The medical treatment of venomous snakebite victims has been a controversial subject for decades. Appropriate first aid and the use of antivenom have proven to be efficacious in reducing both morbidity and mortality.

VENOMOUS SNAKES

3500 species in world

Approximately 20 out of 120 species in the U.S. are poisonous

EPIDEMIOLOGY

500,000/yr. in world; 50,000 – 65,000 fatalities

45,000 total bites/year in people in U.S. – 8,000 involve poisonous snakes

Fatalities – 12-15/ yr.

Exotics – 15/yr. (zoos, schools, other collections) – probably under-reported

Rattlesnakes – 65% of all venomous bites – almost all deaths

VENOM – CHEMISTRY & TOXICOLOGY

Toxins

Difficult to classify as single type such as hemotoxic, myotoxic, or neurotoxic (i.e. the phenomenon involving ion exchange at the neuromuscular junction or in a nerve may, or may not, be the same phenomenon that occurs at the blood cell membrane, or a single heart fiber, a node, or even a coagulation factor)

Venom

Usually a mixture of complex proteins having synergistic enzymatic activities which are multifactorial in action

Collaginase & Hyaluronidase – break down tissue matrix
Nuclease & Protease – hydrolyze nucleic acids & polypeptides
Lipases – Phospholipase A – attack cell wall
Phosphodiesterase – cleaves cyclic nucleotides

Lethal Fraction – Non-enzymatic polypeptides, 100 times more potent than crude venom, and have chemical & physiological specific receptor sites.
SEVERITY OF POISONING FACTORS

Number, depth, and location of bites  
Amount of venom injected  
Snake size & species  
Victim age & size (children & elderly most at risk)  
Victim sensitivity (history of previous venomous snake bite)  
Bacterial involvement with bite  
***FIRST AID – lack of, or over zealous treatment

ENVENOMATION SYMPTOMS

Fang Marks – If present do not always indicate envenomation, also may not be seen even though envenomation has occurred.

25% of rattlesnake bites may be “dry bites” (superficial; no penetration of muscle)

Pain, swelling, edema, ecchymosis,  
Rubbery taste in mouth, Perioral tingling  
With time develop nausea, elevated temperature around wound  
Eventually weak rapid pulse, pulmonary edema, bleeding into lungs, kidneys, and pericardium, leading to hypotension, and cardiovascular collapse.  
Hemolysis, – may lead to renal failure (hemolytic uremic syndrome)

LABORATORY

Attain baseline coagulation profile

CBC  
Platelets (decrease)  
Urinalysis (hemoglobinuria, myoglobinuria)  
PT (increases)  
PTT (increases)  
Fibrinogen (decreases) – FDPs (increase)  
RBC – “burring” phenomenon  
Hmct, Hgb (drop)  
EKG
TREATMENT

Key factors:
1) Availability of medical attention (hospital, antivenom, and professional consultation familiar with snakebite treatment)
2) TIME – don’t waste it – act appropriately and transport to hospital

First Aid

GET TO A MEDICAL FACILITY AS SOON AS POSSIBLE
Keep victim calm, lie down, remove jewelry (watches, rings etc…)
Immobilize affected extremity, keep it at heart level in functional position
Apply wide constriction bandage only snug enough to restrict lymphatic flow (NO ARTERIAL TOURNIQUET)
Incision & suction – Not Recommended (Sawyer Extractor may be of value)
Ice, ETOH, heat, – NO

Antivenom Therapy

Consult Regional Poison Center or Toxicologist
Amount of antivenom needed depends on severity & symptoms
Keep giving antivenom until symptoms stop progressing. Antivenom does not reverse toxicity but rather stops its progression.
Allergic reactions can occur –
Anticompliment reaction
Anaphylactic shock
Serum sickness (occurs days to weeks after AV therapy)
(more commonly rashes, urticaria and pruritis)
*Patient medical history (asthmatic, eczemic,previous bite)

*****
Antivenom may be useful for reducing severe bleeding and tissue problems in addition to being live-saving

Antivenoms/Antivenins

<table>
<thead>
<tr>
<th>Variable</th>
<th>Antivenin (Crotalidae) Polyvalent</th>
<th>Crotalidae Polyvalent Immune Fab</th>
<th>Antivenom (Crotlidae) Purified (Avian)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Source</td>
<td>Equine</td>
<td>Ovine</td>
<td>Avian</td>
</tr>
<tr>
<td>Immunization</td>
<td>C. adamanteus</td>
<td>C. adamanteus</td>
<td>C. atrox</td>
</tr>
<tr>
<td>Venoms</td>
<td>C. atrox</td>
<td>C. atrox</td>
<td>C. durisus terrificus</td>
</tr>
<tr>
<td></td>
<td>C. durissus terrificus</td>
<td>C. scutulatus</td>
<td>Agkistrodon piscivorus</td>
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<tr>
<td></td>
<td>Bothrops atrox</td>
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<td></td>
</tr>
<tr>
<td>Immunoglobulin</td>
<td>IgG – 150,000</td>
<td>Fab – 50,000</td>
<td>IgY – 180,000</td>
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<tr>
<td>(molecular wt.)</td>
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</table>
Antivenoms (Available in the USA – 2002)

CroFab™ (Crotalidae Polyvalent Immune Fab – Ovine)
Savage Laboratories®

Antivenin (Crotalidae) Polyvalent
Wyeth-Ayerst Laboratories®

AV Administration - CroFab™ - Wyeth Antivenin (Crotalidae) Polyvalent™

1) Allergy history? - May want to give prophylactic epinephrine - .25mg subQ, or antihistamine (devoid of sedative effect)
2) Have O₂, epi, shock drugs, tracheostomy equipment & IPPB on hand
3) Reconstitute antivenom as directed in package insert
4) Give as a continuous IV drip slowly into limb contralateral to bite
5) Measure dimension of swelling for monitoring progression or reduction of symptoms (measure diameter of limb just proximal to bite & at 10 & 20 cm at 15 min intervals.
6) Dosing – until symptoms (clinical or lab parameters) stop progressing
7) Antivenom is most effective – the sooner it is given following envenomation

Corticosteroids may be useful to treat the delayed serum reaction that may occur 6-24 days after antivenom use.

AV Dosing

<table>
<thead>
<tr>
<th>CroFab™</th>
<th>Initial Dose</th>
<th>Option</th>
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<tbody>
<tr>
<td></td>
<td>6 vials (250 mL/hr)</td>
<td>Retreat - additional 6 vials</td>
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<tr>
<td></td>
<td></td>
<td>Follow with 2 vials q 6 hrs (up to 18 hrs)</td>
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</tbody>
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<th>Antivenin (Crotalidae)</th>
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<tbody>
<tr>
<td>Polyvalent™</td>
<td>5-10 vials (500 mL/</td>
<td>Retreat – + 3-5 vials (repeat as needed)</td>
</tr>
</tbody>
</table>

SUPPORTIVE MEASURES

- Tetanus antitoxin for prophylaxis
- Broad spectrum antibiotic
- Plasma, platelets, or whole blood as indicated
- Analgesia - Tylenol or codeine for pain (no morphine)
- Hydration (don’t over do it)
- Liquid or soft diet
- O₂, respiratory support
- Keep limb at heart level or elevate if extensive swelling is present
- Wound care ***
IMPORTANT CONSIDERATIONS

1) Allergic reactions, anaphylactic, serum sickness.
2) Antivenoms may bind complement and produce an anaphylactic-like reaction, even in patients with no previous contact with equine or ovine proteins.
3) Object of antivenom treatment is to neutralize all venom injected by snake ASAP
4) Make sure antivenom is adequately diluted.
5) Administer antivenom cautiously and slowly with close observation of the patient.
6) If symptoms of envenomation further develop or return – you need more antivenom
7) Symptoms may be more readily controlled in early stages than when fully developed.
8) In cases of bleeding such as coagulation defects, intravascular coagulation, afibrinogenemia, etc. – to commence with replacement therapy (i.e. whole blood) is useless if the circulating venom procoagulant or anticoagulant is not sufficiently neutralized; in fact, it can be more harmful.