“Animal Bites Fact and Fiction?”

WRAIR- GEIS 'Operational Clinical Infectious Disease' Course
Two Great References:

• The current concepts in management of animal (dog, cat, snake, scorpion) and human bite wounds. Aziz, et al. Journal of Trauma and Acute Care Surgery 2015;78:3:641-648

• Dog and Cat Bites. Ellis and Ellis, American Family Physician. 2014;90(4):239-243
A Most Common Story ...
An 8 Year Old Boy - Dog Bite to Face:

- **PLAYING WITH NEIGHBOR’S “COCKER SPANIEL”**
- **CAUGHT HIM UNDER THE RIGHT NOSE**
- **“BITTEN AND HUNG ON”**
- **NOSE PARTIALLY REMOVED, INITIALLY VERY BLOODY**
- **QUICK TO OUR PEDIATRIC E.R**

**QUESTIONS:**
- Initial care – what comes first?
- Primary vs. delayed closure?
- Antibiotics?
- Other prophylaxis?
Animal Bites and Zoonoses: 

**Overview**

**Bite Infections:**

*Bacterial* – 1st concern: mix of anaerobes and aerobes from the patient’s skin and the animal’s oral cavity – direct inoculation. *Viral* – 2nd and most deadly risk? (Rabies, Herpes B)

**Zoonosis:** (1) disease that is transmissable from animals to human (2) spread by aerosols, feces, urine, insects, and direct contact.

**Zooanthroponosis:** Reverse zoonotic disease transmission – primarily human disease, can bridge over in animals (History of RSV – chimpanzee coryza virus?)
Risk Factors Quiz:

• Who is most likely to get bit by a dog?
  – 1 year old infant
  – 9 year old boy
  – 38 year old man
  – 75 year old woman
• Who is most likely to get bit by a cat?
  – 1 year old infant
  – 9 year old boy
  – 38 year old man
  – 75 year old woman
• Who is most likely to have a complication from human bites?
  – 1 year old infant
  – 9 year old boy
  – 38 year old man
  – 75 year old woman
• Rank in order of most to least likely to get infected:
  – Dog, Cat, Human
Dog and Cat bite Overview:

- 4.5 million people are bitten each year (US)
- 1% of ER visits, 2% admitted, 10-20 deaths/yr
  - Dogs = 85% in USA, 103-118/100,000/yr
  - >70% known animal, 50% unprovoked
  - Children >> Adults (Peak dog = 5–9 year old boys)
- Dogs more likely to bite: male (6.2x), chained (2.8x), intact (2.6x)
- Wide Variety: Pit bulls, Rottweiler's, Presa canarios, Cane corsos, Mastiffs, Dogo argentinos, Fila brasileiro, Sharpeis, Boxers

Ellis and Ellis, Am Fam Physician. 2014;90(4):239-243
Animal Bites and Zoonoses: Dogs
2000-2009: 256 Fatal Dog Bites in US:

- Homicide, animal control, media
- 85% of dogs “unrelated/unknown” to the attacked
- 87% without an able bodied defender/77% limited communication ability
- 76% of dogs isolated, limited contact with humans
- Only 21% history of owner neglect or abuse
- At least 20 breeds/mixes (negates breed-specific legislation – pit bull, wolf, etc.)

Cat Bites:

- #2 common reported bites US
  - 5% - 15%
  - Incidence of 400,000/year
  - Late reporting (less obvious trauma)
- 6% admitted
  - Similar/higher than dogs
  - 2x greater infection rate
- Peak women > 75 yrs
- Arms > face > lower extremities

Animal Bites and Zoonoses: Overview

Figure 1. Location of Wound Infections in 50 Patients Bitten by Dogs and 57 Patients Bitten by Cats.

NEJM 1999; 340: 85-92
Human Bites:

• #3 cause of ER referrals for Bites: 
  (23% of bites)
  - Clench fist fighting
  - Violence /abuse
  - Sexual behavior
  - Seizure with self-biting

• 10-15% Infected

• **Aulus Cornelius Celsus** (Not an MD):
  – Roman historian, 25 BC to 50 AD
  – “Rubor, Dolor, Calor, Turgor”
• To prevent infection and rabies: “Cleanliness and washing wounds with solutions such as vinegar”
• Hold the victim underwater to relieve thirst and cure rabies
Early care – Clean/Clean/Clean!

- Stop Bleeding (> 10 min – acute care)
- Clean, clean, clean – soak, then 20 ml syringe “If Open,” cannot for puncture
- Explore for deep damage (tendon sheaths)

Be a little more delicate than this provider!
| TABLE 3. Wound Management After Dog, Cat, or Human Bites |

- Obtain culture (in case of abscess, severe cellulitis, devitalized tissue, or sepsis)
- Use saline solution for wound irrigation.
- Debride necrotic tissue, and remove any foreign bodies.
- Obtain radiographic study (in case of fracture or bone penetration).
- Initiate prophylactic antibiotics in selected patients, depending on type of dog or cat involved.
- Hospitalize patient (in case of fever, sepsis, spreading cellulitis, severe edema, or crush injuries).
- Consider hospitalization for patients who are immunocompromised or are likely to be noncompliant.
- Administer tetanus booster (if none given in the past year), or initiate primary series in nonvaccinated individuals.
- Assess the need for rabies vaccine and immunoglobulin administration.

2 Big Decisions: Primary vs. Delayed Closure; Antibiotics:

• Equivocal data regarding increased infection risk with primary closure (if well irrigated) – use cosmetic/practical guidance

• Antibiotics – more supported if:
  – Wound factors: +/- Need to close, severe tissue damage
  – Site: face, hand, deep punctures
  – Sources: Cat bites, Human bites
  – Time of presentation: >6-12 hours for extremities, >24 hours for facial bites
  – Host: Immune compromised, asplenic, diabetes

Ellis and Ellis, Am Fam Physician. 2014;90(4):239-243
| TABLE 4. Organisms Causing Infections After Bites |

**Cat bites**  
- *Pasteurella* species, *Streptococcus* species  
- *Staphylococcus* species, *Moraxella* species  
- *Fusobacterium* species, *Bacteroides* species  
- *Porphyromonas* species  

**Dog bites**  
- *Pasteurella* species, *Streptococcus* species  
- *Staphylococcus* species, *Neisseria* species  
- *Fusobacterium* species, *Bacteroides* species  
- *Porphyromonas* species, *Prevotella* species  
- *Capnocytophaga* species  

**Human bites**  
- *Viridans streptococci*  
- *Streptococcus pyogenes, S. aureus*  
- Anaerobes *E. corrodens*  
- Hepatitis B and C  
- HIV
Table 2. Prophylactic Antibiotic Dosages for Animal Bites

**Adults**

**First-line**

- Amoxicillin/clavulanate (Augmentin), 875/125 mg every 12 hours

**Alternatives**

- Clindamycin, 300 mg 3 times per day *plus* ciprofloxacin (Cipro), 500 mg twice per day
- Doxycycline, 100 mg twice per day
- Penicillin VK, 500 mg 4 times per day *plus* dicloxacillin, 500 mg 4 times per day
- A fluoroquinolone; trimethoprim/sulfamethoxazole, 160/800 mg twice per day; or cefuroxime axetil (Ceftin), 500 mg twice per day *plus* metronidazole (Flagyl), 250 to 500 mg 4 times per day, or clindamycin, 300 mg 3 times per day

**Children**

**First-line**

- Amoxicillin/clavulanate, 25 to 45 mg per kg divided every 12 hours

**Alternative**

- Clindamycin, 10 to 25 mg per kg divided every 6 to 8 hours *plus* trimethoprim/sulfamethoxazole, 8 to 10 mg per kg (trimethoprim component) divided every 12 hours

**Pregnant women who are allergic to penicillin**

- Azithromycin (Zithromax), 250 to 500 mg per day
- Close monitoring is needed because of high failure rate
Animal Bites and Zoonoses: *Cats*

- **Bacteria:**
  - **Aerobic**
    - High rates of *Pasteurella*, *Streptococcus spp*, *Staphylococcus spp*, *Neisseria*, *Bartonella henselae*
  - **Anaerobic**
    - *Fusobacterium*, *Bacteriodes*, *Porphyromonas*, *Prevotella*
  - Bacteria located on the skin of person bitten
- Again, Augmentin is #1 choice
- Virus: RABIES actually more from cats in the US!
Animal Bites and Zoonoses: Cats

(Pasteurella multocida)
Animal Bites and Zoonoses: Cats

(*Pasteurella multocida*)

Gram-negative, non-spore-forming bacilli consistent with *Pasteurella multocida*
Big Cat Bites
Rapid onset cellulitis

*P. multocida* most commonly reported

Deep structure involvement
   - Tenosynovitis, septic arthritis, osteomyelitis, meningitis, spinal cord injury
US Army Tiger Bite

- September 18, 2003, U.S. Army Reserve soldiers and Iraqi police on patrol in Baghdad zoo after closing
- Soldier attempted to feed a male Bengal tiger a chicken kabob; right arm severely mauled
- Bleeding stopped, wound debrided, placed on broad spectrum antibiotics, medevac’d to WRAMC for debridement/therapy
- Cultures obtained...
Clubbing with the Rat Pack

• 48 y/o male in SE Asia comes to the clinic with fevers and severe myalgias
• He had been slipped a ruffi while at a club, bushwacked when exiting, roughed up, robbed and left in a back alley, awakening in his own filth, shoes, valuables and ID all stolen
• No evidence of sexual assault
• On PE, animal bite marks around right ankle
• Faint rash on extremities
• Within 24hrs, blood cultures positive for pleomorphic GNR
Pustular rash

Branching Gram-negative bacilli

What is the most likely diagnosis?
Rat Bite Fever

- *Streptobacillus moniliformis* (US)
- *Spirillum minus* (Asia)
- Children, poor, pet shop, labs
- Symptoms:
  - Relapsing fever, rash, migratory polyarthralgias
  - Mortality 13%
- Treatment – PCN (amox-clav); doxycycline
- Endocarditis most common complication
FEAR THE FISH!! (Candiru)

Fig. 51 Illustration of a candiru (Vandellia cl. plazai) from the Rio Jauaperi. 

Not all Zoonoses are due to “Bites”: *(Cat Scratch Fever)*

- *Bartonella henselae*; gram-negative, argyrophilic, bacilli.
- Cats are the major reservoir but arthropods (fleas) and other animals may also play a role in the pathogenesis; Worldwide
- **Transmission**: scratches; licks; bites
- **Clinical signs/lesions**: Single-node / regional lymphadenopathy; fever; fatigue; muscle/joint pain; weight loss; and splenomegaly
- **Treatment**: No proven efficacy; +/- Azithromycin (Consider penicillin; tetracycline; cephalosporins; aminoglycosides; fluoroquinolones
Animal Bites and Zoonoses: NHP 
(Herpes B)

NEW WORLD MONKEYS
- Nostrils are far apart and open to the side
- Some species have prehensile tails
- Thumb orientation lies in line with other digits
- Some species have fingernails on big toe
- Live in trees
(Examples: marmosets, tamarins, squirrel monkeys)

OLD WORLD MONKEYS / Asia:
- Nostrils are closer together and open downward or forward
- Tail is not prehensile
- Thumbs are opposable
- Fingernails and toenails present on digits
- Live mostly on the ground
- Main source of LabAnimals
(Examples: rhesus macaques, cynomolgous monkeys, baboons, African green monkeys)
NHP and *Herpes B*

- **Herpes B Virus**
  - Macaquesine (formerly Cercopethicine) herpes virus 1
  - Distribution: Worldwide
  - **#1 = rhesus macaques**
    - Bites/scratches/contact w/tissue fluids
    - 80 – 90% of adult macaques infected; ASYMPTOMATIC
      - Virus is shed throughout life in oral, genital and ocular secretions
    - 3 patterns of disease:
      - Vesicular/ulcerative
      - Influenza like illness
      - Neurologic with nausea and vomiting
  
**Human disease (encephalitis) is usually fatal (80%) if untreated or results in severe neurologic impairment**
Animal Bites From NHP: *Herpes B*

**Post exposure treatment:**

- **Wash wound** for 15 minutes
  - Skin: antiseptic (betadine; chlorohexidine; or bleach 1:20)
  - Eyes, mucous membranes: flush with sterile saline
- **Cultures of wound** (post wash); **viral transport media** (refrigerate)
- **Draw blood** (5 mls. of serum)
- **Seek medical attention!!!!**
- **Most receive** antiviral medication
Animal Bites and Zoonoses: NHP

*Herpes B (Post exposure treatment)*

**Post exposure treatment:**

- **Prophylaxis**
  - Acyclovir: (800 mg po qid) x 2 weeks, if 1 day post exposure
  - Valacyclovir: (1g po tid) x 2 weeks

- **ANY Clinical signs**
  - If no CNS/PNS findings: IV Acyclovir
  - If CNS/PNS findings: IV Gancyclovir

- Additional treatment:
  - Antimicrobials
  - Tetanus verification/vaccination
  - Rabies post exposure prophylaxis (PEP)

[http://cid.oxfordjournals.org/content/35/10/1191.full](http://cid.oxfordjournals.org/content/35/10/1191.full) Or CDC website
Animal Bites and Zoonoses: Herpes B

Herpes B (Potential Cases in Afghanistan)

- 126 animal bite exposures in Afghanistan
- 10 = monkey bites
- But only 5 received appropriate B virus prophylaxis

Combined Joint Task Force–1 in eastern Afghanistan. We evaluated these records to identify and describe monkey bites and high-risk exposures among US military members serving in eastern Afghanistan during September–December 2011. For this study, eastern Afghanistan refers to North Atlantic Treaty Organization Regional Command East, which covers ~43,000 square miles (110,000 km²). The US military population in eastern Afghanistan during the study period was ~23,500 persons. Case information obtained included patient age, sex, rank, branch of military service, animal exposures, and treatment details.

We evaluated the cases for the 5 parameters that comprise appropriate initial treatment according to the literature. The parameters are wound care (appropriate cleansing of the wound) (7), antiviral medications for B-virus (valacyclovir) (3), antimicrobial drugs for oral bacteria (amoxicillin/clavulanic acid or clindamycin plus sulfamethoxazole/trimethoprim) (3), verification of up-to-date tetanus vaccination status or vaccine administration in accordance with Advisory Committee on Immunization Practices guidelines (9), and rabies postexposure prophylaxis (PEP). US military policy advised that rabies PEP should adhere to World Health Organization guidelines (10), which recommend giving human rabies immunoglobulin plus 5 doses of rabies vaccine. In accordance with the same policy, adherence to Advisory Committee on Immunization Practices guidelines for rabies PEP with human rabies immunoglobulin plus 4 doses of rabies vaccine was also acceptable (11).

When appropriate initial treatment was not administered, subsequent follow-up was conducted to ensure that patients received required treatment. Appropriate treatment was accomplished by contacting and coordinating with the responsible provider, the patients, and their commanders.

During the study period, we identified 126 cases of animal bites or serious exposures (involving animal neural tissue or saliva affecting the mucosal surfaces or open wounds of the patient). Among these cases, 10 were cases of monkey bites.

Among the 10 military members who had been bitten by monkeys, age range was 22–44 years (Table); most (7) were ~30 years of age, and 8 were male. All were junior enlisted or noncommissioned officers; 8 were members of the Army, and 2 were members of the Air Force (Table).
A few Notes on Venomous Bites...
US and Global Spiders:

US: Black Widow
Latrodectus
muscle cramping, pain, and other neuromuscular-related symptom
Anti-venom, pain control, muscle relaxants
Calcium-gluconate?

Brown Recluse:
Loxosceles
Dermonecrosis within 3 to 4 days
Dapsone?
Local/systemic steroids?
### Clinical Symptoms “Widow” Spider Bites:

<table>
<thead>
<tr>
<th></th>
<th>Latrodectus hasselti</th>
<th>Latrodectus mactans</th>
<th>Latrodectus auracaviensis</th>
<th>Latrodectus indistinctis</th>
<th>Latrodectus geometricus</th>
<th>Latrodectus mactans</th>
<th>Latrodectus tredecimguttatus</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of bites</strong></td>
<td>68</td>
<td>163</td>
<td>77</td>
<td>30</td>
<td>15</td>
<td>89</td>
<td>56</td>
</tr>
<tr>
<td><strong>Study design</strong></td>
<td>Pr, PIC</td>
<td>R, ED</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>Pr, ED</td>
</tr>
<tr>
<td><strong>Positive identification</strong></td>
<td>100%</td>
<td>72%</td>
<td>75%</td>
<td>20%</td>
<td>67%</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Pain</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local pain*</td>
<td>100%</td>
<td>38%</td>
<td>56%</td>
<td>67%</td>
<td>93%</td>
<td>91%</td>
<td>90%</td>
</tr>
<tr>
<td>Radiating pain to limb</td>
<td>38%</td>
<td>18%</td>
<td>41%</td>
<td>57%</td>
<td>7%</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Abdominal pain</td>
<td>9%</td>
<td>17%</td>
<td>17%</td>
<td>67%</td>
<td>27%</td>
<td>53%</td>
<td>35%</td>
</tr>
<tr>
<td>Chest pain, constriction</td>
<td>6%</td>
<td>4%</td>
<td>10%</td>
<td>30%</td>
<td>0%</td>
<td>--</td>
<td>14%</td>
</tr>
<tr>
<td>Back pain</td>
<td>--</td>
<td>56%</td>
<td>--</td>
<td>47%</td>
<td>7%</td>
<td>--</td>
<td>45%</td>
</tr>
<tr>
<td>Diaphoresis</td>
<td>34%</td>
<td>22%</td>
<td>28%</td>
<td>70%</td>
<td>--</td>
<td>70%</td>
<td>55%</td>
</tr>
<tr>
<td><strong>Systemic effects</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nausea</td>
<td>24%</td>
<td>11%</td>
<td>--</td>
<td>17%</td>
<td>0%</td>
<td>--</td>
<td>12%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>4%</td>
<td>11%</td>
<td>5%</td>
<td>17%</td>
<td>0%</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Headache</td>
<td>10%</td>
<td>9%</td>
<td>8%</td>
<td>21%</td>
<td>0%</td>
<td>--</td>
<td>12%</td>
</tr>
<tr>
<td>Abdominal rigidity</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>70%</td>
<td>7%</td>
<td>45%</td>
<td>--</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1%</td>
<td>29%</td>
<td>4%</td>
<td>--</td>
<td>0%</td>
<td>17%</td>
<td>--</td>
</tr>
<tr>
<td>Agitation, irritation</td>
<td>--</td>
<td>--</td>
<td>14%</td>
<td>50%</td>
<td>13%</td>
<td>44%</td>
<td>--</td>
</tr>
</tbody>
</table>

Pr=prospective study. R=retrospective study. ED=emergency department study. PIC=Poison centre study. *In most studies, local pain seems to refer to persistent or severe pain only, rather than any discomfort of the bite (initial or persistent), which differs from the prospective study in Australia.29

Table: Summary of clinical effects of widow spider bites from different regions of the world29,31-35
• Antivenom for Black widows:
  – Initial cold compress
  – Acute anaphylaxis – 1 to 2%
  – Serum sickness – 10%
  – Also, potent analgesics; +/- use of benzodiazepines;
    weak evidence of Ca++ or Mg++ supplements
  – Multiple studies – either underpowered or not significant

• Antivenom for Recluses:
  – Common in Brazil, but ineffective once necrosis is present

Isbister and Fan, Lancet 2011; 378: 2039–47
Scorpion bites:

- SW US and Mexico
- *Centruroides exilicauda*
  - Milder, Occ. neurotoxicity/children
- *Centruroides vittatus*
  - More severe pain
- *Centruroides sculpturatus* (Arizona bark)
  - More durable pain, local dysfunction (72 hrs)

**TABLE 1. Scorpion Sing Evaluation and Treatment**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Clinical Finding</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade I</td>
<td>Localized pain or paresthesia at site</td>
<td>Symptomatic care</td>
</tr>
<tr>
<td>Grade II</td>
<td>Local and remote pain or paresthesia</td>
<td>Symptomatic care</td>
</tr>
<tr>
<td>Grade III</td>
<td>Findings of Grade II plus cranial nerve abnormalities or</td>
<td>Symptomatic care</td>
</tr>
<tr>
<td>Grade IV</td>
<td>Somatic skeletal neuromuscular dysfunction</td>
<td>Give antivenom if available</td>
</tr>
<tr>
<td></td>
<td>Localized pain, cranial nerve abnormalities, somatic skeletal neuromuscular dysfunction, and airway involvement are all present</td>
<td>Symptomatic care give antivenom if available</td>
</tr>
</tbody>
</table>


*2011 – Mexican anti-venom product licensed for use, mainly in Arizona for children*
Snake Bites (In General):

- South and Southeast Asia, sub-Saharan Africa, and Latin America (XX USA)
- 1.8 to 2.5 million venomous snake bites annually 100,000 to 125,000 annual deaths
- Multiple injuries:
  - Local toxins: proteases/digestive = necrotic
  - Systemic toxins:
    - Neurotoxins = paralysis
    - Myotoxins = rhabdomyolysis
    - Hemostasis toxins
    - Cadiotoxins
    - Renal toxins

Snake Anti-Venom:

*Antivenom*

When available, antivenom is the primary treatment for any patient with serious snake envenomation. The effect of the antivenom should be monitored carefully. Lack of response is usually caused by administration of inadequate amounts of antivenom or the use of the wrong antivenom. Lack of response may also occur because it is too late for the antivenom to be effective, such as a patient with advanced paralysis caused by presynaptic neurotoxins in the venom.

*Contraindication.* Previous reaction, patients with asthma, and patients receiving β-adrenergic blockers or angiotensin-converting enzyme inhibitors are a higher risk for allergic reaction.
Cellulitis due to Snake/Reptile Bites:

- 5 million snake bites – 100,000 infections / year
- 43 infected bites; 31 Male/12 female; ¾ one bacteria isolated

<table>
<thead>
<tr>
<th>Bacteria isolated (n=53)</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gram-positive bacteria (n=28)</td>
<td></td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>17</td>
</tr>
<tr>
<td>Coagulase negative staphylococcus</td>
<td>5</td>
</tr>
<tr>
<td><em>Enterococcus faecalis</em></td>
<td>4</td>
</tr>
<tr>
<td><em>Streptococcus spp</em></td>
<td>2</td>
</tr>
<tr>
<td>Gram-negative bacteria (n=25)</td>
<td></td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>8</td>
</tr>
<tr>
<td><em>Klebsiella pneumoniae</em></td>
<td>4</td>
</tr>
<tr>
<td><em>Proteus spp.</em></td>
<td>3</td>
</tr>
<tr>
<td><em>Morganella morganii</em></td>
<td>3</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>3</td>
</tr>
<tr>
<td><em>Acinetobacter spp</em></td>
<td>2</td>
</tr>
<tr>
<td><em>Enterobacter spp</em></td>
<td>2</td>
</tr>
</tbody>
</table>

Reptile Bites:

- High rates of gram negative enteric bacteria
- Salmonella is fairly common:
  - 26% of rattlesnakes per Fitzgerald et al, 2013, even “in the wild”
- Recent British study – 2012 Warwick et al:

<table>
<thead>
<tr>
<th>Injury. envenomation or sting</th>
<th>Episodes</th>
<th>Admissions</th>
<th>Hospitalization days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitten or struck by crocodile or alligator</td>
<td>15</td>
<td>15</td>
<td>31</td>
</tr>
<tr>
<td>Bitten or crushed by other reptiles</td>
<td>398</td>
<td>376</td>
<td>1340</td>
</tr>
<tr>
<td>Contact with venomous snakes and lizards</td>
<td>307</td>
<td>287</td>
<td>463</td>
</tr>
<tr>
<td>Contact with scorpions</td>
<td>40</td>
<td>31</td>
<td>287</td>
</tr>
<tr>
<td>Total</td>
<td>760</td>
<td>709</td>
<td>2121</td>
</tr>
</tbody>
</table>
# Tetanus:

## Table 3. Indications for Tetanus Prophylaxis

<table>
<thead>
<tr>
<th>History of tetanus immunization</th>
<th>Clean, minor wounds</th>
<th>All other wounds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vaccine</td>
<td>Immune globulin</td>
</tr>
<tr>
<td>Uncertain or &lt; 3 doses</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>≥ 3 doses</td>
<td>No, unless &gt; 10 years since last dose</td>
<td>No</td>
</tr>
</tbody>
</table>


![FIGURE. Annual rate* of tetanus cases and tetanus deaths — National Notifiable Diseases Surveillance System, United States, 1947–2008](image)
Tetanus

*Clostridium tetani* Environmental pathogen: soil, dust, manure

Spores enter via wound or breach in skin
Disseminate toxin that acts within CNS Toxin interferes with neurotransmitter release, blocking inhibitor impulses
Result: unopposed muscle contraction, spasm
Tetanus – Clinical Presentation

• Clinical syndrome
  – no confirmatory lab tests
• Painful muscular contractions
  – Masseter (“lock jaw”) and neck muscles
  – Trunk muscles
  – Abdominal rigidity
• Generalized spasms
• Seizures
Tetanus - Treatment

- TETANUS IMMUNE GLOBULIN (TIG)
- TETANUS TOXOID BOOSTER
- AGGRESSIVE WOUND CARE
- ANTIBIOTICS
- MECHANICAL VENTILATION
- SEDATION
- MUSCLE RELAXANTS
Take-Home Points

• Don’t mess with animals...or people
• Recognize the most common pathogens in animal and human bite infections
• Recognize importance of aggressive wound cleaning
• Recognize other less common animal-associated infections – cat scratch disease, rat bite fever, herpes B virus
• Don’t forget about rabies and tetanus prophylaxis
QUESTIONS

THANK YOU