Purpose Statement: To provide guidance on the evaluation and management of snakebites in the Houston area.

Contacts:
Poison Control Center 1-800-222-1222

The herpetologists at the Houston Zoo are available to help in the identification of snakes.

1. Judith Bryja – Herpetology Supervisor
   Office 713-533-6655 (7am-7pm)
2. Herpetology Curator
   Office 713 533-6527 (7am-7pm)
3. Houston Zoo Operator Number (afterhours, emergency)
   Operator 713-533-6500

Antivenin for Rattlesnake, Copperhead and Water Moccasin
Crofab (Protherics; Ovine-derived polyvalent Fab-1 antibody)

Antivenin for Coral Snakes
Coralmyn

Available at Houston Zoo, not approved by FDA

*additional consent for usage must be signed

Antivenin for Exotic Snakes
Not readily available. Contact the poison control center for assistance. They will assist in obtaining antivenin if the snake is not found in the Houston Zoo collection.

*additional consent for usage must be signed

If the victim has a personal supply of antivenin for the type of snake involved, it can be used if it is not visibly turbid or expire/ five or fewer years beyond its expiration date.

**Identification of Snakes:** There are four classes of poisonous snakes in the Houston area; Rattlesnake, Copperhead, Water Moccasin, and Coral.

1. **Coral snakes** are easily identified due to their bright colors. Corral snakes in the United States are poisonous if the color *red touches yellow*. Red on black are not native poisonous snakes to the U.S. This general principle reliably applies only to coral snakes native to North America.
2. **Rattlesnakes, Copperheads, and Water Moccasins** can be difficult to identify. If question is raised to weather the snake is poisonous some principles can be taken to identify poisonous verses non-poisonous. (Figure 1)
3. **Exotic snakes:** Identification of the snake is of key importance in providing appropriate care as envenomation by some of these snakes requires a specific antivenin. If at all possible, a herpetologist should see the snake or a high quality photograph of the snake in order to identify the snake as precisely as possible. (See contact information above).

**Rattlesnake, Copperhead or Water Moccasin Management**

1. Attend to ABC’s
2. Obtain the following labs
   a. CBC
   b. TEG
3. Depending upon the circumstances, consider the following:
   a. BMP, Liver profile, UA
   b. EKG – Older adults and those with known heart disease
   c. CPK – Patients with significant local edema
   d. PT/PTT, INR, FSP, Fibrinogen (Poison control follows)
   e. Type and Cross – Those with significant coagulopathy
   f. ETOH/UDS – Intoxication is common among a certain sub-group of victim
   g. Consider an x-ray of the bite site to rule out a retained fang or fragment thereof.
4. Mark and track the spread of erythema/ swelling on the patient’s skin, along with time.
5. Tetanus prophylaxis , if indicate
7. Antivenin- Crofab

**Rattlesnake, Copperhead and Water Moccasin Antivenin Administration**
Categorize the snake bite by the Snake Severity Score (Figure 2) as minimal, moderate, or severe and follow the Crofab Algorithm (Figure 3).

Administer the first portion of the antivenin slowly over 10 minutes. If no adverse effects occur, continue administration so that the initial 4-6 vials are administered over 1 hour.

**Rattlesnake, Copperhead and Water Moccasin Disposition**

If admission is warranted consult Trauma for adult patients. Pediatric patients (<16 years age) should have a Pediatric Trauma consult.

1. The following patients should be placed in the ICU or IMU per discretion of the trauma/pediatric trauma team.
   a. Patients with systemic symptoms even if the symptoms resolved with the administration of antivenin.
   b. Patients with active bleeding and coagulopathy.
   c. Patients with grossly abnormal coagulation indices.
   d. Patients requiring antivenin.
2. Documented compartment syndrome should be admitted to Trauma/Pediatric Trauma with Orthopedic or Hand service consult as needed.
3. If mild envenomation, placement in observation under the hospitalist/general pediatrics is appropriate. Trauma/Pediatric Trauma should be aware in case patient condition worsens.
4. Presumed “dry bites” or patients with none of the above criteria that still require short term observation should be placed in the COU under Hospitalist or Pediatric Observation with General Pediatrics.
5. If no swelling, ecchymosis, abnormal labs or vitals and the ED attending deems appropriate, patient can be discharged with close follow up. Patients being discharged do not need a Trauma/Pediatric Trauma consult or follow-up in their surgery clinics.

**Coral Snake Management**

1. Attend to ABC’s
2. Consider elective tracheal intubation if any signs of bulbar paralysis are present.
3. Consider an EKG – Anecdotal evidence suggests that coral snake envenomation is sometimes associated with cardiac arrhythmias.
4. Tetanus prophylaxis, if indicated.
5. Antibiotics – not needed.
6. No specific laboratory tests are mandatory but the following might be considered especially in patients with underlying medical conditions: CBC, TEG, VBG and CMP.
7. Systemic effects may be delayed for many hours but can include: Impending respiratory failure, Respiratory distress, Pharyngeal spasm, Hypersalivation, Cyanosis, Trismus, Neurologic dysfunction, Altered mental status, Ptosis, Generalized weakness, Muscle fasciculations, Cardiovascular collapse, Hypotension, and Tachycardia.
8. If the snake is positively identified, antivenin should be administered presumptively in cases of envenomation.

**Coral Snake Antivenin Administration**
1. The only FDA approved coral snake antivenin, Wyeth Micrurus, is no longer being produced and limited stock piles are now expired.

2. Alternative is antivenin called Coralmyn. It is manufactured in Mexico and is available in the US, however, not approved by the FDA approved. If needed it can be obtained from the Houston Zoo. Special consent must be signed if this is used.

3. Pretreat with diphenhydramine and H2 blocker.

4. Assure that airway devices, epinephrine, steroids, and other medications and equipment necessary to treat anaphylaxis are at the bedside.

5. To administer antivenin reconstitute the antivenin as directed on the package and follow instructions.

6. Begin a slow infusion while observing the patient for symptoms. If no reaction occurs after a few minutes of slow infusion, then the infusion rate may be increased so that the entire initial dose is administered over 1-2 hours.

Coral Snake Disposition

1. Asymptomatic patients should be observed for 24 hours. Symptoms may be delayed in onset for up to 12 hours or more. Given the potentially lethal nature of coral snake venom, these patients should be admitted to Trauma/Pediatric Trauma for monitoring.

2. All patients with a good history for envenomation by a coral snake should be admitted to the ICU or IMU (per discretion of Trauma/Pediatric Trauma Attending) for at least 24 hours of monitoring.

Exotic Snake Management

Different species of snake and members of the same species from different environments have different qualities of venom. Toxins: Neurotoxin, Cardiotoxin, Nephrotoxin, Coagulotoxins, Myotoxins/Necrotoxins.

1. Attend to the ABC’s

2. Be prepared to support ventilation should respiratory distress occur.

3. Contact the herpetologist to determine if offending snake is found in the Houston Zoo’s collection. If so, they will have antivenin available.

4. Contact the poison control center for management advice. They can help to obtain antivenin, if the snake is not found in the Houston Zoo collection. Some types of antivenin are difficult to obtain and must come from other states.

5. If the victim has a personal supply of antivenin for the type of snake involved, it can be used if:
   a. Is not visibly turbid
   b. It is not expired or is five or fewer years beyond its expiration date

Exotic Snake Disposition

All patients bitten by non-native venomous snakes should be admitted to Trauma/Pediatric Trauma for further monitoring.
Appendix:

Figure 1: US poisonous snake/pit viper identification

Poisonous

- Nostril
- Pit
- Fangs
- Elliptical pupil
- Rattlesnakes
- Anal plate
- Single row subcaudal plates
- No rattles
- Copperheads and cottonmouths

Non-poisonous

- Nostril
- Round pupil
- Teeth
- Anal plate
- Double row subcaudal plates
# Figure 2: Snake Severity Score (Mild, Moderate, Severe)

## Pulmonary symptoms
- No signs/symptoms: 0
- Dyspnea, minimal chest tightness, mild/vague discomfort, respirations of 20-25 bpm: 1
- Moderate respiratory distress, 26-40 bpm: 2
- Cyanosis, air hunger, extreme tachypnea, or respiratory insufficiency/failure: 3

## Cardiovascular system
- No signs/symptoms: 0
- HR 100-125 BPM, palpitations, generalized weakness, benign dysrhythmia, or hypotension: 1
- HR 126-175 BPM, or hypotension with SBP > 100 mmHg: 2
- HR > 175 BPM, or hypotension with SBP < 100 mmHg, malignant dysrhythmia, or cardiac arrest: 3

## Local wound
- No signs/symptoms: 0
- Pain, swelling, or ecchymosis within 5-7.5 cm of bite site: 1
- Pain, swelling, or ecchymosis involving less than half the extremity (7.5-50 cm from bite site): 2
- Pain, swelling, or ecchymosis involving half to all of extremity (50-100 cm from bite site): 3
- Pain, swelling, or ecchymosis extending beyond affected extremity (more than 100 cm of bite site): 4

## Gastrointestinal system
- No signs/symptoms: 0
- Pain, tenesmus, or nausea: 1
- Vomiting or diarrhea: 2
- Repeated vomiting, diarrhea, hematemesis, or hematochezia: 3

## Hematologic symptoms
- No signs/symptoms: 0
- Coagulation parameters slightly abnormal: PT < 20 secs, PTT < 50 secs, platelets 100-150K/mL, or fibrinogen 100-150 mcg/mL: 1
- Coagulation parameters abnormal: PT < 20-25 secs, PTT < 50-75 secs, platelets 50-100K/mL, or fibrinogen 50-100 mcg/mL: 2
- Coagulation parameters abnormal: PT < 50-100 secs, PTT < 75-100 secs, platelets 20-50K/mL, or fibrinogen < 50 mcg/mL: 3
- Coagulation parameters markedly abnormal, with serious bleeding or the threat of spontaneous bleeding: unmeasurable PT or PTT, platelets < 20 K/mL, undetectable fibrinogen, severe abnormalities of other laboratory values also fall into this category: 4

## Central nervous system
- No signs/symptoms: 0
- Minimal apprehension, headache, weakness, dizziness, chills, or paresthesia: 1
- Moderate apprehension, headache, weakness, dizziness, chills, paresthesia, confusion, or fasciculation in area of bite site: 2
- Severe confusion, lethargy, seizures, coma, psychosis, or generalized fasciculation: 3

## Total

<table>
<thead>
<tr>
<th>Severity of Envenomation</th>
<th>Minimal</th>
<th>Moderate</th>
<th>Severe</th>
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<tbody>
<tr>
<td>SSS</td>
<td>0-3</td>
<td>4-7</td>
<td>8-20</td>
</tr>
</tbody>
</table>
Figure 3: Algorithm for Poisonous Snake Management and Disposition

Poisonous Snakebite Protocol

1. Attend to ABCs
2. Identify the snake
   - Copperhead, Water Moccasin, or Rattlesnakes
   - Coral Snake or Exotic Snake

3. Laboratory Studies
   - Snake Severity Score
   - Minimal 0-3
   - Moderate 4-7
   - Severe >7

4. Re-Assess SSS at 2-hr including repeat TEG

5. If Needed, place in Observation with Hospitalist/General Pediatrics

6. Re-examination; Repeat Coags n 6-8 hours

7. Discharge when clinically stable

8. Administer loading dose of 4-6 vials of CroFab

9. Consult Trauma/Pediatric Trauma

10. Admit ICU/IMU

11. Re-Assess SSS Q2H including serial TEGs

12. SSS stable or decreasing

13. Maintenance Dose: 2 vials every 6 hours x 3

14. Assess Clinically and SSS/TEG every 6 hours

15. SSS stable or decreasing

16. Discharge when clinically stable

17. SSS Increasing

18. Repeat Loading Dose: of 4-6 vials