Tuberculosis in a Primary School: the Uppingham Outbreak

- Described in 1985
  - Leighfield Primary school in Uppingham (Leicestershire), England

Tuberculosis in a Primary School: the Uppingham Outbreak

• A 9-year-old student is taken to the school health clinic with ‘red lesions’ on her legs
Tuberculosis in a Primary School: the Uppingham Outbreak---December

• Several months later, another student at the school is seen with the same lesions on their legs
• Referred to her Pediatrician, but nothing was done

Tuberculosis in a Primary School: the Uppingham Outbreak—December

- Soon after, a third child is seen in the nursing office
- He presented with a prolonged cough, fever and headache
- He was diagnosed with a viral illness and his parents were called

Tuberculosis in a Primary School: the Uppingham Outbreak---January

- 4 more students present with cough and fatigue, but no fevers

Tuberculosis in a Primary School: the Uppingham Outbreak---Late January

- An eighth child presented with headaches, cough and fevers
- Initially diagnosed with a viral illness

Tuberculosis in a Primary School: the Uppingham Outbreak---February 2\textsuperscript{nd}

- This eighth child is admitted to the Leicester Royal infirmary
- The principal of the school reports the cluster of unusual illnesses to the Leicestershire Area Health Authority

Tuberculosis in a Primary School: the Uppingham Outbreak---Mid-Late February

- The last patient is diagnosed with tuberculous meningitis, as is the third child
- An extensive contact investigation is undertaken at the school
- All patients and faculty at the school were screened

Tuberculosis in a Primary School: the Uppingham Outbreak---Mid-Late February

• The index patient is identified---a teacher with left-sided cavitary lesions on her chest X-ray and sputum growing *M. tuberculosis* on culture

Tuberculosis in a Primary School: the Uppingham Outbreak---Mid-Late February

- 46 children of the 215 at the school (21%) ultimately received treatment for tuberculosis
- Ages between 6 and 11 years
- The children were in 7 different classes

# Distribution of 46 Children Treated for Tuberculosis by Classroom

<table>
<thead>
<tr>
<th>Variable</th>
<th>Classroom Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom #</td>
<td>1    2   3   4  5  6  7</td>
</tr>
<tr>
<td># students with TB</td>
<td>3  18  13  3  2  3  4</td>
</tr>
</tbody>
</table>

Class 2 was taught by the index case. Class 2 was separated from class 3 by a mobile partition, and students were able to intermingle between the classes.

Classroom Layout

Figure adapted from Wales JM, et al. British Med J. 1985;291:1039-1040
• All children made a full recovery

Outline

• 1.) Tuberculosis
• 2.) Gastroenteritis/Diarrhea
• 3.) Pink Eye---the Scourge of Daycares Everywhere
• 4.) Plague
• 5.) Hantavirus
• 6.) Whooping Cough
• 7.) Bite Wounds
1.) Tuberculosis
Clinical Pearls

1.) Children may look well for months with TB
Clinical Pearls

1.) Children are not little adults---they may have different symptoms
   - Less likely to have a productive cough
   - May not have night sweats
   - May not cough up blood

Clinical Pearls

- Most likely to have
  - Cough for >21 days
  - Fever
  - Weight loss
  - Fatigue
  - Symptoms may be mild and insidious (a ‘bad virus’)

Clinical Pearls

• 2.) The incubation period may be up to 12 weeks
  • May hinder identification of an outbreak (no temporal relationship seen between cases)

Clinical Pearls

• 3.) Most children are less contagious than adults
  • They lack the tussive force with a cough to expel mycobacteria
  • They are less likely than adults to have cavitary lesions with high bacillary loads
  • They are less likely to be smear positive
  • Most outbreaks derive from infected adults

Clinical Pearls

• 4.) The TB (BCG) vaccine does not reliably prevent TB nor cause false + PPD tests
  • Children from Mexico and other countries with BCG immunization may develop TB
  • Never blame a reactive TB test on the BCG vaccine

2015 Committee on Infectious Diseases, American Academy of Pediatrics RedBook; 805-831
Global Coverage of Children Under 1-year of Age with the BCG Vaccine (WHO Data)

<table>
<thead>
<tr>
<th>Country of Study</th>
<th># Cases</th>
<th>Minimum Efficacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haiti</td>
<td>18</td>
<td>45%</td>
</tr>
<tr>
<td>England</td>
<td>203</td>
<td>60%</td>
</tr>
<tr>
<td>USA</td>
<td>249</td>
<td>60%</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>295</td>
<td>10%</td>
</tr>
<tr>
<td>India</td>
<td>80</td>
<td>0%</td>
</tr>
<tr>
<td>USA</td>
<td>60</td>
<td>0%</td>
</tr>
<tr>
<td>India</td>
<td>533</td>
<td>0%</td>
</tr>
<tr>
<td>USA</td>
<td>7</td>
<td>0%</td>
</tr>
<tr>
<td>USA</td>
<td>19</td>
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<tr>
<td>England</td>
<td>33</td>
<td>25%</td>
</tr>
<tr>
<td>Cameroon</td>
<td>213</td>
<td>50%</td>
</tr>
<tr>
<td>Argentina</td>
<td>131</td>
<td>50%</td>
</tr>
<tr>
<td>Indonesia</td>
<td>88</td>
<td>0%</td>
</tr>
<tr>
<td>Kenya</td>
<td>126</td>
<td>0%</td>
</tr>
<tr>
<td>Columbia</td>
<td>178</td>
<td>0%</td>
</tr>
<tr>
<td>Malawi</td>
<td>23</td>
<td>0%</td>
</tr>
</tbody>
</table>
Clinical Pearls

• 5.) An Interferon Gamma Release Assay (IGRA; Quantiferon Gold) is an acceptable alternative to the PPD, in kids over 5 years of age
  • One visit vs. 2 visits
  • Less subjective
  • Less false positives

What were those red spots on the patients’ legs?
What were those red spots on the patients’ legs?

• Erythema nodosum
2.) Gastroenteritis/Diarrhea
## Categorization of Infectious Diarrhea

<table>
<thead>
<tr>
<th>Variable</th>
<th>Non-Inflammatory</th>
<th>Inflammatory</th>
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</thead>
<tbody>
<tr>
<td><strong>Mechanism</strong></td>
<td>Enterotoxin/adherence</td>
<td>Cytotoxin/Invasion</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Small bowel</td>
<td>Colon</td>
</tr>
<tr>
<td><strong>Clinical Presentation</strong></td>
<td>Watery diarrhea, may be afebrile</td>
<td>Bloody diarrhea/mucous, often febrile</td>
</tr>
<tr>
<td><strong>Stool Findings</strong></td>
<td>No fecal WBC’s</td>
<td>Fecal WBC’s</td>
</tr>
<tr>
<td><strong>Pathogens</strong></td>
<td><em>Vibrio cholerae</em></td>
<td><em>Shigella</em></td>
</tr>
<tr>
<td></td>
<td><em>Bacillus cereus</em></td>
<td><em>Salmonella enteritidis</em></td>
</tr>
<tr>
<td></td>
<td><em>Clostridium perferingens</em></td>
<td><em>Clostridium difficile</em></td>
</tr>
<tr>
<td></td>
<td>ETEC</td>
<td><em>Campylobacter jejuni</em></td>
</tr>
<tr>
<td></td>
<td><em>S. aureus</em></td>
<td><em>Campylobacter fetus</em></td>
</tr>
<tr>
<td></td>
<td>Rotavirus</td>
<td><em>Yersenia enterolytica</em></td>
</tr>
<tr>
<td></td>
<td><em>Giardia lamblia</em></td>
<td><em>Entamoeba histolytica</em></td>
</tr>
<tr>
<td></td>
<td><em>Cryptosporidium parvum</em></td>
<td><em>Vibrio parahemolyticus</em></td>
</tr>
<tr>
<td></td>
<td><em>Microsporidium</em></td>
<td>EIEC/EHEC</td>
</tr>
<tr>
<td></td>
<td><em>Cyclospora cayetanensis</em></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Norwalk-like viruses</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EPEC/EAEC</td>
<td></td>
</tr>
</tbody>
</table>

EPEC=Enteropathogenic *E. coli*
EAEC=Enteroaggregative *E. coli*
Modified from Principles and Practice of Infectious Diseases. Mandell, Douglas and Bennett, ed. 7th ed. 2010
Viral Etiologies of Diarrhea

• Rotavirus
• Norovirus
• Adenovirus
• Astrovirus
• Calicivirus
• Norwalk
Q1. For which of the following viral causes of diarrhea do we have a vaccine?

• A.) Rotavirus
• B.) Adenovirus
• C.) Norovirus
• D.) Norwalk virus
• E.) None of the above
Q1. For which of the following viral causes of diarrhea do we have a vaccine?

• A.) Rotavirus
Q2. Which of the following characteristics of stool are most consistent with a viral cause of diarrhea?

- A.) Floating stool
- B.) Excessively foul-smelling stool
- C.) Pale-colored stool
- D.) Darker stool
- E.) Lack of blood and mucous in the stool
Q2. Which of the following characteristics of stool are most consistent with a viral cause of diarrhea?

• E.) Lack of blood and mucous in the stool
Cryptosporidium Cases in the U.S. by Age and Gender, 2009-2010

* Per 100,000 population.
Giardia Cases in the U.S. by Age and Gender, 2009-2010

* Per 100,000 population.
Treatment of Diarrhea

• Primary treatment=Supportive care
• MOST cases of bacterial diarrhea do NOT require antimicrobial treatment
• Treatment CAN make things worse...
The risk of the hemolytic-uremic syndrome after antibiotic treatment of *Escherichia coli* O157:H7 infections

Craig S. Wong, M.D., Srdjan Jelacic, B.S., Rebecca L. Habeeb, B.S., Sandra L. Watkins, M.D., and Phillip I. Tarr, M.D.
## Infection Control Issues for Diarrhea

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Isolation</th>
<th>Follow-up Testing Required?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norovirus</td>
<td>Duration of illness</td>
<td>No</td>
</tr>
<tr>
<td>Rotavirus</td>
<td>Duration of illness</td>
<td>No</td>
</tr>
<tr>
<td><em>Salmonella, non-typhii</em></td>
<td>Duration of illness</td>
<td>No</td>
</tr>
<tr>
<td>Shigella</td>
<td>24 hours after illness resolution</td>
<td>Some states yes; NM no</td>
</tr>
<tr>
<td><em>Salmonella typhii</em></td>
<td>3 negative stool tests and 48 h after antibiotics are completed</td>
<td>Yes---x3</td>
</tr>
</tbody>
</table>
3.) Pink Eye---The Scourge of Daycares Everywhere
Clinical Pearls

• Bacterial (80%)
• Viral (20%)

# Bacterial vs. Viral Conjunctivitis---Clinical Presentation

<table>
<thead>
<tr>
<th>Clinical Finding</th>
<th>Bacterial</th>
<th>Viral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilateral at onset?</td>
<td>70%</td>
<td>30%</td>
</tr>
<tr>
<td>Discharge</td>
<td>Purulent</td>
<td>Watery</td>
</tr>
<tr>
<td>Pre-auricular lymphadenopathy</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Concurrent Otitis Media?</td>
<td>Yes (up to 70%)</td>
<td>No (&lt;10%)</td>
</tr>
<tr>
<td>Age</td>
<td>Often &lt;6 years</td>
<td>Often &gt;6 years</td>
</tr>
<tr>
<td>Eyelids closed shut in morning?</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

# Bacterial vs. Viral Conjunctivitis---Treatment and Infection Control

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Treatment</th>
<th>Treatment Choice</th>
<th>Isolation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacterial</td>
<td>Will speed recovery*</td>
<td>Polytrim or Erythromycin ointment</td>
<td>Can attend school if they can wash hands frequently^</td>
</tr>
<tr>
<td>Viral</td>
<td>None</td>
<td>N/A</td>
<td>Can attend school if they can wash hands frequently^</td>
</tr>
</tbody>
</table>

*is self-limited, however
^assuming no outbreak

4.) Plague
Vignette (based off a true story from 2005)

• A 2-year-old boy living in the East Mountains near Albuquerque is seen by the school nurse on a Friday for a swollen inguinal lymph node, which is noted to be very tender. He is referred to his Pediatrician, who provides a prescription for cephalexin and sends him home.
Vignette (based off a true story from 2005)

• He is found dead in his bed the next morning. Autopsy confirms growth of *Y. pestis* on blood culture. A coroners’ investigation documents that the child was attempting to catch rats in his backyard in the weeks prior to his death. His father, who provides the history to the coroners, is noted to have a febrile cough.
  • Of the following, which is a TRUE statement regarding this patient’s case?
Which of the Following Statements is True?

• A.) Plague is transmissible from human to human, so his father may be contagious
• B.) His family members should be offered a plague vaccine for prevention of disease
• C.) Most beta-lactam antibiotics provide decent treatment for plague, so the disease was likely very advanced at the time of presentation
• D.) His exam was inconsistent with plague, as buboes, or infected lymph nodes, are frequently non-tender on exam
• E.) Plague is seen in all states in the US, not just New Mexico
Which of the Following Statements is True?

• A.) Plague is transmissible from human to human, so his father may be contagious
Is Plague Transmissible from Human to Human?

Sign outside the port of Weymouth, England, 1348
Should Exposed Patients be Offered a Plague Vaccine?

• Ideally yes, but no such vaccine is commercially available
Do beta-lactam Antibiotics Adequately Treat Plague?

- No---standard of care involves the use of aminoglycosides for severe disease. Tetracyclines and fluoroquinolones also have activity against *Y. pestis*.
Are Buboes Frequently non-tender on Exam?
Where is Most Plague Seen in the U.S.?
5.) Hantavirus
Outside Gallup, NM
May 14, 1993

• 19-year-old Merrill Bahe is out for a run
• He become quite dyspneic, gasping for breath

The Coming Plague. Laurie Garrett. 1994
Outside Gallup, NM
May 14, 1993

• Upon return home, he develops high fevers and respiratory distress
• His family rushes him to Gallup Indian Medical Center
  • He is pronounced dead several minutes later

The Coming Plague. Laurie Garrett. 1994
Outside Gallup, NM
May 14, 1993

• His girlfriend had died of an identical illness several days earlier
• By the end of a week, two other close friends/relatives of Bahe died of this mysterious respiratory illness

The Coming Plague. Laurie Garrett. 1994
Outside Gallup, NM
May 14, 1993

• Dr. Bruce Tempest, an internist at Gallup Indian Medical Center, was struck by these deaths
• He felt they could be related

The Coming Plague. Laurie Garrett. 1994
Outside Gallup, NM
May 14, 1993

• He took the unusual step of requesting full autopsies of the deceased individuals and contacted the DOH
• His calls to other IHS facilities turned up 5 similar cases in the area

The Coming Plague. Laurie Garrett. 1994
Outside Gallup, NM
May 16, 1993

• By May 16th, no specific cause of death could be found on any of the autopsies
• The DOH began hearing rumors of ‘weird deaths’ occurring on the reservation

The Coming Plague. Laurie Garrett. 1994
Outside Gallup, NM
Memorial day weekend, 1993

• The CDC was brought in on the case over memorial day weekend
• The death toll was up to 12 at this point
Early Morning, June 3rd, 1993
CDC Lab

• Serum from patients from New Mexico found to cross-react with hantaviruses
• Had it not been for Dr. Tempests’ initial actions, the outbreak may have died out without identification
• Many more may have died in future outbreaks

The Coming Plague. Laurie Garrett. 1994
Clinical Pearls

• 1.) Presenting Features
  • Myalgias (often shoulders, back and thighs)
  • Fever
  • May or may not have respiratory distress/cough
  • Can progress rapidly to death if not caught

• Looks like influenza at the wrong time of year!
Clinical Pearls

• 2.) **Epidemiological Features**
  • Four corners region or travel to that area
  • Exposure to mice/droppings (e.g. cleaning out sheds)
  • Often in warmer weather months (when one does not expect to see viral type illnesses)

2015 RedBook AAP Committee on Infectious Diseases
Clinical Pearls

• 2.) Epidemiological Features
  • Incubation period may be up to 6 weeks
  • Mild forms or the disease are rare
  • May follow especially wet winters
Clinical Pearls

• 3.) Infection Control Issues
  • Person-to-person spread has not been documented
  • Find and shut down the source!
Near Four Corners, NM
Spring, 2016---School Baseball Shed
6.) Whooping Cough

Not Vaccinated?
No Kisses!

Get the adult whooping cough vaccine.
www.VaccinateYourFamily.org
Clinical Presentation

• Prolonged non-productive cough (often >10 weeks)
• Afebrile
• Initial runny nose that resolves as the cough starts
• May be vaccinated
### Waning Effectiveness of the Whooping Cough Vaccine (DTaP)

<table>
<thead>
<tr>
<th>Time After Last DTaP</th>
<th>Risk Per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3 Years</td>
<td>1.42</td>
</tr>
<tr>
<td>3-4 Years</td>
<td>1.77</td>
</tr>
<tr>
<td>4-5 Years</td>
<td>2.81</td>
</tr>
<tr>
<td>&gt;6 Years</td>
<td>5.14</td>
</tr>
</tbody>
</table>

Clinical Pearls

• 1.) Treatment after the cough starts does not help the disease (but limits contagiousness)
Question: When may a child with Pertussis return to school?

• A.) After the cough resolves
• B.) After 3 weeks of cough
• C.) After completing 5 days of appropriate therapy
• D.) Any of the above
Question: When may a child with Pertussis return to school?

• D.) Any of the above
7.) Bite Wounds
<table>
<thead>
<tr>
<th>Location of Wound</th>
<th>Dog Bite</th>
<th>Cat Bite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Face, scalp, or neck</td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>Trunk</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Shoulder, arm, or forearm</td>
<td>12</td>
<td>23</td>
</tr>
<tr>
<td>Hand</td>
<td>50</td>
<td>63</td>
</tr>
<tr>
<td>Thigh or leg</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>Feet</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

• Abscesses almost twice as common in cat vs. dog bites (puncture with long fangs vs. tearing)

• Cat bites became symptomatic after 12 hours, dog bites after 24 hours

<table>
<thead>
<tr>
<th>Bacteria Type</th>
<th>Dog</th>
<th>Cat</th>
<th>Bacteria Type</th>
<th>Dog</th>
<th>Cat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria (cont.)</td>
<td></td>
<td></td>
<td>Aerobes (cont.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pasteurella</td>
<td>25 (59)</td>
<td>48 (75)</td>
<td>Moraxella</td>
<td>5 (10)</td>
<td>20 (35)</td>
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<tr>
<td>Haemophilus sp.</td>
<td>13 (36)</td>
<td>1 (2)</td>
<td>Other</td>
<td>5 (10)</td>
<td>18 (32)</td>
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<tr>
<td>Haemophilus sp. var. melitensis</td>
<td>6 (13)</td>
<td>3 (54)</td>
<td>Other</td>
<td>1 (2)</td>
<td>6 (13)</td>
</tr>
<tr>
<td>Haemophilus sp. var. ducreyi</td>
<td>6 (12)</td>
<td>2 (4)</td>
<td>Other</td>
<td>5 (10)</td>
<td>9 (16)</td>
</tr>
<tr>
<td>Haemophilus sp. var. septicus</td>
<td>5 (10)</td>
<td>16 (28)</td>
<td>Other</td>
<td>5 (10)</td>
<td>7 (12)</td>
</tr>
<tr>
<td>Haemophilus sp. var. ducalis</td>
<td>2 (4)</td>
<td>4 (7)</td>
<td>Ent. faecalis</td>
<td>3 (6)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (2)</td>
<td>0</td>
<td>Ent. sero</td>
<td>1 (2)</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>1 (2)</td>
<td>0</td>
<td>Ent. mundi</td>
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<td>0</td>
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<td>0</td>
<td>Ent. ducreyi</td>
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<td>Enterobacter cloacae</td>
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<td>Ent. aerogenes</td>
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<td>Ent. seriata</td>
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<td>0</td>
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<tr>
<td>Other</td>
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<td>Ent. dispar</td>
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<td>Ent. durans</td>
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<td>0</td>
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<td>0</td>
<td>Rhodococcus</td>
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<td>0</td>
</tr>
<tr>
<td>Other</td>
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<td>0</td>
<td>Streptococcus</td>
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<td>0</td>
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<tr>
<td>Other</td>
<td>1 (2)</td>
<td>0</td>
<td>Fusobacterium</td>
<td>16 (32)</td>
<td>19 (33)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (2)</td>
<td>0</td>
<td>Fusobacterium</td>
<td>8 (16)</td>
<td>14 (25)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (2)</td>
<td>0</td>
<td>Fusobacterium</td>
<td>6 (12)</td>
<td>4 (7)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (2)</td>
<td>0</td>
<td>Fusobacterium</td>
<td>1 (2)</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>1 (2)</td>
<td>0</td>
<td>Fusobacterium</td>
<td>6 (12)</td>
<td>8 (14)</td>
</tr>
<tr>
<td>Other</td>
<td>1 (2)</td>
<td>0</td>
<td>Fusobacterium</td>
<td>1 (2)</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
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<td>Fusobacterium</td>
<td>1 (2)</td>
<td>0</td>
</tr>
</tbody>
</table>
• Can treat with Augmentin (amoxicillin-clavulonate)
Can you get rabies from a bite?

- Wild animals
- Feral dogs/cats
- Stray, ‘loner dogs’ wandering around campus
Is Rabies Endemic in the U.S.?

Data courtesy www.cdc.gov
Animal Rabies in New Mexico

Animal Rabies by County, New Mexico, 2011

Total = 19

Bat (3)
Bobcat
Bovine
Dog (1)
Fox
Horse (1)
Skunk (14)
Cat
Coyote
Raccoon

As of 12/31/2011
Question: What is the most common animal source of human rabies in the U.S.?

- A.) Dogs
- B.) Cats
- C.) Racoons
- D.) Bats
- E.) Foxes
Question: What is the most common animal source of human rabies in the U.S.?

- D.) Bats
Vectors of Domestic Rabies, United States (1995-2011)

<table>
<thead>
<tr>
<th># Cases</th>
<th># Due to Bats</th>
<th># Due to Other Animals</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>34</td>
<td>1 (Raccoon)</td>
</tr>
</tbody>
</table>

Worldwide Causes of Human Rabies

• Globally, the most common cause of human rabies is from exposure to rabid dogs
Conclusion: A Life Saved
(details changed for confidentiality)
Acute Illness of Unclear Etiology
Summer, 2014

• A 12-year-old girl is pulled out of PE class for left arm pain
• A school RN identifies a large mass under the right arm
  • Not red
  • Very painful
Acute Illness of Unclear Etiology

- The child lived in a rural setting with exposure to wildlife
Acute Illness of Unclear Etiology

• The child is referred to a local Emergency Department
• The school RN notes a concern of bubonic plague at the time of transfer (by car via parents)
Acute Illness of Unclear Etiology

• The Emergency Physician agrees
• A dose of gentamicin is administered
• The child is transferred to UNM Children’s Hospital
Acute Illness of Unclear Etiology

- Upon arrival to UNM, gentamicin is discontinued
- Ceftriaxone is begun (will not treat plague)
Acute Illness of Unclear Etiology

• Within 48 hours:
  • The patient is in the intensive care unit
  • Intubated
  • On 3 inotropes
  • Critically ill
  • A blood culture is collected...
Acute Illness of Unclear Etiology

• A Gram negative rod is identified
• Antibiotics are changed to cefepime (will not treat plague)
Acute Illness of Unclear Etiology

• An MRI of the shoulder is obtained
  • Large abscess in the lymph nodes in the left axillary region
  • Infectious Disease consultation is obtained
Acute Illness of Unclear Etiology

- Gentamicin is begun
- The blood culture ultimately grows...
Acute Illness of Unclear Etiology

- *Yersinia pestis*
  - Plague
Acute Illness of Unclear Etiology

• The mortality rate for untreated septicemic plague approaches 100%
• Gentamicin may persist in the blood for days in critically ill patients
• A study from the United States analyzing 112 years of plague data found that patients receiving at least one dose of medication appropriate for plague were 6-times less likely to die...

Acute Illness of Unclear Etiology

• The school nurse and Emergency physician likely saved the child's life