Snake and Insect Envenomation

Insect and snake envenomation of dogs is possible in deployed settings. This chapter discusses general management of these injuries; refer to local guidance for geographic area information regarding species specific differences relating to clinical presentation and recommended therapeutic interventions.

- Specific treatment with geographic area specific antivenom is optimal for patients with clinical signs.
- Antivenom is the only product that can neutralize venom thereby decreasing morbidity and mortality. It is optimally given within 4 hours after snake bite, although it can be effective up to 24 hours or longer after envenomation. (Mortality rates in snake bite envenomated dogs ranges from 1-30% and depends highly on the snake involved.) [1-4]
- Antivenom is typically only available in select Role 2 and Role 3 facilities because antivenom use – for humans and dogs – is highly regulated and governed by theater policy.
- Antivenoms, especially those that contain whole immunoglobulin components, must be used with caution due to the potential to induce Type I (immediate) and Type III (delayed) hypersensitivity reactions.[1,3-6] Additionally, due to the equine and ovine origin of the product, acute anaphylaxis has been documented as a complication and has been noted in 0.7% - 7% of patients receiving antivenom.[1]
- Steroids, diphenhydramine, and antibiotics are not indicated in the acute phases of snake bite. Non-steroidal anti-inflammatories (NSAIDs) are contraindicated due to risk of bleeding, gastrointestinal ulcers, and kidney injury.
- Avoid cutting and/or suctioning the wound, ice, prophylactic antibiotics, prophylactic fasciotomy, routine use of blood products, and tourniquets. Do try to minimize patient activity and movement of affected site.
- Establish a timeline and trend changes over time. Serial assessments and documentation are essential because the resolution or continuance of clinical signs will drive recommendations for antivenom therapy.

Insect Envenomation

Insect envenomation typically causes local pain, erythema, and swelling (angioedema or urticaria). Some insect venoms cause a locally extensive wound that often take several days to manifest, while others may cause systemic anaphylaxis.

Venomous Scorpions

Venomous scorpions that typically induce severe clinical signs include the Arabian or Asian Fat-Tailed Scorpion (Androctonus amoreuxi), the African Ground Scorpion (Hottentotta alticola), and Hemiscorpius lepturus (no common name). The sting causes minimal local inflammation, but the systemic effects can be serious and include nystagmus, paresthesia, referred pain, myoclonus, hypersalivation, tachycardia, hypertension, fever, and increased respiratory secretions.

Venomous Spiders

Venomous spiders that typically induce severe clinical signs include the Mediterranean Black Widow (Latrodectus tredecimguttatus/lugubris) and the Tarantula or Wolf spider (Lycosa signoriensis). Patients usually

present with severe pain after a painless bite and death can occur in severe envenomations. Note that sopulgids (Camel spiders) are NOT venomous but may cause a painful bite.

Supportive Care for Scorpion Stings and Spider Bites

- Coordinate MEDEVAC (urgent) directly to appropriate medical facilities where antivenom is stored. Remote sites should request overfly (bypass the local MTF/VTF) directly to appropriate facilities.
- Ensure a patent airway and provide supplemental oxygen and ventilation, as needed.
- Place an IV catheter and obtain a CBC, blood chemistry panel, and urinalysis.
- Isotonic crystalloids at a rate based on clinical signs and laboratory findings. A fluid rate of 1.5 – 2 times maintenance is an initial starting point, however, fluid boluses may initially be necessary. General maintenance fluid rate is 40-60 mL/kg/day. Adjustment to fluid rate is based on patient's clinical response.
- Administer 2-4 mg/kg diphenhydramine IM. Repeat diphenhydramine every 8 hours for 72 hours. ***NOTE: MWD handlers may have been issued diphenhydramine and may have initiated therapy before presentation. Do not give diphenhydramine IV because it can cause severe hypotension in dogs.***
- Manage any open wounds that develop (See Chapter 14).
- Treat pain if noted (See Chapter 16). ***NOTE: Do not treat with NSAIDs given the propensity for envenomated dogs to develop coagulopathies, thrombocytopenia, thromobocytopathia, and secondary acute kidney injury.***
- If systemic anaphylaxis is suspected based on the history and clinical signs (weakness, peracute vomiting or diarrhea, collapse, or hypotension), treat the MWD as above, and treat with IV fluid therapy as for shock (See Chapter 6, Figure 33) and start an epinephrine CRI at 0.1-1 mcg/kg/min. Though a CRI takes longer to set up, it has demonstrated superiority in the treatment and resolution of anaphylaxis over bolus dosing.[7,8] If a CRI is unavailable, give epinephrine (0.01 mg/kg, IM or IV; repeat if necessary every 20-30 minutes).
- Hospitalize the patient and provide supportive care until resolved or evacuated.

Antivenom Use for Scorpion Stings and Spider Bites

Scorpion Stings

Administer Saudi Polyvalent Scorpion (Equine) $F(ab)_2$ if the specific scorpion is identified as susceptible and if systemic clinical signs of envenomation are present. Dosing is empiric: Follow manufacturer recommendations for dilution and dosing, and with consultation by the respective 64F.

Spider Bites

Antivenom is only available for Black Widow spider bites. Administer Antivenin Latrodectus mactans for witnessed Black Widow spider (Latrodectus tredecimguttatus/lugubris) bites and with systemic envenomation clinical signs. Dosing is empiric: Reconstitute 1 vial, dilute according to manufacturer recommendations, and infuse IV over 15 minutes.[1]

Snake Envenomation

- Clinical signs of bites by venomous snakes can vary tremendously, principally depending on the type of snake involved, location and number of bites, and the amount of venom injected. HCPs should be-

come familiar with indigenous snakes in deployed areas and seek guidance on specific management recommendations in preparation for deployments. Information on indigenous venomous snakes in each AO can be found in the Veterinary Medical Threat Brief from the MDVSS or the component command veterinarian.

- In general, snakebites by most venomous vipers cause severe pain, variable degrees of local swelling that may spread, and varying degrees of local tissue necrosis. Many MWDs will also develop systemic signs of pain. Some dogs can develop life-threatening complications of envenomation. Conversely, snakebites by most venomous elapids (i.e. cobras, mambas, coral snakes, and taipans) produce minimal swelling but are potent neurotoxins that can progress to life-threatening paresis and respiratory failure. Elapid venom can also cause marked intravascular hemolysis that may require red blood cell transfusions. It is prudent to recommend that any MWD bitten by a venomous snake be evacuated URGENTLY for optimal management. Follow guidelines below while coordinating evacuation.
- Unwitnessed envenomation is common. The presence of fang marks does not mean that envenomation has occurred – "dry bites" are common. Approximately 25% of pit viper bites in humans are "dry" and do not cause envenomation.[9] Conversely, envenomation may have occurred without obvious puncture wounds evident. *Note: Echinocytosis seen on blood smear evaluation can confirm snake envenomation.*
- Injection of viper venom typically causes marked localized swelling and edema, intense local pain, and discoloration of the surrounding tissues due to necrosis, with oozing of venous blood. Clinical signs of pit viper envenomation occur within the first 30 minutes from time of bite, but the patient should be observed for delayed effects over 24 hours.[9]
- Systemic signs frequently observed include pain, lethargy, vomiting, weakness, hypotension, tachypnea, tachycardia, ecchymosis, diarrhea/hematochezia, and occasionally neuropathies. Many MWDs will develop laboratory evidence of thrombocytopenia and coagulopathy but true spontaneous hemorrhage is rare.
- Injection of elapid venom typically causes rapid paresis that can occur within minutes but may be delayed for up to 24 hours. Paresis can progress to the diaphragm requiring mechanical ventilation. Elapid venom can also cause significant hemolysis that may require a packed red blood cell transfusion. Monitoring for early clinical signs includes serial checks of the patellar reflex, measuring respiratory parameters on a blood gas analysis, and serial evaluations of serum for hemolysis. In addition to respiratory paralysis, life-threatening acute kidney injury can occur with severe hemolysis, therefore kidney values should be monitored if hemolysis develops.
- If no clinical signs of envenomation are present, do not administer antivenom and observe the patient for 12-24 hours. Perform baseline database on intake, if any clinical signs develop, and prior to discharge.
- In severe envenomation cases, blood products such as canine Fresh Frozen Plasma, pRBCs, whole blood, or other interventions may be needed. Refer to MWD Transfusion CPG for guidance.
- Patients presenting in or later develop shock should be treated as recommended in Chapter 6, in addition to receiving antivenom treatment.

Supportive Care for Venomous Snake Bites

- Coordinate MEDEVAC (urgent) directly to appropriate medical facilities where antivenom is stored. Remote sites should request overfly (bypass the local MTF/VTF) directly to appropriate facilities.
- Hospitalize any MWD with history or signs suggesting envenomation for at least 24-48 hours to monitor progression.
- Ensure patent airway, provide supplemental oxygen, and ventilation, as needed.
- Place an IV catheter.

Diagnostics

- Obtain initial vital signs measurements including a blood pressure to assess for hypotensive shock.
- Perform a CBC, blood chemistry panel, and urinalysis. Do not perform a cystocentesis due to risk of coagulopathy.
- If possible, perform a PT/aPTT or ACT. Coagulation machines meant for human blood are not reliable for canine coagulation parameters.
- Examine a blood smear to evaluate for echinocytosis and perform a manual platelet count.

Treatment

Antivenom

- Antivenom choice should be determined by the MWDs' geographical area and suspected species of snake involved.
- Dose based on the severity of envenomation and clinical response to antivenom therapy.
- Follow manufacturer directions for dilution, if necessary.
- Mild clinical signs: infuse antivenom over 60 minutes.
- Moderate to severe clinical signs: infuse antivenom over 20-60 minutes.
- Repeat administration until control is achieved – swelling and tenderness not progressing, bloodwork improving/resolved, clinically stable, neurotoxicity improving/improved. Monitor for hypersensitivity.

Analgesia

- Fully reversible opioids preferred until patient is no longer a risk for hypotension (See Chapter 16). NOTE: Do not treat with NSAIDs, given the propensity for envenomated dogs to develop coagulopathies and secondary acute kidney injuries.
- IV Fluid therapy
- Isotonic crystalloids at a rate based on clinical signs and laboratory findings. Generally, a fluid rate of 1.5 – 2 times maintenance is an initial starting point after any necessary fluid boluses. General maintenance fluid rate is 40-60 mL/kg/day. Adjustment to fluid rate is based on patient's clinical response.
- Manage any open wounds that develop (See Chapter 14).
- Do NOT use tourniquets, ice packs, heating, or local vasoconstriction (e.g., injection of epinephrine locally) in an attempt to slow venom spread.
- Confine MWDs to minimize venom distribution.

Monitoring

- Snakebite Severity Score (SSS) should be considered as an objective tool to guide antivenom administration. A SSS assigns a score of 0-3 or 4 to six body areas to assess neurological, gastrointestinal, cardiac, coagulation, local wound, and pulmonary parameters.10 A score of 20 is consistent with severe envenomation. SSS is most helpful for monitoring trends and can be misleading in the subacute setting as signs can be delayed.[11] Consider completing a SSS every six hours during patient hospitalization (see Table 15).

- Repeat diagnostics as necessary (to include PCV/TS, blood chemistry panel, platelet count, blood pressure) 4-6 hours after initial baseline, as needed based on clinical signs, and at time of discharge.

Adverse Reactions

- Type I hypersensitivity reactions can be minor and local or severe and generalized. Clinical symptoms include hyperemia of the sclera or pinnae, agitation, bradycardia, tachycardia, vomiting, ptyalism, urticaria, facial pruritis, tachypnea, and/or fever. Most reactions can be treated by slowing the antivenom infusion rate.4 Additional treatments include diphenhydramine (2-4 mg/kg, IM) and +/- an anti-inflammatory dose (0.1 mg/kg/day), IV) of dexamethasone. Pretreatment with antihistamines or steroids is not recommended to influence development of type I hypersensitivity.

- Delayed Type III hypersensitivity reactions, or serum sickness, can manifest 3 to 21 days after antivenom administration and include fever, lethargy, diarrhea, painful joints, lymphadenomegaly, vasculitis, urticaria, and gastrointestinal signs. Treatment involves a tapering dose of glucocorticoids and antihistamines.[12]

- Anaphylaxis to antivenom is rare but can have an acute or a delayed onset. Reported anaphylactoid adverse reactions include Type I hypersensitivity clinical symptoms in addition to hypotension, dyspnea, shock, collapse, and death. HCP should be prepared to treat signs of anaphylaxis with an epinephrine CRI (0.1-1 mcg/kg/min) or bolus dosing (0.01 mg/kg, IV or IM), diphenhydramine (2-4 mg/kg IM), and +/- an anti-inflammatory dose (0.1 mg/kg/day, IV) of dexamethasone. Though an epinephrine CRI takes longer to set up, it has demonstrated superiority in the treatment and resolution of anaphylaxis over bolus dosing.[7,8]

TABLE 15. SNAKE BITE SEVERITY SCORE

Pulmonary System	0—Signs within normal limit. 1—Minimal: Slight dyspnea 2—Moderate : Respiratory compromise, tachypnea, use of accessory 3—Severe: Cyanosis, dyspnea, extreme tachypnea, respiratory insufficiency or respiratory arrest from the cause.
Cardiovascular System	0—Signs with normal limits 1—Minimal: tachycardia, general weakness, benign dysrhythmia. 2—Moderate: Tachypnea, hypotension (but tarsal pulse still palpable) 3—Severe: Extreme tachypnea, hypotension (nonpalpable pulse or systolic blood pressure <80 mm Hg), malignant dysrhythmia or cardiac arrest.
Local Wound	0—Signs with 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 issue to slough.
Gastrointestinal System	0—Signs with normal limits 1— Minimal: Abdominal pain, tenesmus. 2—Moderate: Vomiting, diarrhea. 3— Severe: Repetitive vomiting, diarrhea, or hematemesis

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TABLE 15. SNAKE BITE SEVERITY SCORE	
Hematological System	0—Signs with normal limits 1—Minimal changes of coagulation parameters: PT and PTT above normal and up to 2 times above normal, platelets 100,000 to 150,000/mm3. 2—Moderate increase in coagulation parameters: PT increased by a factor of 2-5 times above normal and PTT increased by a factor of 2-3 above normal, platelets 50,000 to 100,000/mm3. 3—Severe: Increases of coagulation parameters: PT increased by a factor of 5-10 times above normal and PTT increased by a factor of 3-4 times above normal, 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 immeasurable, PTT immeasurable, platelets <20,000/mm3
Central Nervous System	0—Signs with normal limits 1– Minimal: Apprehension. 2—Moderate: Chills, weakness, faintness and ataxia. 3—Severe: Lethargy, seizures, coma.
Severity Score: (sum of 6 sections)	Time:_____ Score:_____ Time:_____ Score:_____ *Table created from existing examples.*

Snake & Insect Envenomation References

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