

## Georgia Poison Center's EXOTIC SNAKE BITE GUIDELINE – ZOO ATLANTA

*This document is intended primarily to address bites from exotic snakes occurring at Zoo Atlanta. It contains information which may also be useful at other sites, but not all of the patient transport instructions apply to sites other than Zoo Atlanta. Antivenins maintained by Zoo Atlanta may or may not be available for use outside of Zoo Atlanta-related events.*

Based on AAPCC data collected from 1995-2004, there were 399 exotic (non-native) venomous snakebites in the US. Of these 46% were from the family viperidae, 38% elapidae family, and 2.9% were hydrophids and colubrids. There are approximately 40-50 exotic snake exposures in the US annually. The majority of bites occur within private residences followed by zoos and universities.

Typical symptoms:

- 1) **Vipers and pit-vipers:** local swelling, pain/tingling sensation, muscle contractions/cramps, pupillary constriction, constitutional signs (dizziness, fever, fainting, sweating), blistering/discoloration of skin around bite, weakness, ecchymosis, bleeding.
- 2) **Elapidae:** drooping of eyelids, blurred vision, difficulty breathing/ speaking/ swallowing, oculomotor palsy, swelling and/or pain (pronounced in cobras)
  - a. **Black mamba:**
    - i. Produces a classic clinical syndrome of paraesthesias, autonomic nervous system stimulation, muscular fasciculations, and occasionally a rapidly progressive descending paralysis (including respiratory) soon after envenomation.
    - ii. Other symptoms are similar to those seen in organophosphate poisoning, and include altered taste, diarrhea, hypersalivation, involuntary muscle contractions, and paralysis that improves after antivenom treatment but can then reoccur.
  - b. **Red Spitting cobra**
    - i. *Sprays* venom into victim's eyes causing intense pain and temporary (possibly permanent) blindness. More likely to „spit“ than to bite.
    - ii. **Local effects:** swelling, pain, blistering, and necrosis
    - iii. **Systemic effects:**
      1. Neurological (immediate or delayed up to 24 hrs post-bite): altered mental status, cranial nerve dysfunction (ptosis, ophthalmoplegia, dysphagia, hypersalivation)

2. Muscular: weakness of neck/jaw leading to generalized weakness, progressing to flaccid paralysis and respiratory failure
3. Cardiovascular: hypotension, shock
4. GI: nausea, vomiting, and abdominal pain

c. **Thai King cobra**

- i. **Local effects:** swelling, pain, blistering, and necrosis
  - ii. **Systemic effects:**
    1. Neurological (immediate or delayed up to 24 hrs post-bite): altered mental status, cranial nerve dysfunction (ptosis, ophthalmoplegia, dysphagia, hypersalivation)
    2. Muscular: weakness of neck/jaw leading to generalized weakness, progressing to flaccid paralysis and respiratory failure
    3. Cardiovascular: hypotension, shock
    4. GI: nausea, vomiting, and abdominal pain
- 3) Hydrophids (sea snakes): produce only a small amount of an extremely potent, venom. Symptoms mostly involve the central nervous system producing respiratory paralysis and minimal local inflammation/swelling.
- 4) Colubrids: early signs include headache, nausea, diarrhea, lethargy, altered mental status, bleeding, and (later) exsanguination leading to death,

**Medical management** principles of snake bites, regardless if a native or non-native species, are the same. SEE SNAKE BITE GUIDELINES.

- 1) After receiving call from Zoo Atlanta, EMS, or Grady Hospital (all Zoo Atlanta snake bites are to be directed **only** to Grady Hospital)
  - a. Obtain patient name, age, date of birth. Obtain caller info: name, call back number, verify call location.
  - b. Obtain initial history to include circumstances of bite (how, when victim was bitten), previous therapy, symptoms, allergy history, prior history of snakebite, the treatment involved in prior bites, present health status.
  - c. Inquire about the "first aid" that has been supplied. Discourage "Measures to Be Avoided" (SEE SNAKE BITE GUIDELINES), if asked. If a tourniquet has been applied in the past 10 minutes or less, **AND** the patient is located at a site of medical care, advise immediate removal.
  - d. Direct transportation to Grady Hospital
  - e. Ensure the species/name of snake has been identified and that antivenin (if available) is enroute with patient.
  - f. Page on call toxicologist.

## 2) Recommendations to EMS:

- a. Ensure antivenin is accompanying patient to Grady.
- b. Establish large-bore IV and administer 1 Liter bolus of normal saline or Lactated Ringer's in non-bitten extremity
- c. Do not use ice, cold packs or sprays.
- d. Do not apply a tourniquet. If a tourniquet has been applied, do not remove until intravenous access is in place and shock treatment is available.  
(Exception: if applied in past ten minutes or less, **AND** patient is in a site where medical care can be provided, the tourniquet may be removed.)
- e. Do not make incisions to remove venom (do not "cut").
- f. Suction to the wound should be applied only using a Sawyer Venom Extractor **AND** only if the patient was bitten in the past 5 minutes. Do not apply suction if a Sawyer Venom Extractor is not readily available.
- g. Do not elevate extremity more than 2 inches above supine body level during the first 48 hours.
- h. If snake identified as an elapid (cobra, mamba), apply ace bandage to bitten extremity (starting at wound and extending upwards).
- i. If snake identified as a pit viper or crotalid do NOT apply ace bandage.
- j. Immobilize extremity.

## 3) Recommendations to Grady physician/staff:

- a. NPO/bedrest
- b. Mark and measure the fang marks and the leading edge of any swelling; keep the envenomated limb immobile
- c. Vital signs q-15-min at a minimum, including circumferential measurement of swelling. All patients should be placed on pulse oximetry and cardiac monitoring.
- d. If a tourniquet or ace bandage has been placed do not remove until *after* first dose of antivenom is given if indicated. If antivenom not indicated, then remove once IV and monitor have been established.
- e. Place at least one large bore IV of normal saline or Lactated Ringer's solution in a non-envenomated limb (central line only as a last resort) and draw the following labs:
  - i. CBC, platelets
  - ii. PT, PTT, Fibrinogen, fibrin split products
  - iii. Electrolytes, BUN, creatinine
  - iv. UA (looking for blood, glucose, protein)
  - v. Total serum CPK
  - vi. Consider Type and Screen, for use in case, a coagulopathy develops requiring FFP, platelets, or PRBC's.

- f. Analgesics are usually required with opiates as the agents of choice. ASA and other NSAID's are not recommended due to the potential for bleeding. Consider sedatives to keep the patient calm. However, note that the administration of sedatives can confound the clinical evaluation of the victim in some elapid species.
- g. Update tetanus status.
- h. Be prepared to treat anaphylaxis, particularly if the patient receives antivenin, with epinephrine (1<sup>st</sup> drug to give), methylprednisolone, diphenhydramine, and an H-2 blocker.
- i. Monitor respiratory status and recognize that certain venomous snakes can produce respiratory paralysis. Be prepared to intubate early if necessary.

## Antivenom Availability

### 1) CURRENT ANTIVENOM available from Zoo Atlanta as of December 2021

<u>Antivenin</u>	<u>Amount</u>	<u>Exp. Date</u>	<u>Zoo ATL Antivenin ID</u>
Suero Antiofidio Polivalente	10 vials	05/2026	B
Thai Hemato Polyvalent	10 vials	08/2026	C
SAIMR Polyvalent	15 vials	01/2023	D

### EXPIRED ANTIVENIN (Last Updated: 15 December 2021)

<u>Antivenin</u>	<u>Amount</u>	<u>Exp. Date</u>	<u>Zoo ATL Antivenin ID</u>
Thai King Cobra Monovalent	10 vials	11/2013	A
	20 vials	10/2009	A
	38 vials	11/2006	A
Thai Neuro Polyvalent	15 vials	01/2021	A
	5 vials	02/2018	A
Suero Antiofidio Polivalente	10 vials	05/2021	B
	10 vials	05/2016	B
	5 vials	07/2016	B
	20 vials	02/2014	B
	20 vials	01/2011	B
	20 vials	08/2008	B
Antivipmyn Bioclon	20 vials	09/2006	B
Thai Hemato Polyvalent	15 vials	05/2021	C
	5 vials	09/2018	C
Green Pit Viper	10 vials	09/2015	C
	20 vials	06/2011	C
SAIMR Polyvalent	20 vials	07/2019	D
	5 vials	07/2017	D
	10 vials	02/2015	D
	10 vials	01/2012	D
	20 vials	02/2009	D
	40 vials	12/2005	D
	10 vials	04/2004	D
Viper Venom Antiserum	5 vials	11/2015	E

The Online Antivenin Index (<https://avi.pharmacy.arizona.edu/>) can be used as a source for further information regarding appropriate antivenin selection, zoo antivenin stocks, etc. Username: georgia Password: georgia972

## Antivenom Indications

Antivenom can cause serious life-threatening adverse effects, however it can also be life-saving. The risks must be weighed against the benefits. A bite from a venomous snake is not an indication for antivenom if the patient is otherwise asymptomatic except for local pain and mild swelling. In fact, 10-50% of bites from venomous snakes do not contain venom.

Indications for administration include any signs of systemic toxicity and/or rapid progression of swelling; If either is present, then administration of antivenin should not be delayed. Skin testing is not needed prior to first dose of antivenin because it is not predictive of anaphylactic reactions or serum sickness and can delay treatment.

Antivenom should only be given if the species/name of snake responsible for bite is known. Do NOT administer antivenin (applies to liquid-preps) if solution has turned opaque, as this indicates precipitation and likely low activity of the antivenin. Expired antivenin can still be given if no unexpired antivenin is available and if no precipitant is present and patient meets indications for antivenom. See further discussion about use of expired antivenin below under "Antivenin Preparation".

The indications, dosing, preparation, and management of snake bites are the same in children as adults.

## Selected Exotic Venomous Snakes and their Antivenoms

	<b>SAIMR Polyvalent Antivenom</b>	<b>Thai King Cobra/ Thai Neuro</b>	<b>Suero Antiofidico Polivalente/ Antivipmyn</b>	<b>Green pit viper</b>
<b>Snakes</b>	Cape Cobra Red Spitting Cobra Gaboon Viper Black Mamba	King Cobra	Mexican Cantil	Chinese Mountain Pit Viper Sri Lankan Green Pit Viper
<b>Pharmacology</b>	Equine F(ab') <sub>2</sub>	Equine IgG	Equine Fab/F(ab') <sub>2</sub>	Equine F(ab') <sub>2</sub>
<b>Dosing</b>	<b>Vipers, Red Spitting Cobra:</b> 50-100 mL* <b>Cape Cobra:</b> 80-120 mL* <b>Mamba:</b> 40-200 mL*	50 mL*	<b>Suero antiofidico:</b> 5-10 vials in 500 mL NS <b>Antivipmyn:</b> 3-16 vials <sup>§</sup> in 500 mL NS	30 mL*
<b>Admin.</b>	Infuse @ 2 mL/min Re-dose PRN <sup>†</sup>	Infuse @ 2 mL/min Re-dose Q12 PRN <sup>†</sup>	Infuse @ 2 mL/min <b>Suero antiofidico:</b> Re-dose PRN <sup>†</sup> <b>Antivipmyn maintenance:</b> Re-dose 6-8 vials Q4 PRN <sup>†</sup>	Infuse @ 2 mL/min Re-dose Q6 PRN <sup>†</sup>
<b>Pre-treat?‡</b>	No	Yes	No	No

\* Reconstituted antivenom

† Based on clinical symptoms

‡ H1 and H2 antagonists, corticosteroids, low-dose epinephrine infusion

§ Adult dosing: Mild 3-5 vials; Moderate 6-10 vials; Severe 11-15 vials; Very severe 16+ vials

## ANTIVENOM

### 1) **SAIMR (or SAVP) Polyvalent**

## CORRESPONDING SNAKES, INITIAL DOSE

Equine-derived; manufactured in South Africa

Green mamba, Jameson's mamba, Black mamba (*Dendroaspis polylepis*), Cape cobra (80-120 ml), Forest cobra, Egyptian cobra (50-120 ml), Black-necked spitting cobra (50-100 ml), Red spitting cobra (*Naja pallida*)(50-100 ml), rinkhalses, Puff adder (50-100 ml), Rinkhals, and Gaboon adder/viper

### SUB-SPECIES HOUSED in ZOO ATLANTA:

- i. **Gaboon viper (*Bitis gabonica*), Rhinoceros viper (*Bitis nasicornis*), Ethiopian Mountain adder (*Bitis parviocula*), Mangshan pit viper (or *Zhafermia mangshanensis*)** - Initial dose is 50-100 ml of antivenom (or 2 vials of liquid form of antivenom) given at 2 ml/min, redose as needed based on clinical symptoms.
- ii. **Black mamba (*Dendroaspis polylepis*)**- Initial dose is 40-200 ml of antivenom (or 2 vials of liquid form) given at 2 ml/min, redose based on clinical symptoms.
- iii. **Red spitting cobra (*Naja pallida*)**- initial dose is 50-100 ml of antivenom given at 2 ml/min, redose as needed.

### 2) **Thai King Cobra**

Equine derived; lyophilized; manufactured by Thai Red Cross;

### SUB-SPECIES HOUSED in ZOO ATLANTA:

**Thai King cobra (*Ophiophagus Hannah*)**- neutralizes 0.8 mg/ml of venom; Initial dose is 50 ml of reconstituted antivenom given at 2 ml/min, then Q12 based on clinical symptoms.

### 3) Suero Antiofidico Polivalente or Clodamiro Picado.

Equine-derived; Manufactured in Costa Rica

Mexican moccasin (or Common cantil), Central American jumping pit viper (*Atropoides picadoi*), Side-striped palm pit viper (*Bothriechis lateralis*), Guatemalan palm viper (*Bothriechis aurifer*), Eyelash palm pit viper (*Bothriechis schlegelii*), Terciopelo, Godman's montane pit viper, Middle American pit viper, Black-headed bushmaster, South American bushmaster (*Lachesis muta*), Rainforest hognosed pit viper, and Slender hognosed pit viper.

SUB-SPECIES HOUSED in ZOO ATLANTA:

**Picado's jumping pit viper** (*Atropoides picadoi*), **Side-striped palm pit viper** (*Bothriechis lateralis*), **Eyelash palm viper** (*Bothriechis schlegelii*), **South American bushmaster** (*Lachesis muta*)- 5-10 vials of antivenom given at 2ml/min, redose based on clinical symptoms.

### 4) Green pit viper

Equine derived; manufactured by Thai Red Cross.

*Trimeresurus* genus: White-lipped pit viper, Shore pit viper, Big-eyed pit viper, Indian bamboo vipers, Chinese habu, mangrove pit viper, Chinese bamboo viper

SUB-SPECIES HOUSED in ZOO ATLANTA:

**White-lipped pit viper** (*Trimeresurus albolabris*), **Philippine pit viper** (*Pariasis flavomaculatus*)- neutralizes 0.7 mg/ml of venom; Initial dose is 30 ml of reconstituted antivenom at a rate of 2 ml/min, then Q6 hours based on clinical symptoms.

## 5) Antivipmyn

Equine-derived; manufactured in Mexico.

Crotalids: Mexican West Coast rattlesnake  
Central American rattlesnake, South  
American rattlesnake, Shunu (Middle  
American rattlesnake), Hocico de Puerco  
(Twin-Spotted), Western diamondback  
rattlesnake, black-tailed rattlesnake, and  
Mojave rattlesnake

Agkistrodon: Common Cantil, Taylor's  
Cantil, Southern copperhead, Broad-banded  
copperhead, Northern copperhead,  
Osage

copperhead, Trans-Pecos copperhead,  
Eastern cottonmouth, Florida cottonmouth,  
Western cottonmouth

Sistrurus: Cascabel de neve places,  
Eastern Massasauga, Western  
Massasauga, Carolina pygmy, Southeastern  
(dusky) pygmy, Western pygmy

### SUB-SPECIES HOUSED in ZOO ATLANTA:

**Southern pygmy** (*Sistrurus miliarius*)- initial  
dose for moderate envenomations: 3 to 10  
flasks in 500 ml of normal saline run over  
an hour. Maintenance dose: 6-8 flasks in 500  
ml of normal saline Q4hrs. Severe  
envenomations, initial dose: 10-16 flasks,  
maintenance: 6-8 flasks.

□ **IMPORTANT NOTE: None of the above antivenoms have been FDA approved. All technically are "Investigational New Drugs" and their use requires a report to the FDA and to the approving IRB (Emory) of their use, their efficacy, and side effects observed if any.**

## Antivenom Dosing/Preparation

No exact dosing criteria are available. The dose is generally thought to be the amount needed to bind the venom released during a typical bite. Thus the amount released can vary. Repeat dosing may need to be given if symptoms do not improve within 1-2 hours, recur, or worsen.

No need for skin testing prior to administration. Studies show no predictive value and may actually sensitize patients to develop anaphylaxis.

**EXPIRED ANTIVENINS:** We prefer to use an antivenin that is within its listed shelf life, prior to the expiration date. However, expiration dates do not precisely predict whether the product is currently safe and effective. Therefore, if antivenin is needed and the only appropriate product is past its printed expiration date and the product is not discolored or contain a precipitant, that product should be used. If the patient is able to understand, this information should be shared with the patient as part of the information provided as "Informed Consent".

### Preparation:

1. Freeze-dried (lyophilized)
  - a. Reconstitute with 10 ml of sterile water (may be difficult to dissolve) then administer IV either as a *slow push* (not more than 2 ml/min) or as an *infusion*. For infusion, after reconstitution of freeze-dried antivenin, dilute in 5-10ml of isotonic fluid (saline or D5) per kg of body weight over an hour at a constant rate.
2. Liquid antivenin
  - a. Same as above however, no need for reconstitution

The ideal site for administration of antivenin is an unaffected extremity (avoiding the digits or direct administration into the wound)

Prior to dosing, ensure that epinephrine, diphenhydramine, an H2 antagonist, and an IV steroid preparation are at bedside.

## Antivenom Adverse Effects

- 1) Pyrogenic reactions (early)
- 2) Anaphylactoid reactions (early)
- 3) Serum sickness (late)
  - a. Usually develops 1-2 weeks after antivenom is given
  - b. Symptoms include pruritis, urticaria, fever, arthralgia, peri-articular swelling, proteinuria, and occasionally neurological manifestations.

## Further resources

- 1) AZA Antivenin Index Coordinator: Don Boyer, San Diego Zoo, 1-619-685-3282
- 2) Miami-Dade Fire Rescue: ANTIVENOM BANK (for emergency antivenin acquisition), 24 hr EMERGENCY NUMBER (305) 596-8571, Captain Al Cruz (786) 331-4444, Lt. Ernie Jillson (786)-331-4454.
- 3) Robert J. Geller, MD- Georgia Poison Control (office) 404-616-6652, cell 404 405 4425
- 4) Brent W. Morgan, MD- Georgia Poison Control (office) 404-616-6651, cell 404- 219-9266
- 5) Ziad Kazzi, MD- Georgia Poison Control (office) 404-616-6654, cell 404-702- 1507
- 6) Richard Clark, MD- California Poison System- San Diego 858-715-6300
- 7) Julian White, M.D. [Julian.white@adelaide.edu.au](mailto:Julian.white@adelaide.edu.au). Adelaide Children's Hospital, Kermode Street, North Adelaide, SA 50006 Australia
- 8) Mr. George Van Horn (407)-892-6905 or (407)-957-1978 Reptile World Serpetarium, St. Cloud, Florida
- 9) <http://apps.who.int/bloodproducts/snakeantivenoms/database/>

\*Protocol adapted from Georgia Poison Center Snake Bite Protocol, Zoo Atlanta Herpetology Department Standard Operating Procedures October 2010. World Health Organization 2010- Guidelines for Treatment of Snakebites. [www.miamidade.gov/.../09January\\_Antivenom\\_Species\\_Covered.pdf](http://www.miamidade.gov/.../09January_Antivenom_Species_Covered.pdf), <http://apps.who.int/bloodproducts/snakeantivenoms/database/>, and [www.rattlesnakes.de/Venom/antivipmynenglisch.pdf](http://www.rattlesnakes.de/Venom/antivipmynenglisch.pdf)

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