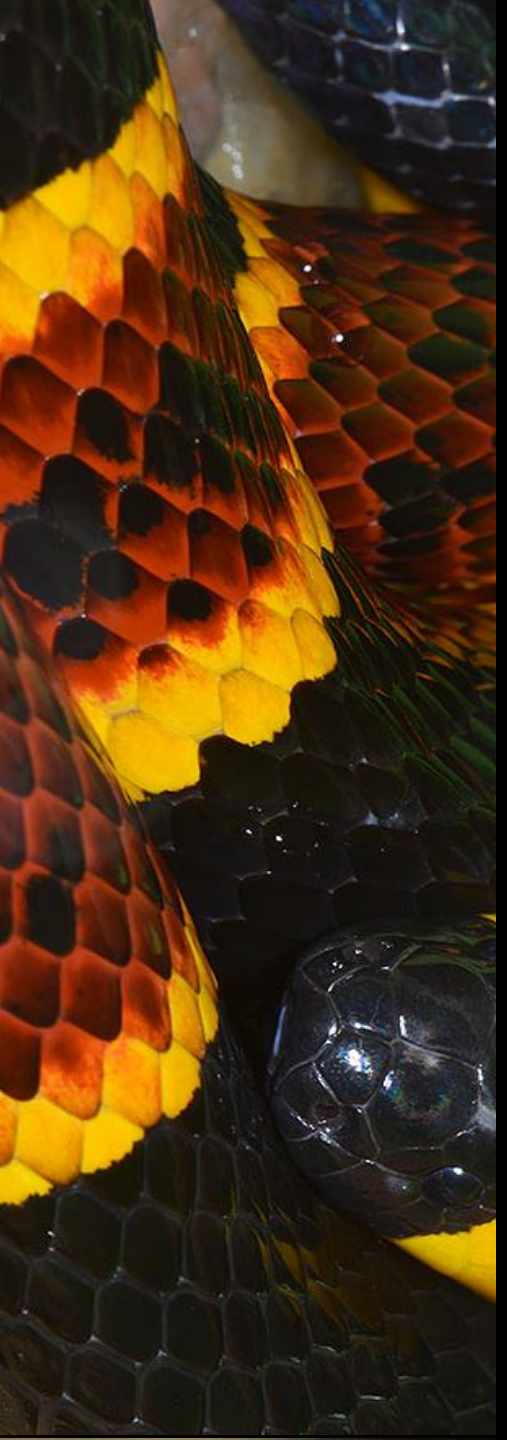


Treatment

- Antivenin – Coralmyn ($760 per vial)
  - Produced in Mexico
  - Special importer's license needed
  - Polyclonal antivenom fragment produced from horses immunized to coral snakes
  - Use in confirmed and suspect cases
  - Only stops progression
- Supportive Care
  - Pressure immobilization until antivenin
  - Mechanical ventilation (up to 48hr)
  - Fluids
  - Nutrition
  - Risk of aspiration pneumonia

Courtesy Dr. Michael Schaer

Courtesy Dr. Michael Schaer



Retrospective Study

Journal of Veterinary Emergency and Critical Care **22**(6) 2012, pp 682–689
doi: 10.1111/j.1476-4431.2012.00806.x

A retrospective evaluation of coral snake envenomation in dogs and cats: 20 cases (1996–2011)

Mayrim L. Pérez, DVM; Karlie Fox and Michael Schaer, DVM, DACVIM, DACVECC

- 16 dogs and 4 cats – UF
- Median time for onset of clinical signs 105 minutes (10 dogs witnessed bite)
- 10/14 received antivenin
  - Clinical signs improved in 24hr
  - Had shorter LOH
- 4/16 dogs required ventilation
- Hemolysis 60% dogs
- 71% survived to discharge

Clinical Signs Dogs/Cats	
Quiet mentation 50%/75%	Ataxia 19%
Teraparesis 25%	Muscle fasciculations 12%
Ptyalism 25%	Decreased spinal reflexes 12%/25%
Tachypnea 25%	CP deficits 12%/75%
Shallow breathing 19%/25%	Slow PLR 6%/25%
Decreased to absent gag 19%	Hemorrhagic diarrhea 6%

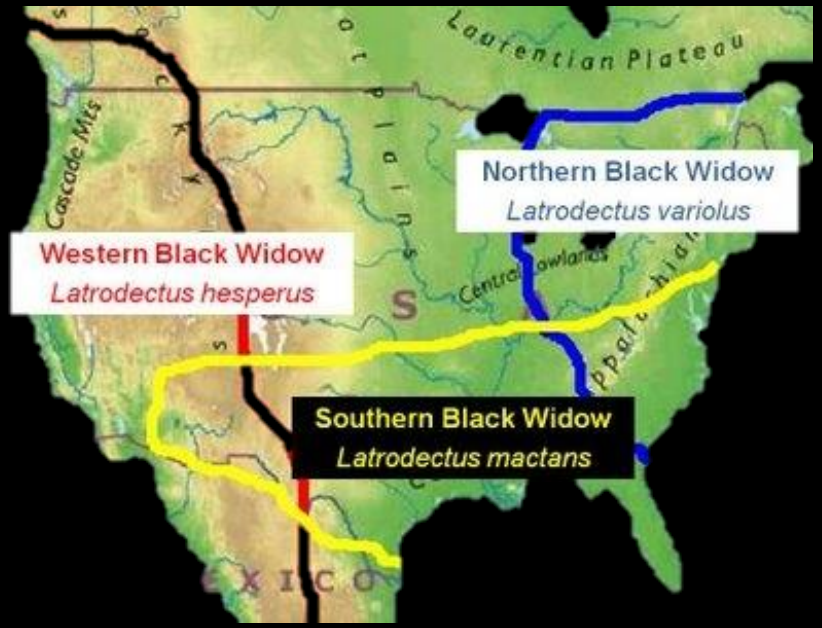
Black Widow Spider

Females have an hour-glass pattern in red or orange on ventrum
Males are unable to penetrate skin due to small size of jaw

Venom is voluntarily injected by striated muscle
15% of human bites are dry

Cats are very sensitive to venom

Latrodectus mactans
Latrodectus variolus
Latrodectus bishop
Latrodectus heperus
Latrodectus geometricus – brown widow
Latrodectus mactans



https://www.clipartsgram.com/image/17395743-bwrange.jpg

Black Widow Venom

Venom has ↑ toxicity in spiders living in areas with higher temperatures

LD50: 0.42 mg/kg - *L. geometricus* (brown widow)
1.39 mg/kg - *L. mactans*

Syndrome in humans: 3-6 days

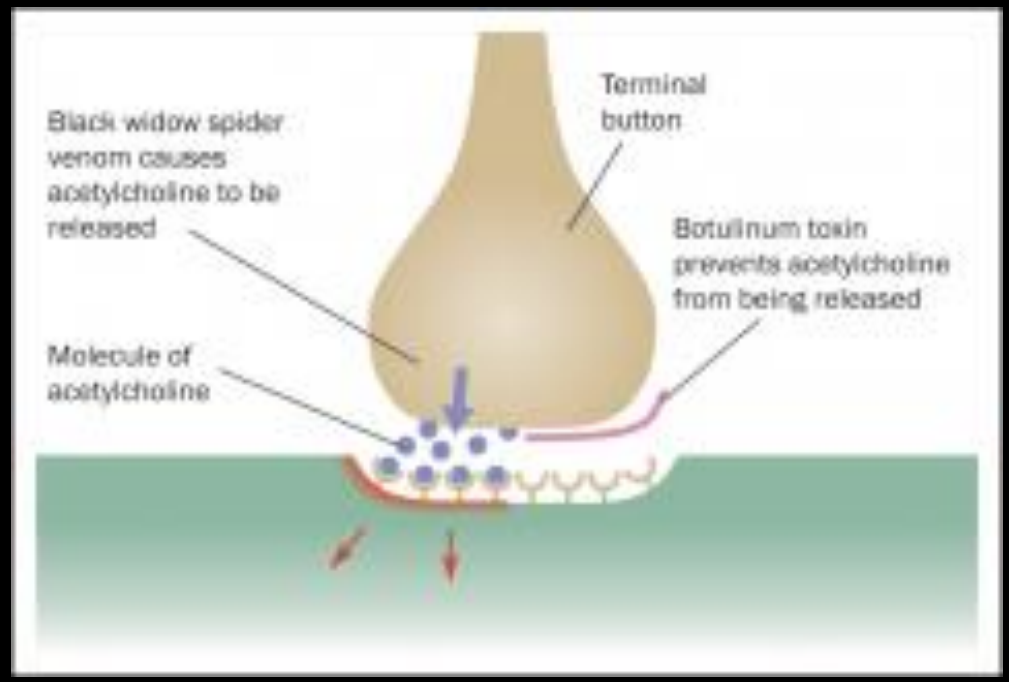
Onset of clinical signs occurs during the first 8 hr

Male Black Widow

Black Widow Venom

Neurotoxin - α-Latrotoxin:

- Stimulates end plate action potential, forming an open channel for monovalent cation exchange
- Depolarization > Ca-independent release of neurotransmitters (acetylcholine and norepinephrine) and inhibits their reuptake
- Later blocks neurotransmission, likely due to depletion of synaptic vesicle content at the NMJ



http://fce-study.netdna-ssl.com/images/upload-flashcards/1018292/1835054_m.png

Clinical Signs

- Local tissue damage is uncommon, small puncture wounds may be visible
- Initial regional numbness > gives way to severe pain
- Tenderness in adjacent LN may precede hyperesthesia, progressive muscle pain and fasciculations > 10-20 hr later paralysis
- Cramping of thoracic, abdominal* and lumbar muscles is common
- Hypertension and tachycardia (pain)
- Respiratory distress > Cheyne-stoke respiratory pattern > death
- Cats are extremely susceptible and average survival time is 115hr (4.5 days)
- Elevated CK, leukocytosis, hyperglycemia, oliguria, albuminuria can be seen

Treatment

- Antivenin – Lyovac (*Latrodectus* antivenin)
  - Slow IV infusion
  - Allergic reactions and anaphylaxis can occur
  - Affordable, long-shelf life
- Ca gluconate for muscle cramping
  - No longer recommended
- Benzodiazepines – muscle relaxants

J Vet Intern Med 1999;13:613–616

Black Widow Spider Envenomation in a Cat

David C. Twedt, Paul A. Cuddon, and Thomas W. Horn

2-hour duration acute distress with pain and muscle stiffness involving the abdomen and pelvic limbs.

Clinical signs very similar to hypokalemic myopathy, however this usually does not progress to flaccid lower motor neuron paralysis as occurs with *Latrodectus* envenomation.

Table 1. Selected laboratory data.

Laboratory Test	Initial Data	12 Hours	30 Hours	36 Hours	Day 4	Day 5	Day 6	Day 9	Day 38	Reference Range
Glucose (mg/dL)	186	137		134				108	92	67–124
Blood urea nitrogen (BUN) (mg/dL)	43	70		61	45	71		38	41	17–32
Creatinine (mg/dL)	2.9	2.5		2.2	2.3	2.5		2.1	2.8	0.6–2.0
Calcium (mg/dL)	9.1	7.5		5.6	7.0	8.2		8.8	9.4	8.5–11.0
Ionized calcium (mmol/L)			0.6	1.47			2.1			1.20–1.32
Potassium (mEq/L)	3.5	5.1	2.0	3.0	2.2	3.0	7.4	4.6	4.9	3.7–5.4
Aspartate aminotransferase (AST) (IU/L)	35	305		423			3.4	240	37	14–38
Creatine kinase (CK) (IU/L)		53,320		72,430			58,820	3298	653	60–300
Total protein (g/dL)	7.0	5.1		4.4		6.7		6.0	7.3	5.9–8.1
Hematocrit (%)	41	25		22		23		26	30	25–45

J Vet Intern Med 1999;13:613–616

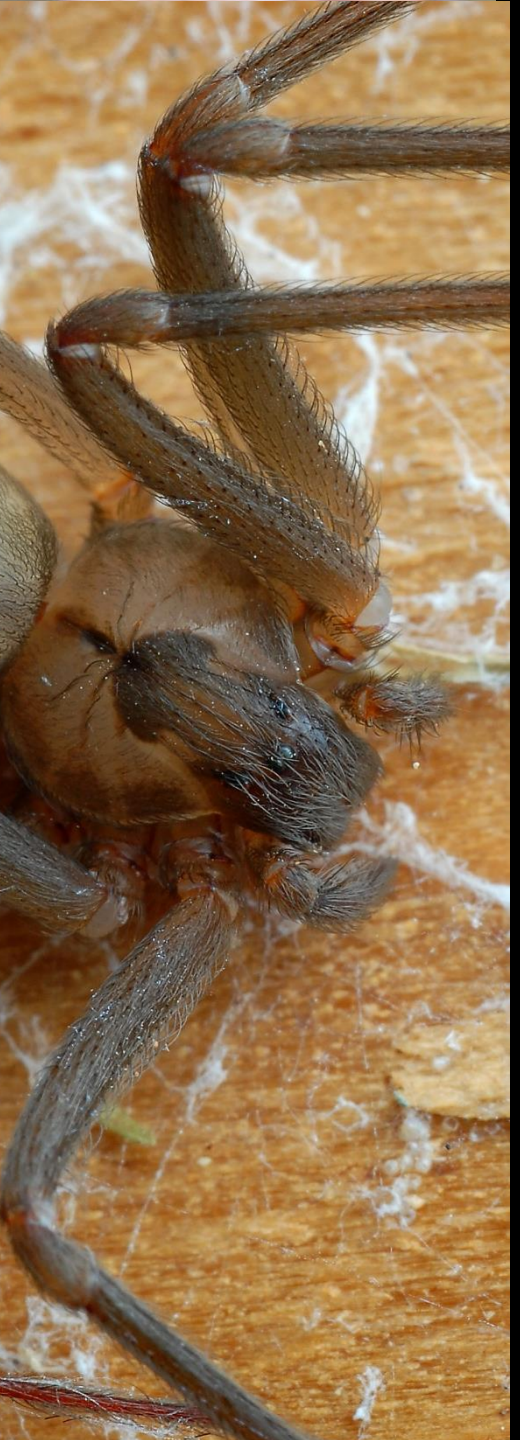
Black Widow Spider Envenomation in a Cat

David C. Twedt, Paul A. Cuddon, and Thomas W. Horn

Antivenin was administered 26hr after hospitalization and clinical response was noted within 2 hr of administration, respiratory function improved and cat was in sternal recumbency

Antibiotics, steroids and aspirin were given as treatment (no longer recommended)

Hypokalemia was attributed to large catecholamine release and K shift



Brown Recluse Spider

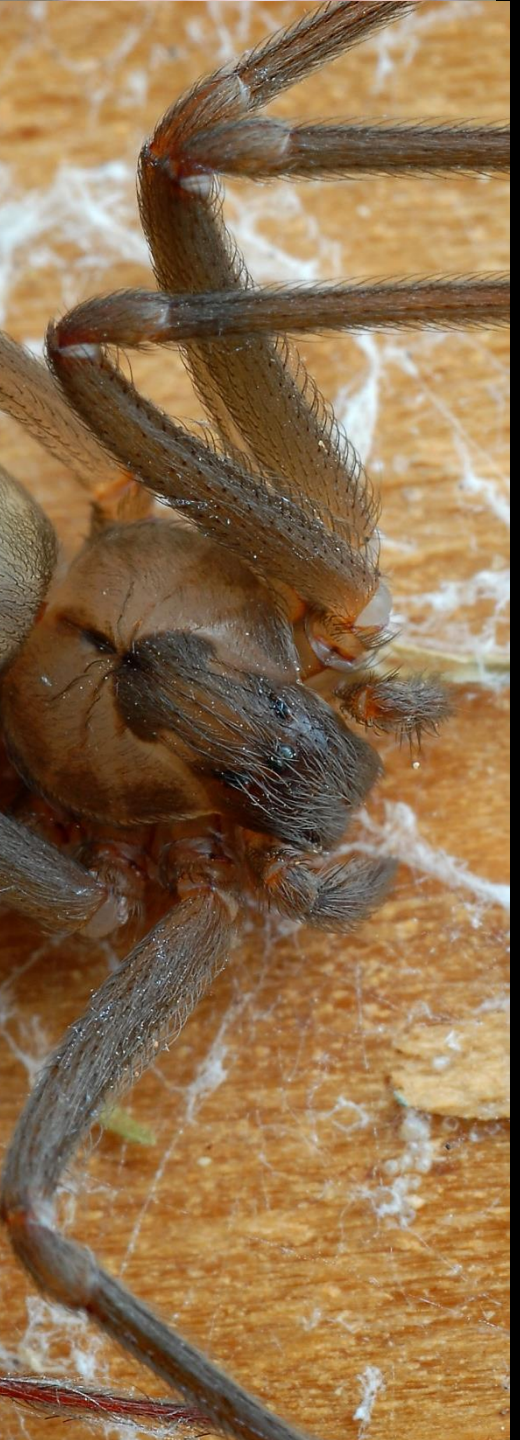
Violin-shaped marking on the dorsum of the cephalothorax, neck of the violin pointing toward the abdomen

Nocturnal, active from spring through fall, found in and around human habitations

Necrotic arachnidism*:*

- *Loxosceles reclusa*
- *Loxosceles refuscens*
- *Loxosceles arizonica*
- *Loxosceles unicolor*
- *Loxosceles laeta*

Peterson, 2016



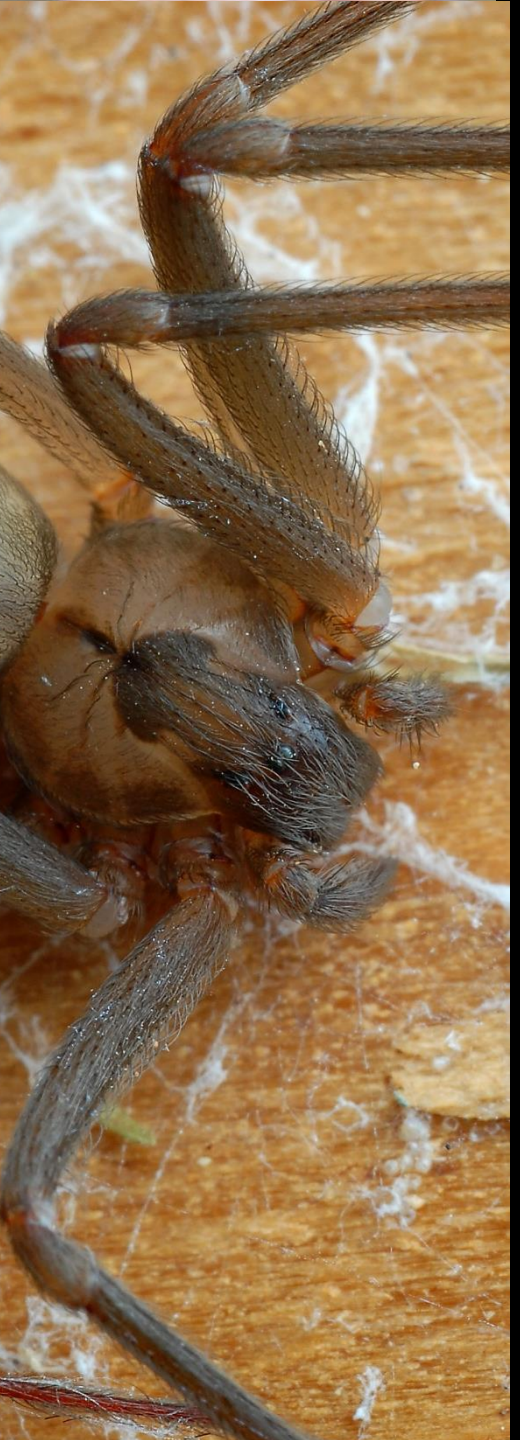
Brown Recluse Venom

Sphingomyelinase D:
- 1ary dermonecrotic factor
- Binds to cell mb, chemotaxis
- Prolongs aPTT, depletes factors VIII, IX, XI, and XII

Venom volume:
- Sex of spider (females >)
- Size of spider (larger >)
- Abnormally high or low temperatures (< volume)

Venom
Hyaluronidase
Esterase
Alkaline phosphatase
Lipase
5-ribonucleotide phosphorylase
Sphingomyelinase D

Venom effects:
- Induces rapid coagulation and occlusion of small capillaries > tissue necrosis
- Hemolysis
- Platelet aggregation
- Frees body lipids act as emboli and inflammatory mediators

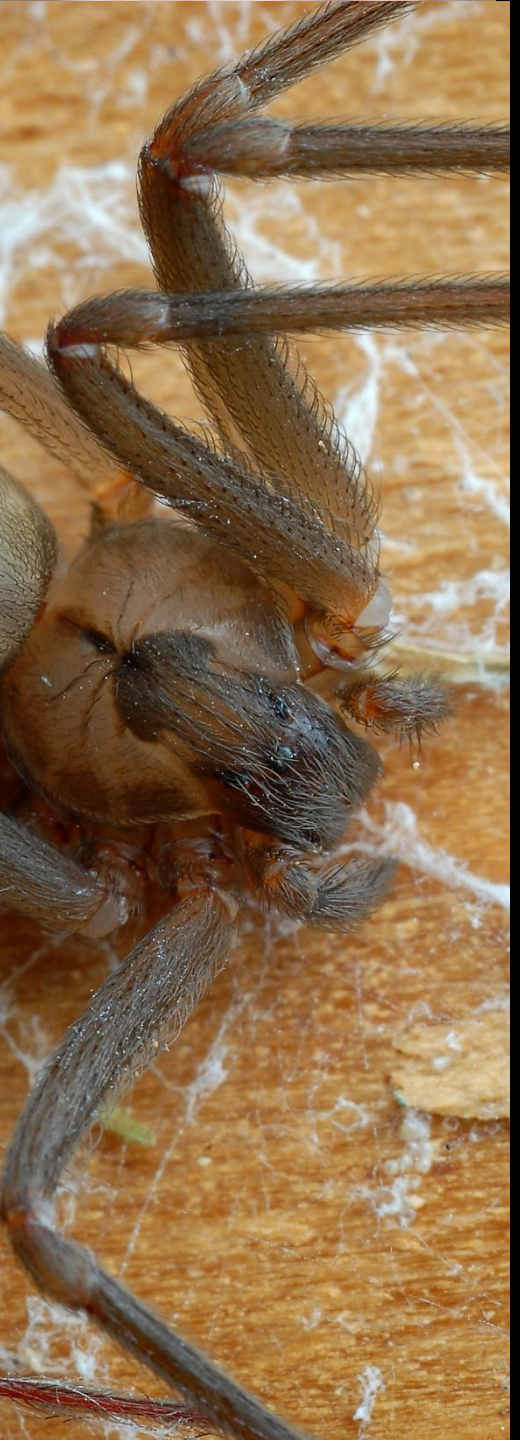


Clinical Signs

- Mild stinging up to 8 hr
- Subsequent pruritus and soreness (vasoconstriction and local ischemia)
- Edema with target, or “bull’s eye,” mark (erythematous area, dark necrotic center)
- Hemorrhagic bulla within 24-72 h with eschar (sloughs in 2-5 weeks > ulcer)
- Fever, vomiting, arthralgias, leukocytosis, hemolytic anemia, hemoglobinuria
- Systemic involvement is rare (AKI, DIC, death)

https://getridpests.com/wp-content/uploads/2016/08/Poisonous-Spider-Bites-Pictures-min.jpg

http://www.city-data.com/forum/attachments/dogs/105464d1356938229-anyone-have-dog-bit-brown-recluse-img_20121229_142834.jpg



Clinical Practice Review

Journal of Veterinary Emergency and Critical Care 19(4) 2009, pp 329–336
doi: 10.1111/j.1476-4431.2009.00440.x

Brown recluse spider (*Loxosceles reclusa*) envenomation in small animals

Lonny B. Pace, DVM and Richard S. Vetter, MS

Clinical categories:

1- No clinical signs or local irritation 95% cases

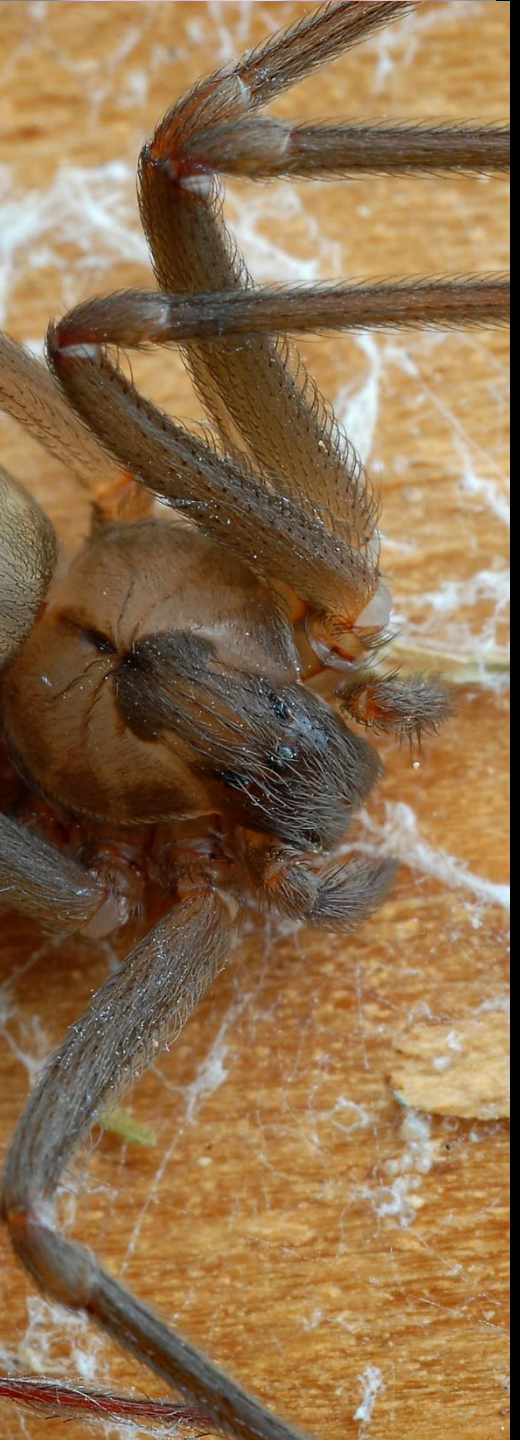
2- Necrotic arachnidism, gangrenous arachnidism or cutaneous loxoscelism 4% cases

3- Viscerocutaneous loxoscelism <1% cases

Proposed treatments:

- Steroids
- Dapsone
- Antihistamines
- Colchicine
- Surgical excision
- Vasodilators
- Hyperbaric oxygen
- Antibiotics
- Anticoagulants
- Shock therapy
- Topical nitroglycerine
- High dose Vit C
- Meat tenderizer

tradermal not intravenous. A Chilean study[34] rated susceptibility based on weight/dose relationships in several different animals to *L. laeta* venom. Rabbits, mice, guinea pigs, and dogs were rated as high susceptibility; hamsters, pigeons, chickens, and toads had moderate susceptibility; frogs were low; and rats and fish exhibited no response to the venom. Dogs ($n = 2$)



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Brown recluse spider (*Loxosceles reclusa*) envenomation in small animals

Lonny B. Pace, DVM and Richard S. Vetter, MS

Dapsone:

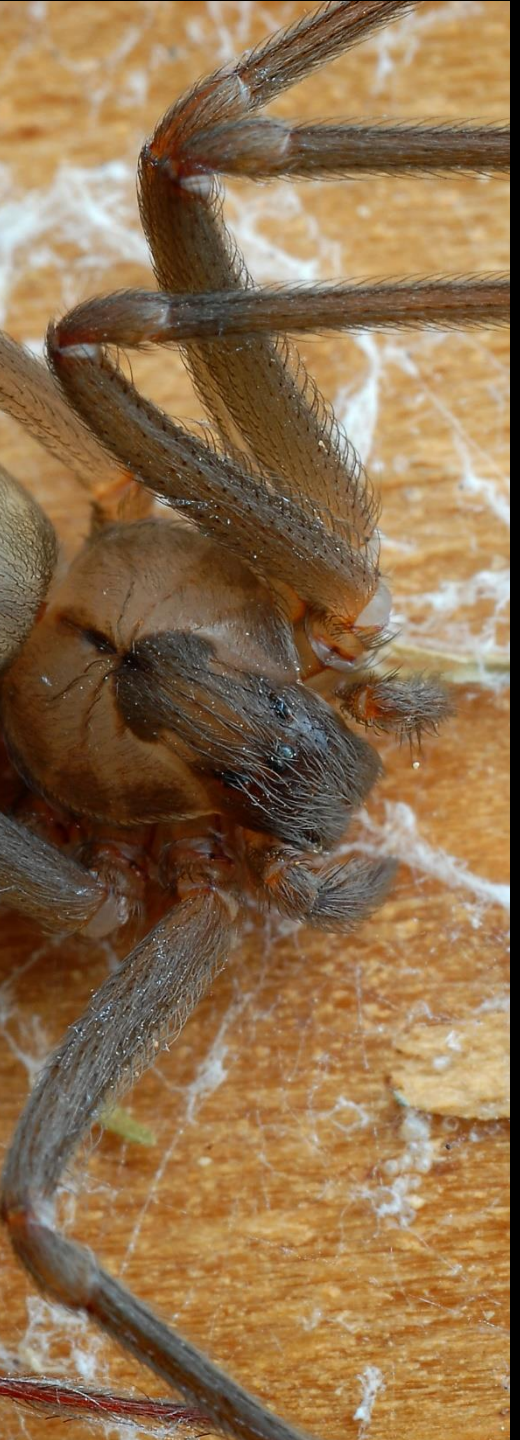
- Antimycobacterial used in leprosy and pemphigus
- Inhibits influx of neutrophils
- Side effects similar to loxoscelism
- Only to be given within the 1st hours of the bite
- Not recommended

Antivenin:

- Only available in Brazil
- Successful if given within 1 hour of envenomation
- Antigen binding fragments attenuate the lesion if given within 4 hr

Tetracyclines:

- Decreases MMPs activated by venom



Treatment

- No antidote in USA
  - One antivenom in Brazil
- Mild local envenomation usually will respond to topical cool compresses
- Supportive care
  - Wound management
  - Pain management
  - Broad spectrum antibiotic therapy if needed

IDENTIFYING COMMON UNITED STATES HOUSE SPIDERS

LEGEND

HARMLESS
Non-toxic bite.

SERIOUS
Venomous, Non-fatal bite.

DANGEROUS
Toxic bite. Potentially lethal. Seek immediate medical attention.

SPECIES IS COMMON

LIGHTLY POPULATED

NONE

YELLOW SAC SPIDER

Yellow sac spiders are small to medium-sized spiders (1/5- to 2/5-inch long) and are usually yellowish or light-colored

FOUND IN
Yellow sac spiders could be found in places like Garden sheds, Garages, House foundations, Behind picture frames, Window sills and Baseboards.

SERIOUS

DOMESTIC HOUSE SPIDER

Commonly known as the barn funnel weaver in North America. These spiders are often yellowish-brown in color with an elongated abdomen.

FOUND IN
Common in buildings or other man-made structures; any cellar, barn, or dark corner is fair game for this spider. It can be found outdoors in other sheltered spots, such as in wood piles and under rocks, etc.

HARMLESS

BLACK WIDOW

Black widows are black and shiny, with a telltale red hourglass shape on their back

FOUND IN
Prefers woodpiles, rubble piles, under stones, in hollow stumps, sheds and garages. Indoors it can be found in undisturbed, cluttered areas in basements and crawl spaces

DANGEROUS

JUMPING SPIDER

Jumping spiders are compact in shape with short legs. They are usually black in color with pale markings

FOUND IN
They are active during the day and are often found on windows, ceilings, walls, and other areas exposed to sunlight.

HARMLESS

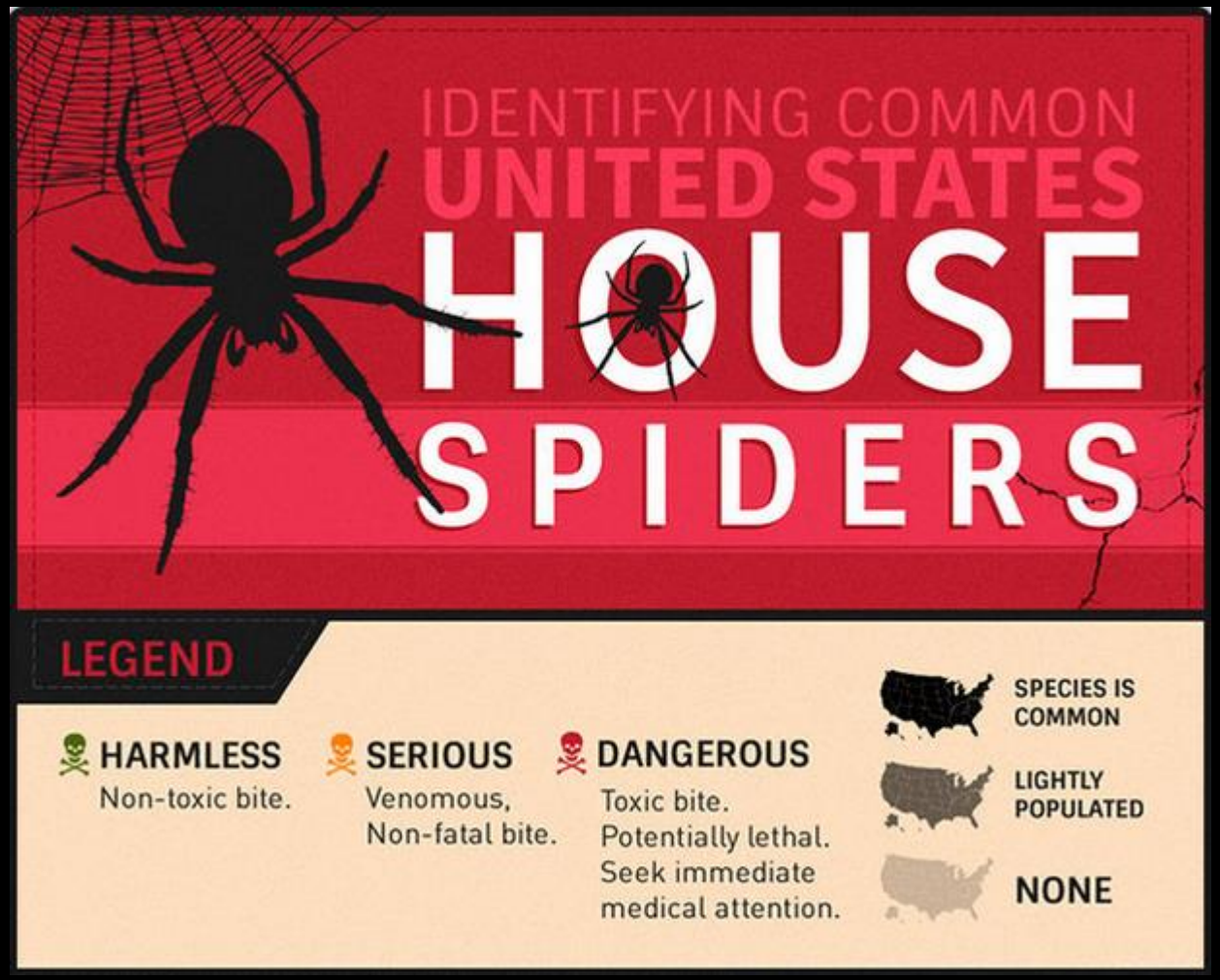
BROWN RECLUSE

Brown recluse spiders are light to dark brown, with a characteristic dark brown violin marking on their back.

FOUND IN
Prefers woodpiles, rubble piles, under stones, in hollow stumps, sheds and garages. Indoors it can be found in undisturbed, cluttered areas in basements and crawl spaces

DANGEROUS

https://www.buzzfeed.com/russpage/how-to-identify-common-poisonous-spiders-in-your-h-lg7l?sub=3018948_2473867#2473867



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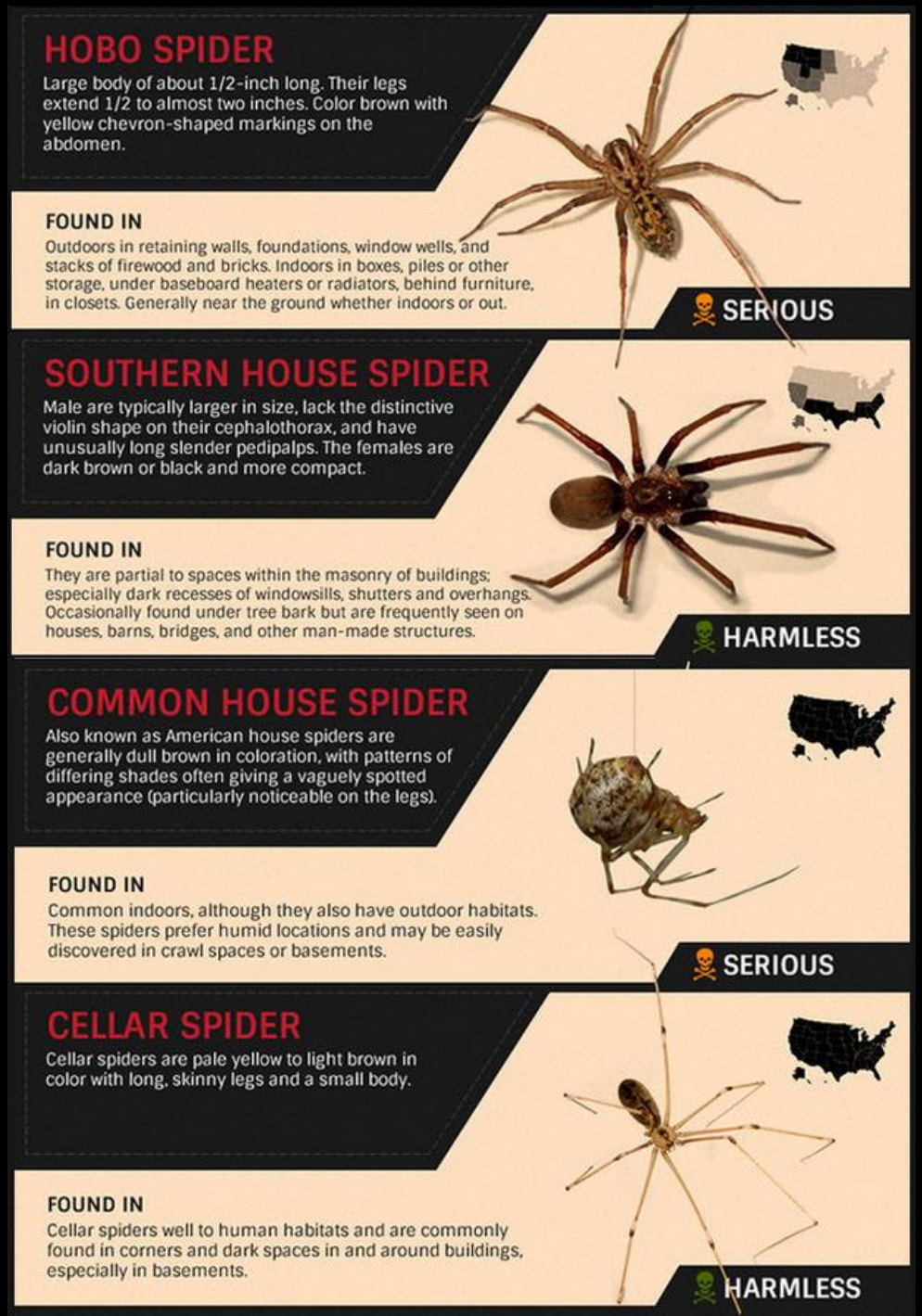
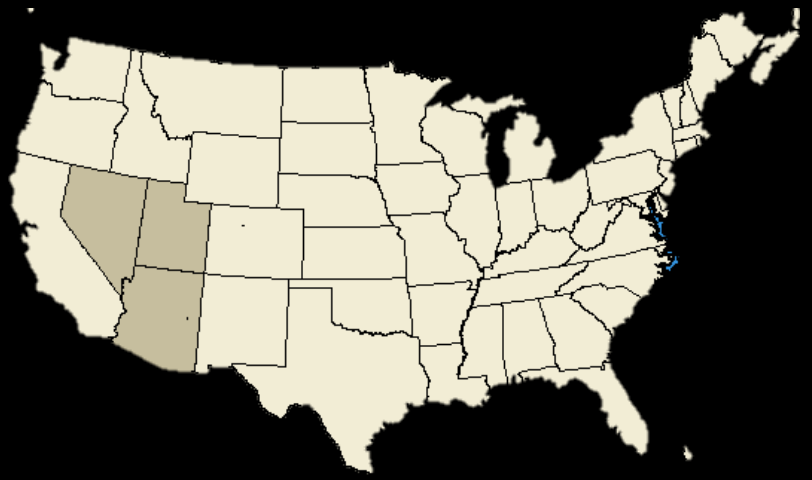


Scorpions

Small light brown scorpion common to the Sonaran Desert in southwest USA and northwestern Mexico

Nocturnal and prefers to ambush its prey, usually feeding on crickets, roaches, beetles, and other small insects

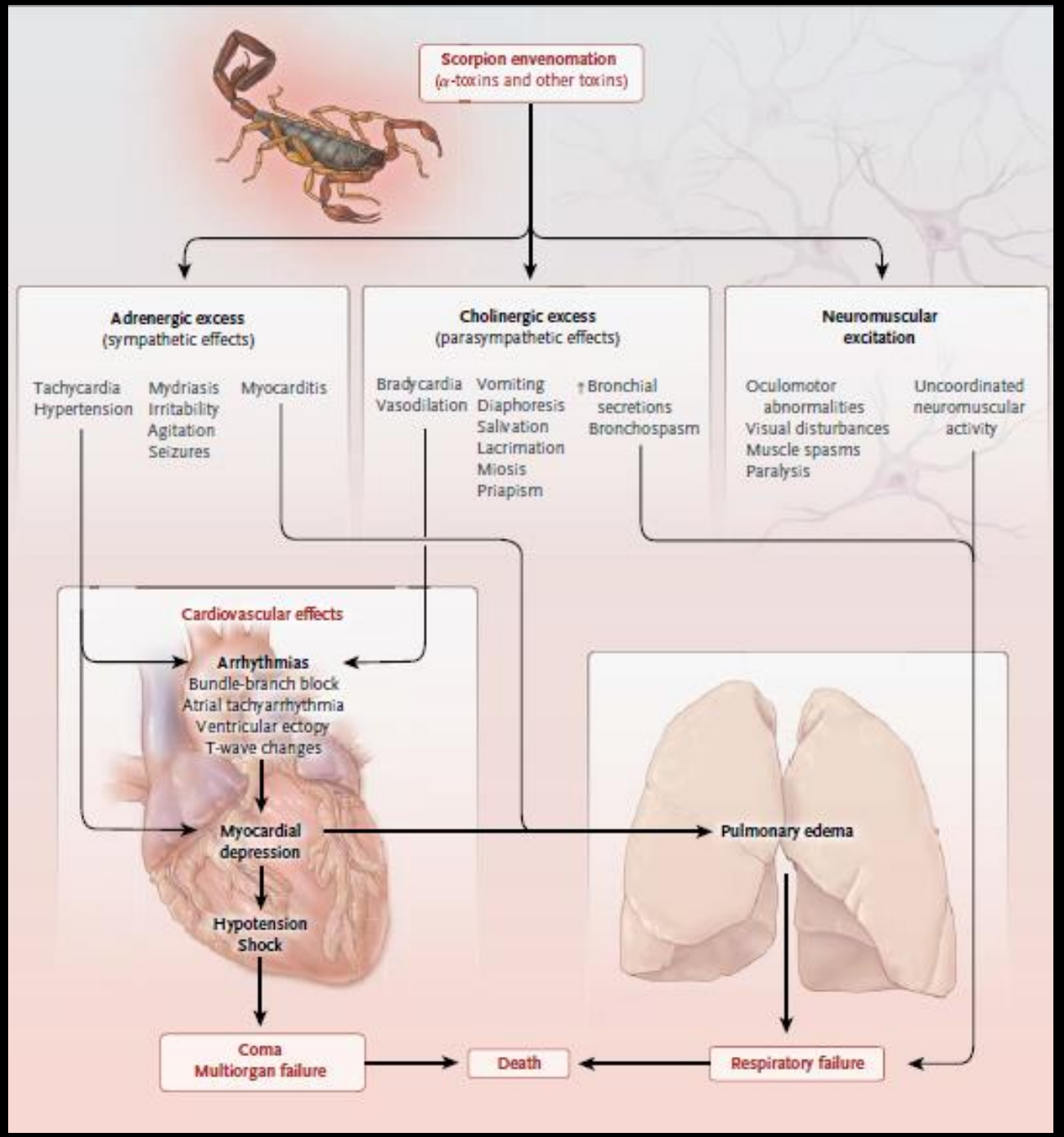
Centruroides sculpturatus – Arizona Bark Scorpion



http://bugguide.net/maps/maps/45899.png

Scorpion Venom

- Mucopolysaccharide
- Hyaluronidase
- Phospholipase
- Acetylcholinesterase
- serotonin
- Histamine protease inhibitors
- Histamine releasers
- Neurotoxins



Scorpion sting classification

Table 1. Treatment of Scorpion Stings According to Clinical Grade.*

Clinical Grade or Class	Clinical Effects	Treatment
1	Local effects only	Analgesia, local anesthesia
2	Autonomic excitation	Antivenom, prazosin
	Agitation and anxiety	Oral benzodiazepines
3	Pulmonary edema	Admission to intensive care unit, noninvasive or mechanical ventilation, antivenom, vasodilators (e.g., prazosin), in some cases nitroglycerin†‡
	Hypotension and cardiogenic shock	Antivenom, dobutamine infusion†
	Severe neuromuscular excitation (associated with centruroides species)	Antivenom, benzodiazepine infusion†
4	Multiorgan failure, including coma, seizures, and end-organ damage caused by hypotension	Supportive care, mechanical ventilation, inotropes (e.g., dobutamine), benzodiazepine infusion

Table 2. Treatments for Scorpion Envenomation, Effects, Indications, and Dosing.*

Treatment	Effect	Indications	Suggested Dosing
Analgesic agent (acetaminophen, ibuprofen)	Provides pain relief and antiinflammatory action; acetaminophen also has antipyretic effect.	Local pain	Follow standard pediatric and adult dosing for pain and fever
Local anesthetic agent	Provides relief from severe local pain	Severe pain that does not respond to analgesia	Follow standard dosing of anesthetic without epinephrine for local wound infiltration, administered at sting site
Antivenom	Binds toxins and prevents them from reaching target site; increases rate of toxin elimination	Systemic envenomation	Follow manufacturer's instructions
Prazosin	Decreases peripheral vascular resistance without affecting cardiac output or heart rate or contributing to elevation of catecholamine levels	Indications of excess catecholamine, hypertension	Administer 0.5 mg prazosin orally every 3 hr (0.25 mg in children)
Dobutamine (or other inotrope)	Treats cardiogenic shock and decreases in cardiac output resulting from elevated catecholamine levels and myocardial injury	Hypotension due to cardiogenic shock	Administer 5–15 μg dobutamine/kg of body weight/min
Nitroglycerin	Acts as vasodilator for treatment of pulmonary edema; decreases preload and afterload through arteriolar dilation and venodilation	Pulmonary edema	Administer 10 μg nitroglycerin/min intravenously in adults, 1–4 μg/kg/hr in children; double rate every 5 min on basis of clinical response, but maintain systolic blood pressure at level >90 mm Hg
Benzodiazepine (e.g., midazolam, diazepam)	Acts as an anticonvulsant and may be effective for treatment of hypertension associated with sympathetic excitation; in cases of severe neuromuscular excitation, used for sedation and symptomatic relief (e.g., midazolam in patients with centruroides stings)	Neuromuscular incoordination, sympathetic agitation and seizures	For neuromuscular incoordination, initially administer midazolam bolus intravenously, 0.05–0.1 mg/kg, then commence infusion at 0.1 mg/kg/hr, adjusting dose to maintain light sleep; for sympathetic agitation and seizures, administer 0.1–0.2 mg diazepam/kg orally or 0.05–0.1 mg diazepam or midazolam/kg intravenously
Atropine	Acts as muscarinic receptor blocker to ameliorate cholinergic effects of sting, including bradycardia, early hypotension, and excessive sweating or salivation; can potentiate sympathetic effects, including hypertension	Severe bradycardia associated with hypotension or cardiac decompensation	Administer 0.5 mg atropine (0.02 mg/kg in children); dose can be repeated if severe bradycardia recurs
Other vasodilator (e.g., hydralazine, captopril, nifedipine, sodium nitroprusside, clonidine)	Decreases peripheral vascular resistance and reduces hypertension, but evidence for use not strong and has potential adverse effects (e.g., sympathetic stimulation, reflex tachycardia)	Not recommended because of potential adverse effects	

J. Venom. Anim. Toxins incl. Trop. Dis.
V.10, n.1, p.98-105, 2004.

ENVENOMATION BY SCORPION IN DOG – CASE REPORT

CARDOSO M. J. L.[1], SAKATE M.[2], CIAMPOLINI P.[2], MOUTINHO F. Q.[2], CHERUBINI A. L.[3]

- Hyperemic, pain, aggressiveness, tachypnea, tachycardia, and discrete erythema
- Asymptomatic within 24h

J. Venom. Anim. Toxins incl. Trop. Dis.
V.12, n.1, p.19-43, 2006.

CLINICAL AND CARDIOVASCULAR ALTERATIONS PRODUCED BY SCORPION ENVENOMATION IN DOGS

CORDEIRO F. F. (1), SAKATE M. (1), FERNANDES V. (2), CUYUMJIAN P. R. (3)

- Natural envenomation dose (0.4 mg/total dose SQ) – G2
  - local pain, hyperesthesia, sialorrhea, vomiting, diarrhea, sneeze and prostration
- Experimental dose (0.25 mg/kg SQ) – G1
  - caused acute and reversible cardiac injury in few days

J. Venom. Anim. Toxins incl. Trop. Dis.
V.10, n.1, p.98-105, 2004.

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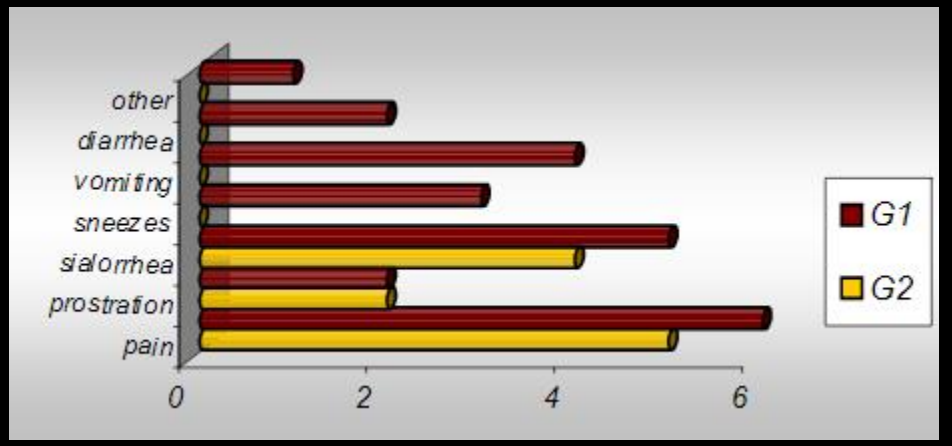


Hymenoptera

3 medically important groups:

- Apoidea (bees 20,000 species)
- Vespoidea (wasps, hornets, and yellow jackets 15,000 species)
- Formicidae (ants 15,000 species)

Deliver venom by stinging

Most deaths are related to hypersensitivity reactions and anaphylaxis, although massive envenomation can lead to death regardless

Lethal dose: 20 stings/kg in most mammals

Hymenoptera venom

Table 1 Comparison of Hymenoptera Venom

Apids (bees)	
Phospholipase A	Biogenic amines
Hyaluronidase	Acid phosphatase
Mellitin	Mast cell degranulating peptide
Apamin	Minimine
Vespids (wasps, yellow jackets, hornets)	
Phospholipase A	Acid phosphatase
Hyaluronidase	Antigen 5
Biogenic amines	Mast cell degranulating peptide
Kinins	
Formicides (fire ants)	
Phospholipase	Piperidines
Hyaluronidase	
Biogenic amines	

Fitzgerald et al, 2006

Bees

Honey bees can only sting once, barbed stinger stays in victim's skin

Usually not aggressive, with exception of Africanized bees

Anaphylaxis is not dose-related and death can occur after a single sting

Venom:

- Phospholipidase A2 major allergen
- Mellitin causes pain > catecholamine release + phospholipidase A2 causes intravascular hemolysis
- Hyaluronidase disrupts collagen allowing venom to spread
- Apamin is neurotoxic
- Adolapin inhibits prostaglandin synthesis and is anti-inflammatory
- Mast cell degranulating protein

Veterinary Radiology & Ultrasound, Vol. 46, No. 4, 2005, pp 300–303.

IMAGING DIAGNOSIS: ACUTE LUNG INJURY FOLLOWING MASSIVE BEE ENVENOMATION IN A DOG

THOMAS WALKER, AMY S. TIDWELL, ELIZABETH A. ROZANSKI, ARMELLE DELAFORCADE, ANDREW M. HOFFMAN

5 yo NM Beagle

100 bee stings > anaphylactic shock

48hr after presented in respiratory distress

Acute lung injury: acute onset, hypoxemia, bilateral infiltrates

Fluids, cefazolin, heparin and oxygen

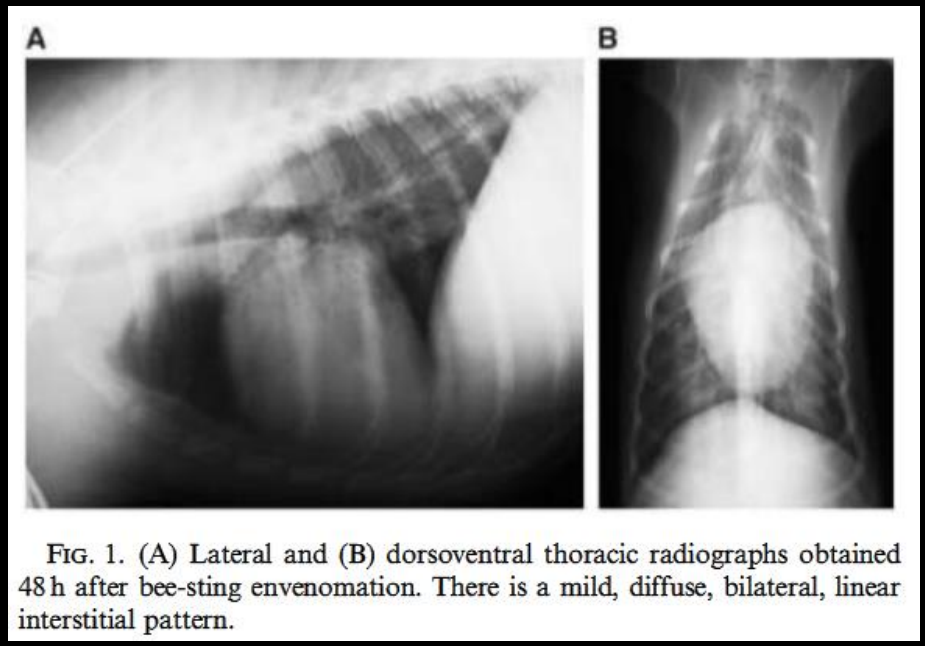


FIG. 1. (A) Lateral and (B) dorsoventral thoracic radiographs obtained 48 h after bee-sting envenomation. There is a mild, diffuse, bilateral, linear interstitial pattern.

Wasp and Hornets

More aggressive than bees, live in shrubs and trees

Carnivores, live on insects and sweets, feeding cue from flesh smell of sugars

Unbarbed stinger, can sting multiple times

Venom:

- Antigen 5 is the main allergen
- Phospholipidase A may produce coagulation abnormalities

THE JOURNAL OF VETERINARY EMERGENCY AND CRITICAL CARE • VOL. 9, NO. 2 • JUNE, 1999 • PAGE 67

Massive envenomation by Vespula *spp.* in two dogs.

Lori S. Waddell, DVM and Kenneth J. Drobatz, DVM

5 y NM Golden Retriever and a 5y NM Labrador

Found collapsed with numerous yellow jackets on them

Labrador: Hemolysis, AKI, DIC, resp failure, euthanasia

- Necropsy: multiorgan hemorrhage, severe pulmonary edema, acute tubular necrosis

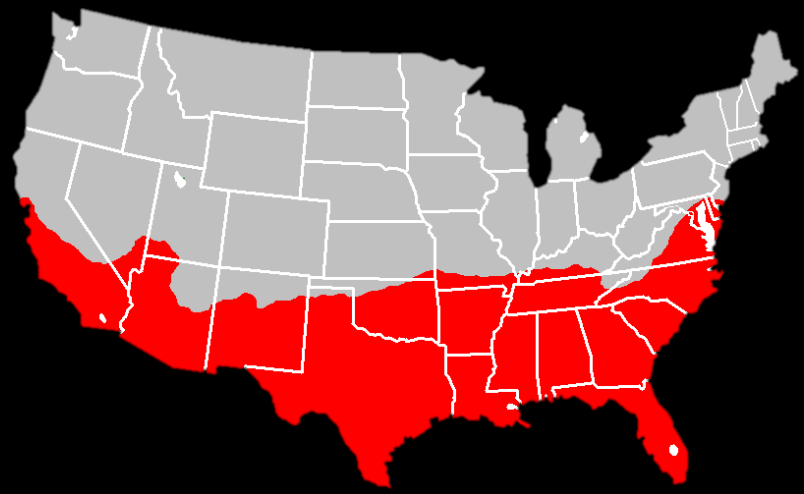
Golden: Coagulopathic, elevated liver enzymes, icteric, pulmonary edema

- Treatment: FFP, oxygen, furosemide, antibiotics, antiemetics

Fire Ants

Very aggressive, 3-4 mm, omnivorous
Latch on 1st with mandible, then stings with unbarbed stinger, rotate one step sideways and sting again, repeat this 6-7 times

Systemic toxic reaction: 50-100 simultaneous stings
Massive envenomation can occur leading to death in 24 hr, although most deaths are due to anaphylaxis



https://zactopia.files.wordpress.com/2010/05/fireantmap1.png

Fire Ants

Venom:

- 95% water-insoluble alkaloid (2,6 di-substituted piperidines) – cytotoxic, hemolytic, antibacterial and insecticidal – very painful, produces pustules
- Aqueous phase has 4 major allergens
- Hyaluronidase and phospholipase

Sterile pustules formed by 24 hr > pathognomonic

- Infiltrated with activated neutrophils and platelets with necrotic base

Treatment is symptomatic

Table 5 Clinical Signs of Fire Ant Stings

Simple, local sting
Wheal and flare
Erythema
Warmth
Pain
Intense itching
Large, regional reaction
Erythema
Warmth
Pain
Itching
Anaphylactic reaction
Urticaria
Cutaneous edema
Laryngeal edema
Bronchospasm
Vascular collapse

Fitzgerald et al, 2006

Bufo Toad

Toads are known to be more active in periods of high rainfall, humidity and temperature

Cane or Marine toad *Bufo marinus*
(Florida and Hawaii)

Colorado river toad *Bufo alvarius*

Cane toad distribution

http://ufwildlife.ifas.ufl.edu/images/canetoadrange.jpg

Bufo Toad Venom

Lethal dose: 0.1 g/dog (entire content of both parotids)
Absorbed across mucus membranes

Release secretions from parotid glands located on the dorsum of their head and neck

- Can also be squirted up to 2 mt
- Bufagenins and bufotoxins: cardioactive steroids, digitalis-like substances, inhibition of Na/K/ATPase >↑ intracellular Na in myocardial cells > ↑ intracellular Ca >predisposing to ventricular arrhythmia and possible fibrillation
- Bufotenine is a pressor substance (catecholamines, epinephrine, norepinephrine, dopamine) and hallucinogenic (serotonin, 5-HTP)

Bufo Toad

Treatment

- Wash mouth
- IV fluids
- Diazepam 0.5-2 mg/kg IV
- Propanolol 0.02-0.06 mg/kg slow IV – tachycardia
- Atropine – only if bradycardic (< 50beats/min), not necessary for ptyalism
- Hypertonic fluids if needed

Monitoring

- ECG
- Blood pressure
- Seizure watch

JAVMA, Vol 216, No. 12, June 15, 2000

Bufo marinus intoxication in dogs: 94 cases (1997–1998)

Brian K. Roberts, DVM; Michael G. Aronsohn, VMD, DACVS; Bradley L. Moses, DVM, DACVIM; Ronald L. Burk, DVM, MS, DACVR; Jeffrey Toll, VMD, DACVIM; F. Robert Weeren, DVM, MS, DACVS

66 dogs with toad envenomation

Spring and summer most frequent envenomations

18% previous offenders (mean 3 exposures)

96% survival with treatment

Clinical signs	
Neurologic abnormalities 54%	Seizures 43% (9% status) Stupor 33% Ataxia 33% Nystagmus 31% Extensor rigidity 8%
Hyperemic mm 51%	
Ptyalism 42%	
Recumbency or collapse 18%	
Tachypnea 16%	
Vomiting 12%	

Australian Veterinary Journal Volume 82, No 10, October 2004

A retrospective report of 90 dogs with suspected cane toad (*Bufo marinus*) toxicity

MP REEVES

90 dogs

41% witnessed cases

59% suspected cases

76% small breed dogs (terriers mostly)

96% survival with treatment

Table 2. Clinical signs in 90 dogs presented to a Brisbane clinic with Cane toad (*Bufo marinus*) toxicity

Clinical Signs	% (Number of cases)
Increased salivation	78 (70)
Red mucous membrane	63 (57)
Seizures	31 (28)
Weak, unsteady gait	31 (28)
Cardiac arrhythmia	21 (19)
Muscle tremors	20 (18)
Vomiting	19 (17)
Altered mental state:	
-unresponsive	20 (18)
-disoriented/hallucinating	9 (8)
-agitated/distressed	7 (6)
Muscle stiffness	7 (6)

Questions?

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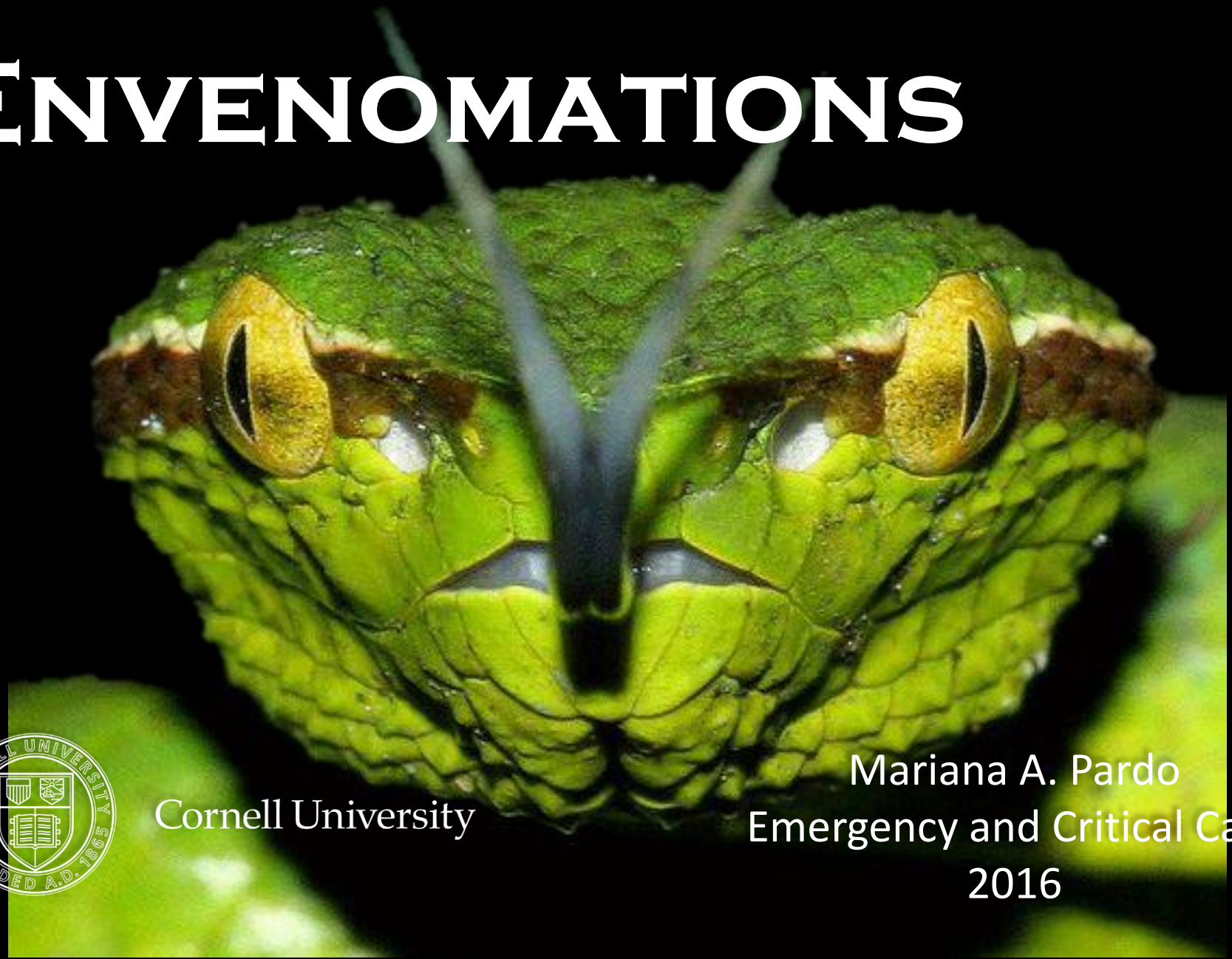
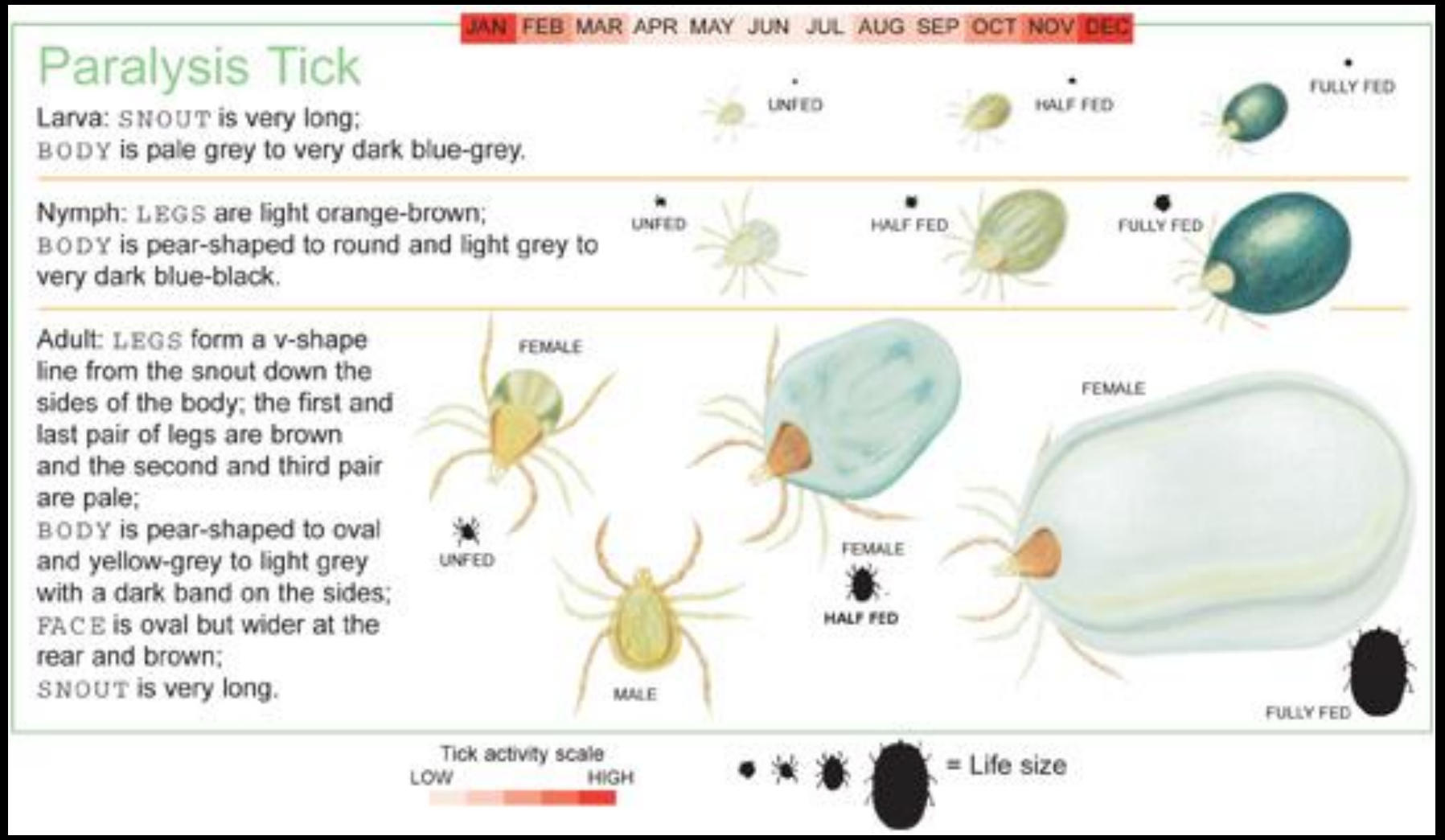
Envenomations



Cornell University

Mariana A. Pardo
Emergency and Critical Care
2016

Paralysis Tick



Snake Severity Score

Pulmonary System
0—Signs within normal limit
1—Minimal: slight dyspnea
2—Moderate: respiratory compromise, tachypnea, use of accessory muscles
3—Severe: cyanosis, air hunger, extreme tachypnea, respiratory insufficiency or respiratory arrest from any cause

Cardiovascular System
0—Signs within normal limits
1—Minimal: tachycardia, general weakness, benign dysrhythmia, hypertension
2—Moderate: tachycardia, hypotension (but tarsal pulse palpable)
3—Severe: extreme tachycardia, hypotension (non palpable tarsal pulse), malignant dysrhythmia or cardiac arrest

Local Wound
0—Signs within normal limits
1—Minimal: pain, swelling, ecchymosis, erythema limited to bite site
2—Moderate: pain, swelling, ecchymosis, erythema involves less than half of extremity and may be spreading slowly
3—Severe: pain, swelling, ecchymosis, erythema involves most or all of one extremity and is spreading rapidly
4—Very Severe: pain, swelling, ecchymosis, erythema extends beyond affected extremity, or significant tissue slough

Gastrointestinal System
0—Signs within normal limits
1—Minimal: abdominal pain, tenesmus
2—Moderate: vomiting, diarrhea
3—Severe: repetitive vomiting, diarrhea, or hematemesis

Hematological System
0—Signs within normal limits
1—Minimal: coags slightly abnormal, platelets 100,000 to 150,000
2—Moderate: coags abnormal, platelets 50,000 to 100,000
3—Severe: coags abnormal, platelets 20,000 to 50,000
4—Very Severe: coags markedly abnormal with bleeding present or PT unmeasurable, PTT unmeasurable, platelets < 20,000

Central Nervous System
0—Signs within normal limits
1—Minimal: apprehension
2—Moderate: chills, weakness, faintness, ataxia
3—Severe: lethargy, seizures, coma