CASE - A BUNNY’S TALE

- 20 yo woman from Staten Island, no hx TB, no immunosuppression
- Seen at a Bklyn hosp ED on 8/20 w 5 days of fever, sweats, chills, no cough
- 5 days later reappears at ED with w SOB, fever (104), malaise, R sided pleuritic CP
- X-ray revealed LLL infiltrate and R pleural effusion

WHAT SPECIMENS SHOULD BE ORDERED?
MICRO & OTHER LABS

- BLOOD CULTURES, PLEURAL TAP & URINE SPECIMENS TO MICRO
- LABS ON ADMISSION: WBC 9.8, Hgb 10, plt wnl. (Note: throughout hospitalization, WBC not above 12.3; no anemia, no thrombocytopenia)

RESULTS
- Blood cultures positive
  ✓ GNR
- More history taken
- Pt has 2 dogs, but no report of bite or cellulitis

WHAT IS LIKELY DX?

AT THE NYC DOH LAB

- Identification by routine semi automated systems in Micro lab was Pasteurella multocida
- Identification Methods
  ✓ DFA panel of Select BT agents
  ✓ PCR
- Organism identification as
  ✓ Francisella tularensis & NOT P. multocida

CLINICAL HISTORY – CONSISTENT WITH PNEUMONIC TULAREMIA
NYC DOHMH

- *Francisella tularensis* is a select agent considered to be a biological threat agent that poses a substantial risk to public health, therefore, reportable to NYC DOH
- *F. tularensis* was weaponized by U.S. in 1950’s & 1960’s during offensive biowarfare program.
- Bureau Communicable Diseases notified; epi investigation begun
- CDC and NYS DOH notified
- Appropriate PHL staff prophylaxed with doxycycline

**Francisella tularensis**

- As few as 10 organisms sufficient to cause severe disease and death
  ✓ One of the most infectious bacterial pathogens known
- 30-60% fatality rate if untreated
- Usual lymph node involvement
  ✓ Not this case
- Transmission
  ✓ Ticks, animal bites, cutaneous inoculation, ingestion or handling infected animals
- TX: Streptomycin, Gentamicin, tetra & chloramphenicol (1-2 wks)
OTHER SELECT AGENT MISIDENTIFICATIONS

- *Bacillus anthracis*
  - *B. megaterium*
- *F. tularensis*
  - *P. multocida*
- *Yersinia pestis*
  - *Shigella*
  - *Acinetobacter*

- *Brucella spp.*
  - “Slow-growing” Staph
  - *Hemophilus sp*
  - *Acinetobacter sp*

A SHOCKING CASE

**DAY 1:** 14 yr old male sustained a traumatic injury to the dorsum of rt foot from a piece of glass while playing in a local sprinkler system.

**DAY 2:** Returned to ED with fever, chills edema. Sutures removed & wound cleaned.

**OR:** I&D of wound. Noted streaking to the medial aspect of the leg. Rapidly progressing cellulitis of the calf. Febrile to 104,, loss of limb Considered.

**ID & MICRO CONSULTED** Infection with toxin producing bacteria highly suspect

**TX:** Clindamycin & Gentamicin
THE MICRO LAB

MICRO SPECIMENS ORDERED

• Blood Culture
• Wound Cultures
  ▪ Bacteriology
  ▪ Mycobacteriology

THE DIFFERENTIAL?

• Group A Streptococcus
• Aeromonas hydrophilia
• Pleisiomonas shigelloides
• Vibrio vulnificus
• Pseudomonas species
• Mycobacterium marinum

MICRO RESULTS

CULTURES

• 5 Colonies on Culture
  ▪ Oxidase Positive
• Identification
  ▪ Special Media

IDENTIFICATION

VIBRIO VULNIFICUS

TX & PT OUTCOME

• Aminoglycoside added to Ceftazadime & Ciprofloxacin
• Skin Grafting
• Recovered

CURVED, MOTILE GRAM-NEGATIVE RODS
**VIBRIO VULNIFICUS**

“Vulnificus”
Latin for inflicting wounds

- **HABITAT:** Marine & Estuaries. Most common in July & Aug when temp is 70°C; Halophilic (1% NaCl)

- **PORTAL OF ENTRY:**
  - Necrotizing soft tissue trauma in **seawater** (onset 4 hr to 4 days)
  - Raw/undercooked seafood, particularly oysters leads to gastroenteritis within 16 hr

**PATHOGEN ACQUISITION**

FAMILY WAS QUESTIONED

- WAS HE NEAR A BEACH? NO
- HOW DID HIS FOOT GET CUT?
  - SPINKLER SYSTEM IN PARK IN WASHINGTON HEIGHTS
- DID HE HAVE CONTACT WITH ANY FISH?
  - NO....BUT A FISH VENDOR WAS NEAR THE SPINKLER & AT THE END OF THE DAY HE DISCARDS THE ICE THAT COOLS THE FISH INTO THE DRAIN OF THE SPINKLER!
**V. VULNIFICUS FACTS**

- Rapidly progressive, highly fatal, fever, shock, multiorgan damage
  - Assoc with bullous skin lesions
- Necrotizing fascitis
- Gastroenteritis
  - Mild to severe non bloody diarrhea
- Causes 95% of all sea-food related deaths in US
- 60% mortality from septicemia unless tx rapidly initiated
- Virulence factors: capsule, LPS antigens, cytotoxin hemolysin, elastolytic protease, collagenase

**HURRICANE KATRINA**

*August 29, 2005*

- Total
  - *Vibrio sp.*
    - 22 cases, 5 deaths
- Wound associated
  - *Vibrio vulnificus*
    - 82%
  - *Vibrio parahaemolyticus*
    - 18%
- Gastroenteritis
  - *Vibrio cholera* (nontoxigenic)
    - 2 Cases
PEDIATRIC CASE #1

- 7 MTH OLD BOY
- SWOLLEN RT SHOULDER
- TEMP 104
- FAMILY OWNED BLACK RIVER SNAKE
- LIVED IN AQUARIUM ON FLOOR
- BABY CRAWLED ON RUG
- 4 BLOOD CULTURES NEGATIVE
- CULTURE
  - SALMONELLA ARIZONAE
  - ISOLATED FROM BABY
  - ISOLATED FROM SNAKE'S STOOL SPECIMEN

CDC RECOMMENDATIONS

- Children <5 years of age & immunocompromised persons avoid direct contact with reptiles
- No reptiles in households with children < 1 yr of age or in childcare programs
- Pet store personnel & reptile owners be aware that reptiles harbor & can transmit Salmonella to humans
PEDIATRIC CASE #2

A 4 yo female developed persistent watery diarrhea
✓ A sibling & several day care center friends had developed similar symptoms
✓ The child drank city water
✓ No travel in the previous 6 mths

WHAT IS YOUR GUT REACTION?
WHAT SPECIMENS SHOULD BE ORDERED?

SPECIMENS

• HOW MANY STOOL SPECIMENS WILL YOU ORDER FOR OVA & PARASITE EXAM?
✓ UPPER GI INFECTION
  ✓ 5-6 STOOLS REQUIRED FOR UPPER GI
✓ DUODENAL ASPIRATE
✓ ENTERO-TEST (STRING TEST)
✓ 3 FOR ROUTINE PARASITES
PARASITOLOGY

- **SPECIMEN PRESERVATIVE**
  - SAF – SODIUM ACETATE ACETIC ACID FORMALIN

- **MICROSCOPIC EXAMINATION – 3 SPECIMENS**
  - TRICROME & AFB STAINS ON ALL STOOLS
  - STOOLS EXAMINED FOR O & P, INCLUDING ISOSPORA, CRYPTOSPORIDIUM, CYCLOSPORA
  - MICROSPORIDIUM BY REQUEST ONLY

- **ENZYME IMMUNOASSAY (EIA) FOR GIARDIA & CRYPTOSPORIDIIUM – ON REQUEST**
  - SENSITIVITY & SPECIFICITY IS 99/100%
  - DISTINGUISHES GIARDIA FROM CRYPTOSPORIDIIUM ANTIGENS USING SPECIFIC CAPTURE ANTIBODIES

GIARDIA LAMBLIA

- **OVA & PARASITE**
  - MICROSCOPY
    - IODINE & TRICROME STAINS
    - TROPH
    - (“LITTLE OLD MAN”)
  - OTHER SPECIMENS
    - DUODENAL ASPIRATE
    - ENTERO-TEST (STRING TEST)
  - UPPER GI PATHOGEN
  - IMMUNOCHROMATOGRAPHIC ASSAY
**GIARDIA HIGHLIGHTS**

- **TRANSMISSION**
  - FECAL CONTAMINATION OF FOOD & WATER
  - PERSON-TO-PERSON
  - STD BY ANAL INTERCOURSE

- **ANIMAL & HUMAN HOSTS**
  - HIKERS FROM SPRING WATER
  - *GIARDIA* ATTACHES TO INTESTINAL WALL USING VENTRAL “SUCKER” DISK
**ADOLESCENT CASE**

- **HPI**
  - 19 YO MALE STUDENT, HEADACHE, FEVER, LETHARGIC

- **PMHX**
  - HEALTHY, NO HX MAJOR ILLNESS

- **PE**
  - FEBRILE (40 C), NECK SUPPLE, PURPURIC RASH TRUNK, LEGS & WRISTS

**WHAT IS THE DIFFERENTIAL?**

- MENINGITIS
  - BACTERIAL ?
  - VIRAL ?

- ENCEPHALITIS

**LAB DX THE CULTURES**

- **CSF**
  - CULTURE & SUSCEPTIBILITY
  - VOLUME 5 - 10 ML
  - RAPID TRANSPORT
  - DO NOT REFRIGERATE

- **BLOOD**
  - PEDS PLUS BLOOD BOTTLE

- **URINE**

- **GRAM STAIN TAKEN FROM SKIN LESION**
  - GRAM-NEGATIVE DIPLOCOCCI
ETIOLOGIC AGENTS

AGE GROUPS

- NEONATES
  - Group B Strep
  - *E. coli*
  - *Listeria*
- ALL OTHERS
  - *N. meningitidis*
  - *S. pneumoniae*
  - *Listeria*
  - *S. aureus*
  - GNR

N. MENINGITIDIS

- MULTIPLE SEROGROUPS
- ENDEMIC WORLDWIDE
  - A,B,C,Y,W135
- SPORADIC U.S. CASES
  - B & C
  - W135
- PEAK SEASON
  - NOV - JAN

ETIOLOGIC AGENT

- N. MENINGITIDIS
  - MENINGOCOCCAL MENINGITIS & MENINGOCOCCEMIA
  - MENINGITIS WITH SEPSIS
    - 30% MORTALITY
  - 8-20% ASYMPTOMATIC CARRIAGE IN ORO- NASO-PHARYNX
    - TRANSIENT, INTERMITTENT OR PERSISTENT
N. MENINGIDITIS IN USA

- 3,000 CASES & 300 DEATHS/YEAR
- COLLEGE STUDENTS
  - 125-175 CASES & 15 - 20 DEATHS/YR
- FRESHMAN IN DORMS HAVE 6X RISK OF DEVELOPING MENINGOCOCCAL INFECTION OVER OTHER COLLEGE STUDENTS
- CHILDREN <1 YR; MILITARY RECRUITS, REFUGEES, PATIENT HOUSEHOLD CONTACTS, MICRO LAB PERSONNEL
- CDC ADVISORY PANEL RECOMMENDS VACCINATION (INCLUDES A, C, Y & W135)

CASE CHALLENGE

AUGUST 2003: 2 MEN EVALUAED AT ED IN FLORIDA WITH 4-DAY HX OF FEVER, CHILLS, MYALGIA, FATIGUE, NAUSEA & HEADACHE.
- THICK & THIN MALARIA SMEAR PREPARED
- 1ST PT FROM UGANDA
  - MALARIA SMEAR WAS READ AS NEGATIVE
- 2ND WAS A NATIVE FLORIDIAN
  - MALARIA SMEAR WAS READ AS POSITIVE
- HIGH INDEX OF SUSPICION, SO SAMPLES SENT TO DOH

ANY THOUGHTS?

MMWR 2004 53:412-413
LAB & CLINICAL ERRORS

CASE
- ONLY ONE BLOOD SPECIMEN SENT TO LAB
  ✓ NEED MULTIPLE BLOOD SAMPLES
- SMEAR WAS POORLY PREPARED
  ✓ PH OF STAIN?
  ✓ SMEARS FROM PT 1 & 2 WERE REVERSED IN LABELING
- P. VIVAX REPORTED ON PT 2 (NATIVE FLORIDIAN) BY A PRIVATE LAB
- DOH CONFIRMED P. OVALE NOT P. VIVAX BY PCR

MALARIA
- ABOUT 60 CASES/YR MALARIA REPORTED FL
- MOSTLY IMPORTED
- AIRPORT MALARIA
- LOCAL CASES USUALLY DUE TO P. VIVAX
- NEED FOR PROPER SMEAR PREP, MICROSCOPIC ID, SPECIMEN HANDLING & LABELING

MALARIA ON THE MOVE

REPORTS OF MALARIA ARE INCREASING IN MANY COUNTRIES & AREAS THOUGHT FREE OF THE DISEASE

- HUMAN MIGRATION
  ✓ ACTIVE TRANSMITTERS
  ✓ PASSIVE ACQUIRERS (low-level immunity)
- INTERCONTINENTAL TRANSFER
  ✓ AIRPORT MALARIA/IMPORTED MALARIA
  • URBANIZATION
  • REFUGEES
PUBLIC HEALTH BREAKTHROUGH

OCTOBER 2002
SEQUENCING OF THE MOSQUITO & P. FALCIPARUM GENOMES
THE AIMS ARE TO
• Engineer a mosquito incapable of carrying the malaria parasite
• Target drug resistance
• Vaccine development

PLASMODIUM SPECIES & SPECIMEN HANDLING

PLASMODIUM SP
• P. VIVAX
• P. OVALE
• P. MALARIAE
• P. FALCIPARUM (medical emergency)

BLOOD SPECIMENS
• BLOOD SPECIMEN IN LAVENDER TOP TUBE OBTAINED ON ADMISSION

WRIGHT-GIEMSA STAIN
THICK & THIN SMEARS
• 200-300 OIL IMMERSION FIELDS EXAMINED
• ONE SET OF NEGATIVE FILMS WILL NOT RULE OUT MALARIA
• EXAMINE 4-5 ADDITIONAL BLOOD FILMS (IN 6 HR INTERVALS) OVER 36 HR
HALLMARKS FOR MALARIA IDENTIFICATION

<table>
<thead>
<tr>
<th>SPECIES</th>
<th>HOST RBC</th>
<th>TROPHS</th>
<th>GAMETO-CYTES</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>P. vivax</em></td>
<td>Enlarged &amp; pale</td>
<td>Ameboid fill entire RBC</td>
<td>Round to oval; almost fill the RBC</td>
</tr>
<tr>
<td><em>P.falciparum</em></td>
<td>Normal</td>
<td>Small rings Multiple rings/RBC</td>
<td>Crescent (banana) shaped</td>
</tr>
<tr>
<td><em>P. malariae</em></td>
<td>Normal</td>
<td>Ribbon/band shaped</td>
<td>Round to oval; almost fill the RBC</td>
</tr>
</tbody>
</table>

DRUG RESISTANCE

- RESISTANCE TO CHLOROQUINE & SULFADOXINE PYRIMETHAMINE IS COMMON
- NOW COMBINATION THERAPY
- AFRICA TO ADOPT ACT AS 1ST LINE THERAPY
  - ARTEMISININ-BASED COMBO THERAPY
  - MAY BE COST PROHIBITIVE