http://www.youtube.com/watch?v=y_qZggrYHRQ
Animal Bites and Zoonosis

Kris Paolino, MD
Chief, Clinical Trials Center
Walter Reed Army Institute of Research
September 2014
• Thanks to :
  – COL James Cummings
Disclaimer

The views expressed in this presentation are those of the speaker and do not reflect the official policy of the Department of Army, Department of Defense, or U.S. Government.
Outline

• Dogs
• Cats
• Other pets
• Exotics
• Most dangerous animal in the jungle
• Review

A few cases along the way…
• **Bite Infections**
  - mix of anaerobes and aerobes from patient’s skin and animals oral cavity

• **Zoonosis**
  - Animal disease that is transmissible to humans (humans are usually an accidental host)
  - Spread by aerosols, feces, urine, insects, and direct skin contact
Bites

- 1% of all ER visits
- 60% related to dogs, 10% -20% cats
- Dog bites account for $1 Billion/year in USA
- Age and gender
  - Age <20 and males more frequent victims for all bites
  - Females and elderly more common in cat bites
- Exotic animals
BAD IDEA
Envenomations
**Table 2. Types of Microorganisms Isolated from 50 Dog Bites and 57 Cat Bites, According to the Type of Infection.**

<table>
<thead>
<tr>
<th>Type of Microorganisms</th>
<th>Abscess</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dog Bite (N=6)</td>
<td>Cat Bite (N=11)</td>
<td>Dog Bite (N=29)</td>
<td>Cat Bite (N=22)</td>
<td>Dog Bite (N=15)</td>
<td>Cat Bite (N=24)</td>
</tr>
<tr>
<td>Aerobes only</td>
<td>1 (17)</td>
<td>3 (27)</td>
<td>10 (34)</td>
<td>7 (32)</td>
<td>10 (67)</td>
<td>8 (33)</td>
</tr>
<tr>
<td>Anaerobes only</td>
<td>1 (17)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Aerobes and anaerobes</td>
<td>4 (67)</td>
<td>8 (73)</td>
<td>18 (62)</td>
<td>14 (64)</td>
<td>2 (13)</td>
<td>14 (58)</td>
</tr>
<tr>
<td>No growth on culture</td>
<td>0</td>
<td>0</td>
<td>1 (3)</td>
<td>1 (5)</td>
<td>3 (20)</td>
<td>2 (8)</td>
</tr>
</tbody>
</table>

*Because of rounding, not all percentages total 100.*

**NEJM 1999; 340: 85-92**
Figure 1. Location of Wound Infections in 50 Patients Bitten by Dogs and 57 Patients Bitten by Cats.
Bites

- 1% of all ER visits
- 60% related to dogs, 10% -20% cats
- Dog bites account for $1 Billion/year in USA
- Age and gender
  - Age <20 and males more frequent victims for all bites
  - Females and elderly more common in cat bites
- Exotic animals
Dogs
Dogs
Dogs

Risk of Bite injury
• Type of dog
  – Working dogs and aggressive breeds at higher risk
  – Pit bull terrier, rottweiller, german shepherd, akita

• Age of victim
  – Young boys (age 5 – 9)

Area of bite
  – Children: face, head and neck
  – Adults: hand, face, scalp, neck, thigh, leg

Type of bite
  – Severe crushing injury can cause depressed skull fracture, severe scalp and intracranial bleed, facial disfigurement, damage to the great vessels and nerves
Dog Bites - organisms

• Aerobic bacteria
  – *Pasteurella* spp.
  – *Streptococcus* spp.
  – *Staphylococcus* spp.
  – *Neisseria* spp.

• Anaerobic bacteria
  – *Fusobacterium* spp.
  – *Bacteroides* spp.
  – *Porphyromonas* spp.
  – *Prevotella* spp.
  – *Capnocytophaga canimorsus* (esp. concerning if no spleen)
Dog Bites

• Only 2 – 10% get infected
• *Pasteurella multocida*
  – Resistant to: cephalexin, clindamycin, erythromycin
  – Susceptible to: Penicillin, Cipro or levofloxacin, Doxycycline, TMP/SMX (Bactrim)

• *Capnocytophaga* spp.
  – Resist to: TMP/SMX (Bactrim), ? vancomycin
  – Susceptible to: Amox/Clav (Augmentin), Penicillin G, clindamycin
Cat Bites - organisms

• Aerobic
  – *Pastuerela* spp,
  – *Streptococcus* spp
  – *Staphylococcus* spp
  – *Bartonella henselae*
  – *Neisseria*

• Anaerobic
  – *Fusobacterium*
  – *Bacteriodes*
  – *Porphyromonas*
  – *Prevotella*
Gram-negative, non-spore-forming bacilli consistent with *Pasteurella multocida*
**Pasteurella multocida**

- In saliva of >90% of cats, over 80% of wounds get infected
  - Different species, *Pastuerella canis*, in saliva of 50% dogs, only 2 – 8% get infected

- Small aerobic gram negative baccilli

- Amoxicillin sensitive
Pasteurella multocida

• Cause serious infections
  – Necrotizing fasciitis
  – Septic arthritis
  – Osteomyelitis
  – Less commonly, sepsis, septic shock, and meningitis

• Severe infection can be seen in:
  – Infants
  – Pregnant women
  – Patients on chronic steroids
  – HIV-positive individuals
  – Organ-transplant recipients
  – Other immunocompromised patients
Pasteurella multocida

• Bacteremia
  – Occurs in 25–50% of patients with pneumonia, meningitis, and septic arthritis due to *P. multocida*
  
  – Many patients with bacteremia have evidence of notable liver disease

  – Rare cases of bacteremia have also been seen in previously healthy individuals.
    • Mortality remains substantial at 25%
Cats

Septic arthritis of left first proximal interphalangeal joint
Girl vs Cat

• 15 yo female with wound from cat on forearm

• Seen in ED, wound cleaned, treated with oral Augmentin

• Wound slowly became worse, somewhat ulcerative

• Patient now back in ED for further evaluation

• Upon further questioning, she had a history of recurrent infections
MRSA infection of the left forearm of a 15-year-old
BUT WAIT, THERE’S MORE…
Cat had developed recurrent MRSA culture-positive skin lesions of the perineal area
Roy Horn of Siegfried and Roy attacked by tiger
Don’t try this at home…or abroad
Tiger Bite

• September 18, 2003, a group of U.S. Army Reserve soldiers and Iraqi police were patrolling in the zoo after it had closed

• A soldier had his right arm severely mauled by a male Bengal tiger; he had reportedly attempted to feed the tiger a chicken kabob

• Bystanders, seeing the attack, shot and killed the animal

• Bleeding was stopped, wound debrided, placed on broad spectrum ABX and patient medi-vaced to WRAMC for further debridement and therapy.
Fastidious gram negative bacillus
Acinetobacter baumanii

- Environmentally present
- Occurs in many of the wounded coming in from theater
- Treated with further wound revision, broad spectrum ABX to include Amp/Sulbact (Unasyn) and Colistin, wound eventually healed
- Sustained a substantial amputation of arm in sequential surgical revisions.
Horses

- **Fecal transmission unlikely**, but considered in those with close equine contacts
  - Salmonella
    - Usually mild, self limited disease
    - Severe cases (septicemia, meningitis) in immunocompromised
  - Campylobacter
    - Incubation 1 – 7 days
    - Abdominal pain and bloody diarrhea
  - Cryptosporidium
    - Rarely from healthy horses
    - Intracellular protozoan parasite
    - *C. parvum* and *C. hominis* are the likely human pathogens
  - *Giardia lamblia*
    - directly or thru contaminated water
Horses

• Aerosol
  – *Rhodococcus equi*
    • Gram positive pleomorphic coccoid
    • Found in the soil contaminated with herbivore manure
    • Horses have lung disease, colitis and mesenteric adenitis
    • Humans – pulmonary infection most common occurs in immunocompromised
    • Generally penicillin and cephalosporin resistant
      – Treat with vancomycin and carbapenems

  – *Brucella suis* and *abortus* (Brucellosis)
    • Unlikely, but occurs with exposure to blood and body fluids
    • Treat with gentamicin and doxycycline

  – *Coxiella burnetti* (Q fever)
    • Generally flu-like illness, pneumonia, hepatitis
    • Chronic infection results in endocarditis
    • Treatment of choice is with doxycycline
Horses

• Mosquito-borne disease
  – Eastern Equine Encephalitis virus
  – Western Equine Encephalitis virus
  – West Nile virus
  – Venezuelan Equine Encephalitis virus
    • Horse is primary amplification host
    • Prevent outbreaks by immunizing horses
    • Found in Florida to South America
    • Incubate 1-6 days in man
    • 0.5% adults on 4% children develop encephalitis

• Infected saliva (Rabies unlikely but possible)
Rabbits

• GI
  – *Salmonella*, *Yersinia pseudotuberculosis*, *cryptococcus spp.*

• Respiratory
  – *Pasteurella multocida* (no bunny-to-man trans) causes eye infections and snuffles in rabbits
  – *Bordetella bronchiseptica* respiratory infection that can transmit to man

• Neurologic
  – Rabies reported in 7 rabbits (chance encounter, generally doesn’t happen)

• Cutaneous
  – Dermatophytes (ringworm) transmitted by direct skin contact

• Zoonoses
  – Tularemia
  – Babesiosis
Rabbits

http://www.youtube.com/watch?v=XcxKIJTb3Hg
Rabbits

• GI
  – Salmonella, Yersinia pseudoTB, Crypto

• Respiratory
  – Pasturella multocida (no bunny to man trans) causes eye infections and snuffles in rabbits
  – Bordetella bronchseptica respiratory infxn that can trans to man

• Neurologic
  – Rabies reported in 7 rabbits

• Cutaneous
  – Dermatophytes transmitted by direct skin contact

• Zoonoses
  – Tularemia
  – Babesiosis
Rabbits

• 22 y/o male acute fever, lymphadenopathy, malaise, and dry, non-productive cough in Martha’s Vineyard

• 5 pack-year smoker, mows lawns at the Golf club

• CXR showed bilateral atypical pneumonia (greater airspace disease on RLL)

NEJM 2001; 345:1601-1606  November 29, 2001
Differential

• Typhoidal syndromes such as salmonellosis or rickettsial infections should be included in the differential diagnosis.

• Other causes of pneumonia such as infection with *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, *Legionella pneumophila*, and *Coxiella burnetii*, or *Chlamydia psittaci*, as well as exposure to staphylococcal enterotoxin B

• In fulminant pneumonias, plague and inhalational anthrax

• Consider severe mononucleosis with Epstein-Barr virus
Tiny, pleomorphic, poorly staining gram-negative coccobacillus (0.2 to 0.5 by 0.7 to 1.0 microns). In clinical specimens, these forms can be found intracellularly.
Figure 1. Cases of Primary Pneumonic Tularemia, Tularemia with No Localizing Signs, and Ulceroglandular Tularemia on Martha’s Vineyard, May 21 through October 28, 2000, According to the Week of Onset of Illness.
Tularemia

• Although *F. tularensis* does not form spores, it can survive in water, soil, and decaying animal carcasses
  – Also makes this a potential biowarfare agent

• The organism persists in water and mud for as long as 14 weeks, in straw for 6 months, and in oats for 4 months

• *F. tularensis* was shed in animal excreta, persisted in the environment, and infected people after being mechanically aerosolized and inhaled
Tularemia: 6 Presentations

• Typhoidal
  – Bacteremia with fever, chills, headache, myalgias, malaise, sore throat, and anorexia.
  – Abdominal pain, nausea, vomiting, and diarrhea may be present

• Pneumonic
  – Dry, non-productive cough, dyspnea, pleuritic chest pain, and fever.
  – Physical examination may reveal rales, consolidation, and a friction rub or signs of effusion

• Oculoglandular
  – Painful, often purulent, conjunctivitis with lymphadenopathy especially in the periauricular, submandibular, and cervical areas
Tularemia: 6 Presentations (cont’d)

• **Oropharyngeal**
  – Painful sore throat; there may also be abdominal pain, nausea and vomiting

• **Ulceroglandular**
  – Regional lymphadenopathy with a papule that develops into an ulcer at the site of entry. Fever, chills, headache, malaise, anorexia, and fatigue usually are the first symptoms

• **Glandular**
  – Similar to the ulceroglandular form, but without skin or mucous membrane lesions
Diagnosis

- *F. tularensis* is difficult to culture on standard media
  - Send early post-exposure (<24 hrs) nasal swabs, sputum, induced respiratory secretions for culture, DFA
  - **Don’t culture unless you talk to the lab first!!!**

- Definitive diagnosis is usually made retrospectively by serology
  - Titers are usually negative during the first week
  - Cross-agglutination can occur with *Brucella* and *Proteus* species
Tularemia

• **Treatment:**
  - Streptomycin 30 mg/kg qd IM for 10-14 days, or gentamicin 3-5 mg/kg qd IV for 10-14 days.
  - Probably will NEVER find a pharmacy with streptomycin

• **Prophylaxis:**
  - A live, attenuated vaccine (available as an IND) is administered once by scarification
  - Doxycycline 100 mg q12h po for 14 days, or
  - Tetracycline 500 mg qid po for 14 days.
Rodents

• Infected saliva
  – Tularemia
  – Rat bite fever
  – Rabies (VERY rare): 2005 case report of rabies in guinea pig and 7 rabbits

• Direct contact or aerosol
  – LCMV (lymphocytic choriomeningitis virus)
    • Transmission to man thru direct contact with fomites or aerosolization of virus
    – Monkeypox (Prairie dogs in the flea market)
    – Cowpox
    – Ringworm
    – Hantavirus
    – Lassa fever
Clubbing with the rat pack

• 48 y/o male in SE Asia comes to the clinic with fevers and severe myalgias

• Drugged, robbed, and left in an alley

• No evidence of sexual assault

• On exam, animal bite marks around right ankle

• Faint rash on extremities

• Within 24hrs, blood cultures positive for pleomorphic gram negative rod bacteria
Rat Bite fever

• *Spirilium minus* in Asia  
• *Streptobacillus moniliformis* in USA  
• Children, poor, pet shops, labs  
• Symptoms:  
  – Fever  
  – Rash (mac/pap, pustular, petechial, purpuric)  
  – Polyarthralgias  
  – Haverhill Fever (unpasteurized milk outbreak in 1926)

• Treatment:  
  – Penicillin or Doxycycline
Birds

• Pet birds

• *Chlamydophila psittaci*:
  – Found in almost all pet birds, shed in feces and nasal discharge
  – 1988-2003, 935 human cases in USA

• *Cryptococcus neoformans*
  – Found in soil, from bird feces
  – Inhalation of basidiospores or poorly encapsulated yeast
  – Generally in the immunocompromised

• Wild birds
  – Avian influenza
  – West Nile virus
Birds

• Psittacosis
  – Fever, headache and dry cough with recent bird exposure
  – Pharyngitis, diarrhea and rarely encephalitis
  – Diagnosed by serology, DFA, PCR
  – **Do NOT culture:** Grade 3 pathogen
  – Treat with tetracycline; erythromycin (alternative)

• Cryptococcus
  – Cough (+/- blood), chest pain, fever, wt loss
  – Uncommon: shortness of breath, rash night sweats
  – Diagnosis by histopathology, fungal culture, serum crypto antigen, x-ray
  – Treat with fluconazole (or other azole) in **immunocompetent** patient with no CNS symp
Exotics

• Ferrets
  – **Influenza: aerosols from infected ferrets**
  – Giardia, Salmonella, Campylobacter, Cryptosporidium
  – *Mycobacterium microtus* (vole TB)
  – No rabies transmission documented (vaccinate!)

• Hedgehogs
  – Salmonella, Yersinia, dermatophytes (Trichophyton)

• Flying squirrels
  – Toxo, Staph, *R. prowazeckii* (epidemic typhus)

• Chinchillas
  – Dermatophytes
  – Klebsiella and Pseudomonas (no known transmission)
Fish

- Water exposures:
  - *Mycobacterium marinum*
  - Additional occupational exposures:
    - *Aeromonas hydrophilia*
    - *Edwardsiella tardia*
    - *Erysipelothrix rhusiopathiae*

- Shellfish insult
- Parasites
Tanks a lot…

• 22 year old grad student had afterwork job at pet shop (fired 3 weeks ago)

• Sustained minor abrasion on underside of tank/plastic branch, while cleaning aquarium

• Now with lesion on dorsum of hand, limited healing, not responsive to topical antibiotic ointment and cephalexin
Acid fast stain
Mycobacterium marinum

• Causes fish TB and contaminates aquarium water

• “Fish tank granuloma” caused while sustaining minor injury or abrasion while cleaning fish tank

• Infections in humans present as cutaneous lesions (soft skin papules, pustules and ulcers developing weeks after an injury/exposure

• Treatment of infection by *M. marinum* is oral antibiotics. Medication options include rifampin plus ethambutol, tetracyclines, TMP-SMX, clarithromycin and fluoroquinolones
BAD IDEA
Fishy case of shellfish?

- 53 y/o gulf bay fisherman, **alcoholic with cirrhosis**, has abrasions on arm/leg while harvesting oysters

- Several hours later, red, painful skin, hemorrhagic bullae begin to develop on legs and hands/arms

- Comes into the clinic not well 36 hrs later, in severe pain
**Vibrio vulnificus**

- Leading cause of shellfish associated deaths in USA
- Wound exposure to salt/brackish water in warm summer months
- Filter-feeding shellfish (i.e. oysters) concentrate bacteria
- Risk factors for severe disease:
  - Liver disease, hemochromatosis, alcohol abuse
- Treatment: Doxycycline + ceftriaxone (or FQ)
**Vibrio vulnificus**

**Preventive measures**
- Avoid exposing open wounds to warm seawater; cover with water-tight wrap
- Wear gloves when handling raw shellfish and avoid cross-contamination of raw shellfish with other foods
- Cook shellfish thoroughly; if considered high risk, do not consume raw oysters or other shellfish
FEAR THE TURTLE
Reptiles

• 74-90% colonized with *Salmonella*
  – *Yersinia*, *Campylobacter*, *Aeromonas*

• Intermittently shed in feces

• Responsible for 6% (74,000 cases) of salmonella in US

• Sale of turtles < 4” banned in 1975 resulted in decrease of Salmonella cases in children by 100k
REALLY BAD IDEA
Monkeys

• Few reports of disease transmission from pet monkeys
• Shigella and Salmonella have been transmitted from asymptomatic spider monkeys

• Herpes B
  – Cercopethicine herpes virus 1
  – Transmitted directly from rhesus macaques through bites or scratches or from tissues or fluids
  – 80 – 90% of adult macaques infected and usually asymptomatic
Herpes B virus

• In monkeys, either no lesions or oral/genital lesions (HSV for monkeys)

• Viral shed is lifelong in oral and genital secretions, conjunctiva

• In humans, leads to encephalitis, fatal in 80% without treatment

• Majority of cases are in those who work with non-human primates
Herpes B Virus – Who is at risk?

• Monkey handlers
• Travelers exposure to free-ranging monkeys
  – India, Indonesia and Nepal
  – Puerto Rico and the Caribbean
• Those with monkeys kept as pets
Herpes B Virus – Clinical manifestations

• Initial Local Symptoms:
  – Vesicular or ulcerative lesions
  – Tingling, pain or itching at site
  – Local lymphadenopathy

• Initial Systemic Symptoms:
  – Influenza like illness (fever and myalgias)
  – Numbness, paresthesias, fever, conjunctivitis, abdominal pain, hepatitis, pneumonitis, CNS symptoms

• Advanced Disease:
  – Nausea and vomiting
  – CNS symptoms including HA, CN deficits, dysarthria, dysphagia, seizures, paralysis, respiratory failure and coma
Herpes B Virus: Post exposure Indications

• Skin or mucosal exposures to animals that are at high risk of shedding B virus
  – Ill or immunocompromised macaques, animals with oral or genital lesions, or animals known to be shedding virus

• Inadequately cleaned skin or mucosal exposures
• Lacerations of the head, neck, or torso
• Deep puncture bites
• Needlestick injuries with possibly contaminated needle
• Lacerations or puncture wounds with contaminated objects
• Exposures in which post-cleansing cultures are positive for B virus
Herpes B Virus: Post exposure

• Wash wound for 15 minutes
  – Skin: chlorhexidine, detergent or bleach (1:20)
  – Eyes, mucous membranes: flush with water

• Post-wash cultures of wound

• Treatment / prophylaxis
  – Acyclovir 800 mg po qid x2 weeks (PREGNANCY)
  – Valacyclovir 1g po tid x2 weeks (preferred for all others)
  – Suppressive treatment lifelong: valacyclovir 500 qd or acyclovir 400 tid

• Treatment/disease
  – If no CNS or PNS findings: IV Acyclovir
  – If CNS or PNS findings: IV Gancyclovir
Understand Rabies:

- Fulminant zoonotic encephalitis (Brain Infection)
- Transmitted by saliva/secrections of infected mammals
  - >99% Fatal

Prevention
- Avoid exposure
- Don’t touch that dog
- Stay away from that bat
  - Vaccination

- Post-exposure prophylaxis
- Pre-exposure prophylaxis
  - Veterinarians and “special circumstances”
4 sample sites required by CDC to rule out rabies
(To prove you do NOT have rabies ....)

1. Saliva:
   – RT-PCR
   – Virus isolation

2. Neck biopsy: 5-6 mm diameter punch from nape
   – Minimum 10 hair follicles
   – Sufficient depth to include cutaneous nerves at base of follicle
   – On sterile gauze moistened with sterile water
   – RT-PCR and IF staining for viral Ag in frozen sections

3 & 4. Serum and CSF
   – Test for Ab with indirect IF and virus neutralization
   – If no vaccine or RIG given, presence of serum rabies Ab makes dx, CSF testing unnecessary
   – Ab to RABV in CSF, regardless of immunization history, suggests rabies infection

5 Rules on How To Deal With Rabies:

1. Understand the disease, know your “region”
   – Rabies is very regional, distinct local vectors (animals)

2. Avoid Getting Bit

3. Low threshold for PEP

4. If “Bit”
   – Clean the wound aggressively for “PEP”
   – Must have excellent information and full control of risk factors to decide to “not” give prophylaxis

5. Follow the rules ASAP
   – Most rabies due to delays, or not following the recommendations
### Postexposure Prophylaxis for Non-immunized Individuals

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wound cleansing</strong></td>
<td>All postexposure prophylaxis should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent such as povidine-iodine solution should be used to irrigate the wounds.</td>
</tr>
<tr>
<td><strong>RIG</strong></td>
<td>If possible, the <strong>full dose</strong> should be infiltrated around any wound(s) and any remaining volume should be administered IM at an anatomical site distant from vaccine administration. Also, RIG should not be administered in the same syringe as vaccine. Because RIG might partially suppress active production of antibody, no more than the recommended dose should be given.</td>
</tr>
<tr>
<td><strong>Vaccine</strong></td>
<td>HDCV or PCECV 1.0 mL, IM (deltoid area), one each on days 0, 3, 7, and 14.</td>
</tr>
</tbody>
</table>

### Postexposure Prophylaxis for Previously Immunized Individuals

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wound cleansing</strong></td>
<td>All postexposure prophylaxis should begin with immediate thorough cleansing of all wounds with soap and water. If available, a virucidal agent such as povidine-iodine solution should be used to irrigate the wounds.</td>
</tr>
<tr>
<td><strong>RIG</strong></td>
<td>RIG should not be administered.</td>
</tr>
<tr>
<td><strong>Vaccine</strong></td>
<td>HDCV or PCECV 1.0 mL, IM (deltoid area), one each on days 0 and 3.</td>
</tr>
</tbody>
</table>
• If you need any additional reason to persuade your soldiers to **NOT** keep dogs for pets while deployed, make them watch the several videos on YouTube that show human rabies cases with hydrophobia.

• Remind them that every one of these individuals died of their disease
"We’ll have to clean that out immediately... there’s nothing dirtier than a lawyer bite."
Human Bites

• 52 y/o male suffers a hand injury in brawl at tailgate party in Baltimore

• Presents 12 hrs later with a swollen, red, painful fist. X-ray shows bony fragments. Wound cleaned and given cephalexin, ice, and rest.

• Returns to ER 5 days later with tachycardia, hypotension, fever, confusion

• Small wound with minimal serous secretions on the dorsum proximal 3rd phalanx of left hand; warmth, edema, painful movement of phalanx, decreased sensation, no crepitation detected
As soon as clinical evaluation was finished, anti-tetanic immunization was performed, and patient transferred to surgery room.

Pressure in dorsal compartment was (20 mm Hg) and in palmar compartment (42 mm Hg).

Purulent material (about 120 ml) drained from pre-retinacular space.

1 g ampicillin–sulbactam IV every 6 hours.
Anaerobic Small GNR
Eikenella corrodens

- Anaerobic small gram negative bacilli
- Common in human oral flora
- Resistant to:
  - Cephalexin, Clindamycin, Erythromycin, Flagyl

- Susceptible to:
  - Penicillin, Fluoroquinolones (Cipro and Levo), TMP/SMX (Bactrim), Doxycycline
Management and Treatment of Animal Bites

Cultures
- Gram stain, aerobic, and anaerobic cultures

Irrigation
- Normal saline; copious high-pressure

Debridement
- Remove necrotic tissue and any foreign bodies

Imaging
- Plain radiographs to rule out foreign body
- CT/MRI if concern for osteomyelitis

Wound closure - not usually indicated
Management and Treatment of Animal Bites

Antimicrobial therapy:
- Prophylactic antibiotics in selected cases
- Coverage based on patient type and specific animal involved

Hospitalization Indications:
- Fever, sepsis, spreading cellulitis, substantial edema or crush injury, loss of function, immunocompromised status, or noncompliance

Immunizations:
- Tetanus booster and/or immune globulin
- ? Rabies vaccine and/or immune globulin
QUESTIONS?
This Lecture……Bites?

• Feedback/thoughts appreciated

• Contact:
  MAJ Kris Paolino
  Office:  301-319-9072
  kristopher.m.paolino.mil@mail.mil
Empiric oral antibiotic therapy for animal bites

<table>
<thead>
<tr>
<th>Antibiotic agents</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agent of choice</td>
<td></td>
</tr>
<tr>
<td>Amoxicillin-clavulanate</td>
<td>875/125 mg twice daily</td>
</tr>
</tbody>
</table>

Alternate empiric regimens include:

One of the following agents with activity against *P. multocida*:

<table>
<thead>
<tr>
<th>Agent</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doxycycline*</td>
<td>100 mg twice daily</td>
</tr>
<tr>
<td>TMP-SMX*</td>
<td>1 double strength tablet twice daily</td>
</tr>
<tr>
<td>Penicillin VK</td>
<td>500 mg four times daily</td>
</tr>
<tr>
<td>Cefuroxime</td>
<td>500 mg twice daily</td>
</tr>
<tr>
<td>Moxifloxacin</td>
<td>400 mg once daily</td>
</tr>
</tbody>
</table>

PLUS

One of the following agents with anaerobic activity:

<table>
<thead>
<tr>
<th>Agent</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metronidazole</td>
<td>500 mg three times daily</td>
</tr>
<tr>
<td>Clindamycin*</td>
<td>450 mg three times daily</td>
</tr>
</tbody>
</table>
### Empiric intravenous antibiotic therapy for animal bites

<table>
<thead>
<tr>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Options for empiric gram-negative and anaerobic coverage include:</strong></td>
</tr>
<tr>
<td>Monotherapy with a beta-lactam/beta-lactamase inhibitor, such as one of the following:</td>
</tr>
<tr>
<td>Ampicillin-sulbactam 3 g every six hours</td>
</tr>
<tr>
<td>Piperacillin-tazobactam 4.5 g every eight hours</td>
</tr>
<tr>
<td>Ticarillin-clavulanate 3.1 g every four hours</td>
</tr>
<tr>
<td>A third generation cephalosporin such as ceftriaxone 1 g IV every 24 hours</td>
</tr>
<tr>
<td><strong>PLUS</strong></td>
</tr>
<tr>
<td>Metronidazole 500 mg IV every eight hours</td>
</tr>
<tr>
<td><strong>Alternative empiric regimens include:</strong></td>
</tr>
<tr>
<td>A fluoroquinolone (eg, ciprofloxacin 400 mg IV every 12 hours or levofloxacin 500 mg IV daily) <strong>PLUS</strong> metronidazole 500 mg IV every eight hours</td>
</tr>
<tr>
<td>Monotherapy with a carbapenem•, such as one of the following:</td>
</tr>
<tr>
<td>Imipenem-clastatin 500 mg every six hours</td>
</tr>
<tr>
<td>Meropenem 1 g every eight hours</td>
</tr>
<tr>
<td>Ertapenem 1 g daily</td>
</tr>
</tbody>
</table>
References

• “Bite-related and septic syndromes caused by cats and dogs” Oehler RL, et al; *Lancet Infectious Diseases*, VOL 9, JUL 2009; 439-447
• Principles And Practice Of Infectious Diseases, Mandell, Douglas, and Bennett, 7th Ed
• “Bites and zoonoses from pets other than dogs and cats”, Kotten CN, UpToDate 2010, 9/12/2010
• 15th Annual Comprehensive Review of Infectious Diseases Syllabus
• Images from online sources and personal library