



TICK, TICK, TICK  
WHY DID YOU BITE ME?



# David Good, DO

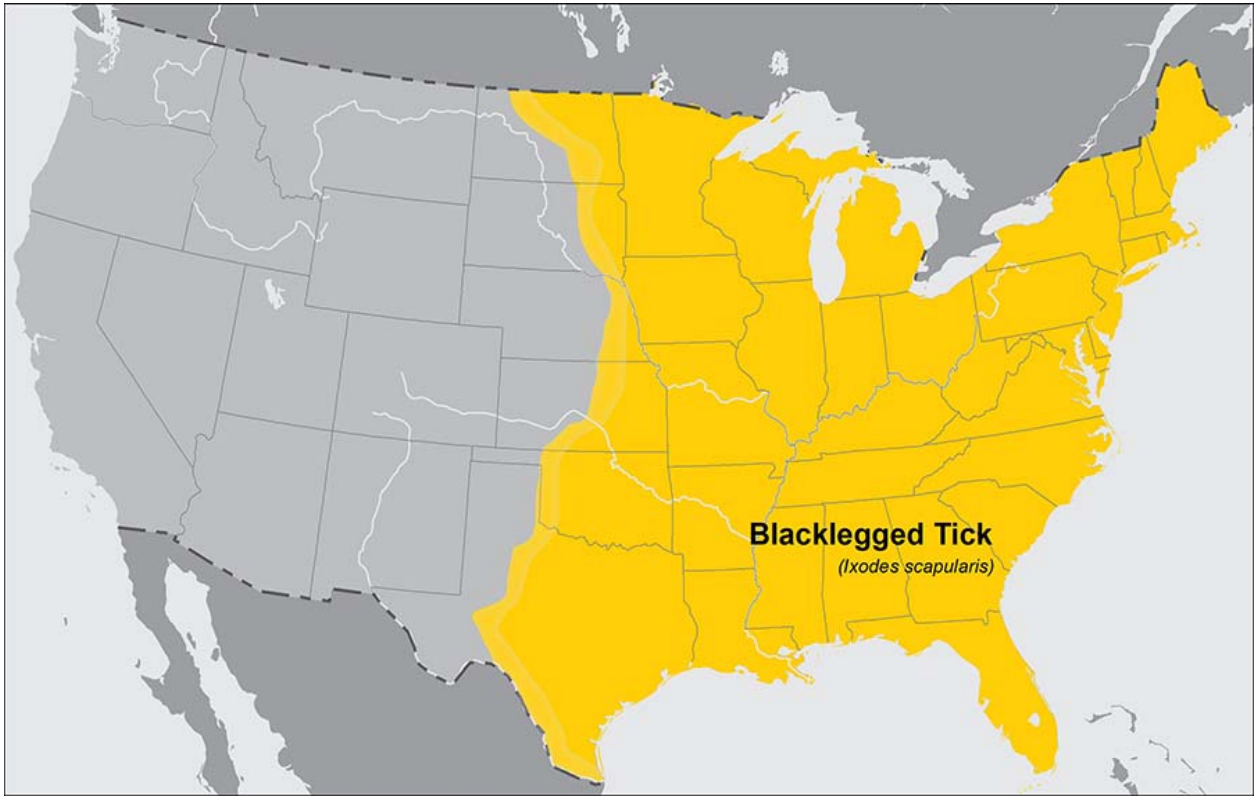
Family Practice Wagoner, OK  
Chief of Staff Wagoner Community Hospital  
President of the Oklahoma Chapter ACOFP

# Tick Diseases and Ticks

## Geographic Distribution of Ticks



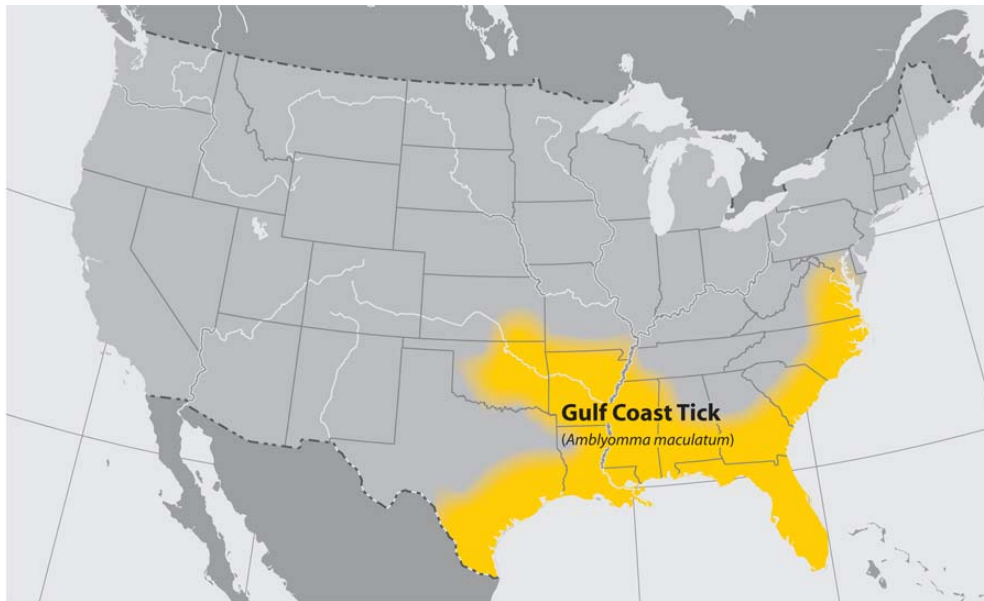
Source: CDC Geographic Distribution of Ticks



Source: Geographic Distribution of Ticks



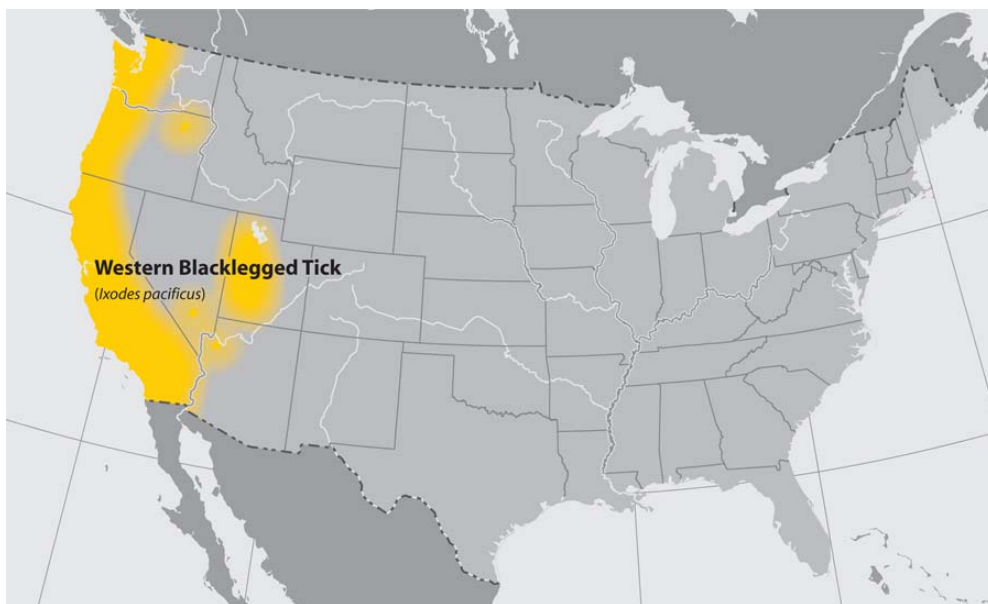
Source: CDC Geographical Distribution of Ticks.











# BLACKLEGGED TICK

- Eastern USA
- *Borrelia burgdorferi* & *B. mayonii*
  - \* Lyme Disease
- *Anaplasma phagocytophilum*
  - \* Anaplasmosis
- *B. miyamotoi*
  - \* Relapsing fever
- *Ehrlichia muris euclairensis*
  - \* Ehrlichiosis
- *Babesia microti*
  - \* Babesiosis
- Potawassan virus
  - \* Potawassan virus disease



## LONE STAR TICK



- Eastern and Southeastern USA
- Ehrlichia chaffeensis & Ehrlichia ewingii
  - \* Ehrlichiosis
- Francisella tularensis
  - \* Tularemia
- Heartland virus
  - \* Heartland virus D2
- Bourbon virus
  - \* Bourbon virus D2
- \* Southern Tick Associated Rash Illness STARI

## AMERICAN DOG TICK



- East of Rocky Mountains
- Francisella tularensis
  - \*Tularemia
- Rickettsia rickettsia
  - \*Rocky Mountain Fever

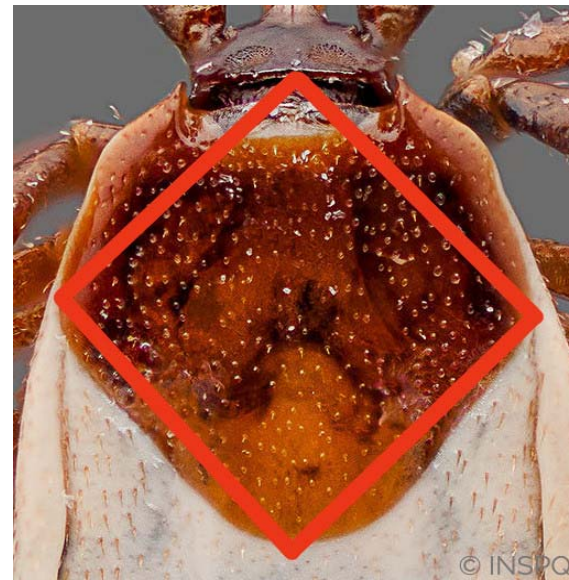
## BROWN DOG TICK



- World Wide
- *Rickettsia rickettsia*
  - \*Rocky Mountain Spotted Fever
- Primary Vector for RMSF

# GROUND HOG TICK

- ▶ Eastern USA
- ▶ POWASSAN virus
- ▶ \*Powassan virus Disease



## GULF COAST TICK



- Southeast & Arizona
- *R. parkeri*
  - \* Spotted fever
- Rocky Mountain Wood Tick
- Rickettsia rickettsii*
  - \* RMSF
- Colorado Tick Fever Virus
  - \* Colorado Tick Fever
- Francisella Tularensis*
  - \*Tularemia

## ROCKY MOUNTAIN WOOD TICK



- Rocky Mountains
- *Rickettsia rickettsii*
  - \* RMSF
- Colorado Tick Fever Virus
  - \* Colorado Tick Fever
- *Francisella tularensis*
  - \* Tularemia



# SOFT TICK

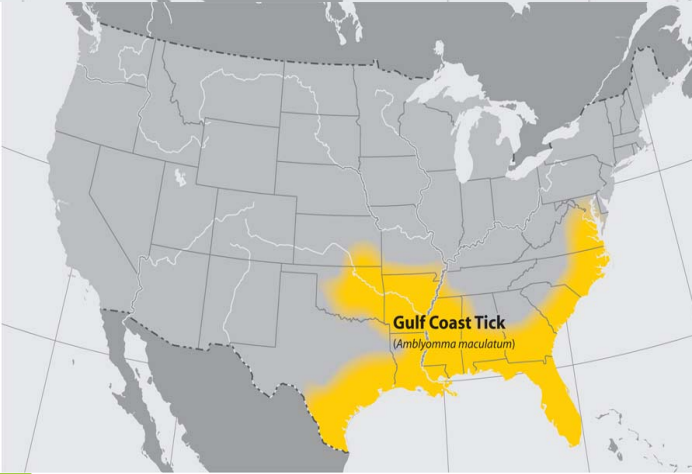
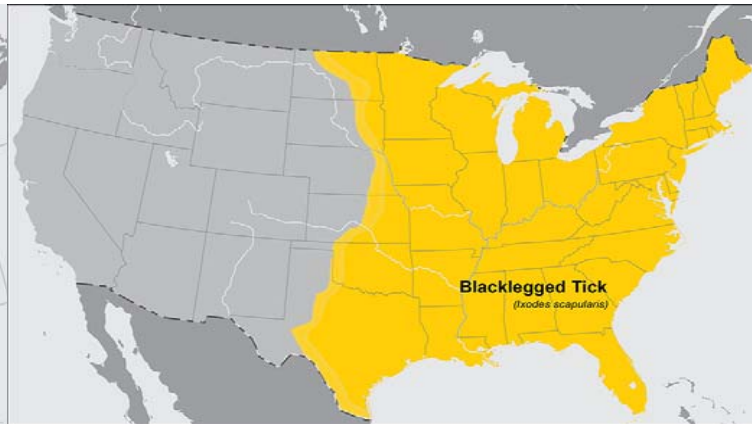
- ▶ Western USA and Texas
- ▶ *Borrelia hermsii* & *B. turicatae*
- ▶ \*Tick born relapsing fever TBRF



## WESTERN BLACKLEGGED TICK



- Pacific Coast States
- *Anaplasma phagocytophilum*
  - \* Anaplasmosis
- *B. burgdorferi*
  - \* Lyme Disease
- *B. miyamotoi*
  - \* Relapsing fever



# ANAPLASMOSIS

## INCUBATION PERIOD

- \* 5-14 DAYS

## SIGN AND SYMPTOMS

- \* Fever, chills, rigors
- \* Headaches, myalgia
- \* Nausea, vomiting, diarrhea, anorexia
- \* Rash < 10%

## LAB FINDINGS

- \* Mild anemia
- \* Trombocytopenia
- \* Leukopenia
- \* Increase in Hepatic Transaminas



# ANAPLASMOSIS

## ▶ DIAGNOSTIC TEST

- ▶ DNA by PRC of whole blood
- ▶ \*Most sensitive during first week
- ▶ Four fold increase in IgG ab
- ▶ \* Week 1 then week 2-4
- ▶ Immunohistochemical IHC Stain
- ▶ Of organism from skin, tissue or bone marrow biopsies.

## ▶ TREATMENT

- ▶ \* Adults
- ▶ Doxycycline 100 mgrs. PO or IV BID x 14 days
- ▶ \* Children
- ▶ Doxycycline 2.2 mg/kg BID PO or IV x 14 days

# BABESIOSIS

- Babesia microti & other species of Babesia  
Parasite that infect Red blood cells

▶ INCUBATION PERIOD

▶ \* 1-9 Weeks

▶ SIGNS AND SYMPTOMS

▶ \* Fever, chills, sweats

▶ \* Malaise, fatigue

▶ \* Myalgia, arthralgia, headaches

▶ \* Nausea, vomiting, anorexia

▶ \* Dark Urine

▶ Splenomegally, hepatomegally, Jaundice



# BABESIOSIS



## ▶ LAB FINDINGS

- ▶ Decreased H&H
- ▶ Thrombocytopenia
- ▶ Elevated BUN & Creatinine
- ▶ Elevated Liver Transaminases

## ▶ LAB DIAGNOSIS

- ▶ Peripheral Blood Smear
- ▶ Positive Babesia Polymerase Chain Reaction PCR
- ▶ Isolation of Parasite by animal inoculation
- ▶ Indirect fluorescent Antibody IFA IgG

# BABESIOSIS



## TREATMENT

Prescribe together

- Atovaquone 750 mgrs. BID 7-10 days

- Azithromycin

Day 1: 500 - 1000 mgrs.

Day 2-10: 250 - 1000 mgrs.

OR

-Clindamycin

300 -600 mgrs. IV q 6 hrs or 600 mg PO q 8

- Quinine 650 mgrs. q 6-8 hrs 7-10 days



# BORRELIA MIYAMOTOI DISEASE

## TICKBORNE RELAPSING FEVER

### ▶ INCUBATION PERIOD

- ▶ \* Day to weeks (Specific ranges unknown)

### ▶ SIGNS AND SYMPTOMS

- ▶ \* Fever, chills
- ▶ \* Fatigue, headaches, myalgia
- ▶ \*Dizziness, confusion
- ▶ \*Rash
- ▶ \*Nausea, diarrhea

### ▶ LAB FINDINGS

- ▶ \*Leukopenia, Thrombocytopenia,
- ▶ \*Elevated Liver Enzymes

# BORRELIA MIYAMOTOI DISEASE

## TICKBORNE RELAPSING FEVER

### ▶ LAB TEST

- ▶ -Polymerase chain reaction RFLP test for DNA
- ▶ -Antibody test IgG
- ▶ -Testing is limited

### ▶ TREATMENT

- ▶ -Adult: Doxycycline 100 mg BID x 10–21 days
- ▶ -Children: Doxycycline 4 mg/Kg BID 10-21 days

# COLORADO TICK FEVER

## -Colorado Tick Fever Virus

### ▶ INCUBATION PERIOD

- ▶ 1-14 days

### ▶ SIGNS & SYMPTOMS

- ▶ -Fever, chills, myalgias, lethargy
- ▶ -Biphasic illness
  - ▶ \*Better in 2-4 days then reoccurring in 1-3 days
  - ▶ \*Rash < 20% patients
  - ▶ \*Death is rare but can occur with DIC or meningoencephalitis in children.

# COLORADO TICK FEVER

- ▶ LABORATORY
- ▶ Leukopenia
- ▶ Thrombocytopenia
- ▶ DIAGNOSTIC LAB
- ▶ Culture and RT-PCR
- ▶ Serologic test IgM
- ▶ Usually 14-21 days after onset
- ▶ TREATMENT
- ▶ Supportive care

# EHRlichiosis

- ▶ INCUBATION

- ▶ 5-14 DAYS

- ▶ SIGNS AND SYMPTOMS

- ▶ Fever, chills, headaches, malaise

- ▶ Muscle aches

- ▶ Nausea, vomiting, diarrhea, anorexia

- ▶ Rash

- ▶ LAB

- ▶ Thrombocytopenia, Leukopenia, Anemia, Increased liver enzymes.

# EHRlichiosis

- ▶ DIAGNOSTIC LAB
- ▶ Detection of DNA by PCR
- ▶ 4 fold rise in IgG ab first sample 1 week  
second sample 2-4 weeks later.

## TREATMENT

- ADULTS Doxycycline 100 mgrs. BID 5-7 DAYS
- CHILDREN Doxycycline 2.2 mg/kgr BID 5-7 DAYS

# HEARTLAND AND BOURBON VIRUS DISEASE

## Heartland virus

- ▶ Incubation period
- ▶ -unknown thought to be approx. 2 weeks
- ▶ **SIGNS AND SYMPTOMS**
- ▶ Fever, headaches, fatigue, myalgia
- ▶ Nausea, vomiting, diarrhea, rash.
- ▶ **LAB**
- ▶ Leukopenia
- ▶ Thrombocytopenia, increase liver enzymes.
- ▶ **DIAGNOSTIC LAB**
- ▶ None at this point
- ▶ State Health Department maybe able to do RNA IgG & IgM antibodies
- ▶ **TREATMENT**
- ▶ Supportive care

# LYME DISEASE

- ▶ INCUBATION PERIOD 3-30 DAYS
- ▶ SIGNS AND SYMPTOMS
- ▶ Erythema migrans ringlike expanding rash
- ▶ Fever chills
- ▶ Myalgias, headache
- ▶ Lymphadenopathy
- ▶ DISSEMINATED STAGE
- ▶ Annular rashes
- ▶ Flulike symptoms
- ▶ Lymphadenopathy



# LYME DISEASE

## ▶ RHEUMATOLOGIC MANIFESTATIONS

- ▶ Arthritis, multiple joints
- ▶ Muscle pains, bursitis, bones
- ▶ Baker cyst
- ▶ If untreated arthritis may reoccur

## ▶ CARDIAC MANIFESTATIONS

- ▶ Conduction abnormalities
- ▶ Myocarditis, pericarditis.



# LYME DISEASE

## ▶ NEUROLOGICAL MANIFESTATIONS

- ▶ Bells Palsy
- ▶ Meningitis
- ▶ Motor & sensory abnormalities
- ▶ Cognitive difficulties
- ▶ Encephalitis ect (rare)

## ▶ OTHER MANIFESTATIONS

- ▶ Conjunctivitis, keratitis, uveitis,
- ▶ Hepatitis
- ▶ Spleenomegally

## ▶ SOMETIMES CONFUSED WITH

- ▶ STARS (Southern tick-associated rash illness) diagnostic test not available, cause unknown.

# LYME DISEASE

- ▶ LAB
- ▶ Elevated ESR
- ▶ Elevated liver enzymes
- ▶ Hematuria and proteinuria
- ▶ With meningitis abnormal CSF
- ▶ DIAGNOSTICS
- ▶ IgM or IgG antibodies

# LYME DISEASE

- ▶ ADULTS
- ▶ Doxycycline 100 mgr BID 10-21 Days
- ▶ Cefuroxime axetil 500 mgrs. BID 14-21 DAYS
- ▶ Amoxicillin 500 mgrs. TID 14-21 DAYS
- ▶ CHILDREN
- ▶ Amoxicillin 50 mgrs./kgrs TID 14-21 DAYS
- ▶ Doxycycline 4 mgrs. BID 10-21 DAYS
- ▶ Cefuroxime axetil 30 mgrs. BID 14-21 DAYS



# POWASSAN VIRUS DISEASE

- ▶ INCUBATION PERIOD

- ▶ 1-4 WEEKS

- ▶ SIGNS AND SYMPTOMS

- ▶ Fever

- ▶ Headaches

- ▶ Nausea & vomiting

- ▶ Weakness

- ▶ Progresses into meningoencephalitis, mental status changes, seizures

- ▶ Paresis, movement disorders or cranial nerve palsies.

# LYME DISEASE

- ▶ LABS
- ▶ CSF lymphocytic pleocytosis normal or elevated proteins normal glucose
- ▶ DIAGNOSTICS
- ▶ Limited- usually through CDC and some health departments
- ▶ Virus specific IgM ab in CSF
- ▶ TREATMENT
- ▶ Supportive care

# ROCKY MOUNTAIN SPOTTED FEVER

- ▶ American dog tick
- ▶ *Rickettsia rickettsia*
- ▶ **INCUBATION PERIOD**
- ▶ 3-12 DAYS
- ▶ **SIGNS AND SYMPTOMS**
- ▶ EARLY : High Fever, headaches, malaise, myalgia, edema around the eyes and back of hands, nausea, vomiting, anorexia.
- ▶ LATE:
- ▶ Altered mental status, coma, cerebral edema
- ▶ Respiratory compromise (pulmonary edema, ARDS)
- ▶ Necrosis, requiring amputation
- ▶ Multiorgan system failure, renal failure, etc.

# ROCKY MOUNTAIN SPOTTED FEVER

- ▶ LAB FINDINGS
- ▶ Thrombocytopenia
- ▶ Elevated Liver Enzymes
- ▶ Hyonatremia
- ▶ Early on in illness labs are usually normal
- ▶ DIAGNOSTICS
- ▶ 4 fold increase in IgG ab (1<sup>st</sup> sample at first week second sample 2-4 weeks later)
- ▶ DNA in skin biopsy
- ▶ Immunohistochemical (IHC) staining of from skin or biopsy
- ▶ IgM Antibodies are less specific



# ROCKY MOUNTAIN SPOTTED FEVER

## ▶ TREATMENT

- ▶ ADULTS Doxycycline 100 BID 5-7 DAYS
- ▶ CHILDREN Doxycycline 2.2 MGR/KG BID 5-7 DAYS
- ▶ Delay in treatment may result in severe illness or death. It is recommended
- ▶ If clinical suspicion.
- ▶ Is noted to start treatment for anaplasmosis, ehrlichosis and spotted fever.



- ▶ Image source: [commons.wikimedia.org/wiki/File:RMSF PHIL 1962 lores.jpg](https://commons.wikimedia.org/wiki/File:RMSF_PHIL_1962_lores.jpg)

# RICKETTSIA PARKERI

## RICKETTSIOSIS

### GULF COAST TICKS

- ▶ INCUBATION PERIOD
- ▶ 2-10 DAYS
- ▶ SIGNS AND SYMPTOMS
- ▶ Fever, headache
- ▶ Rash on trunk and extremities
- ▶ Muscle aches, eschar
- ▶ LAB
- ▶ Leukepenia,
- ▶ Thrombocytopenia
- ▶ Elevated liver enzymes

# RICKETTSIA PARKERI

## ▶ DIAGNOSTICS

- ▶ DNA by swab in eschar whole blood or skin biopsy
- ▶ 4 fold change in Ig G ab from week, to week 2-4

## ▶ TREATMENT

- ▶ ADULT: Doxycycline 100 mg. BID 5-7 DAYS
- ▶ CHILDREN: Doxycycline 2.2 mg/Kg BID 5-7 DAYS

# TICKBORNE RELAPSING FEVER

## *Borrelia hermsii* *B turicatae*

### ▶ INCUBATION PERIOD

- ▶ 7 days followed by febrile episodes that last ~3 days separated by afebrile period of 7 days

### ▶ SIGNS AND SYMPTOMS

- ▶ Fever chills
- ▶ Myalgia headaches
- ▶ Nausea, vomiting
- ▶ Arthralgia, facial palsy

# TICKBORNE RELAPSING FEVER

## ▶ LABS

- ▶ Normal to increased WBC
- ▶ Increased bilirubin
- ▶ Thrombocytopenia
- ▶ Elevated ESR
- ▶ Increase PT and PTT

## ▶ DIAGNOSTICS

- ▶ Organism detected in blood when febrile
- ▶ Spirochetes on peripheral smear
- ▶ Serologic test 10-14 days post illness



# TICKBORNE RELAPSING FEVER TREATMENT

- ▶ ADULT
- ▶ Tetracycline 500 mgrs. qid 10 days
- ▶ Erythromycin 500 mgrs. qid 10 days
- ▶ Ceftriaxone 2 grs IV 10 -14 days
- ▶ CHILDREN
- ▶ Erythromycin 12.5 mg/kgr qid 10 days
- ▶ Ceftriaxone for CNS involvement

# TULAREMIA

## *Francisella tularensis*

- ▶ Dog Tick, Wood Tick, Lone Star Tick
- ▶ Deer Fly Bite, Inhalation ingestion and through skin contact.
- ▶ INCUBATION PERIOD
- ▶ 3-5 days range (1-21) days
- ▶ SIGNS AND SYMPTOMS
- ▶ Fever, chills
- ▶ Headache, malaise, fatigue
- ▶ Anorexia, vomiting diarrhea,
- ▶ Myalgia
- ▶ Cough, Chest discomfort
- ▶ Sore Throat
- ▶ Abdominal Pain

# TULAREMIA

- ▶ Glandular
- ▶ Localized lymphadenopathy
- ▶ Cutaneous ulcer at infection
- ▶ Oculoglandular
- ▶ Photophobia,
- ▶ excessive lacrimation,
- ▶ conjunctivitis,
- ▶ periauricular, submandibular and cervical lymphadenopathy.
- ▶ Oropharyngeal
- ▶ Severe sore throat
- ▶ Exudative pharyngitis or tonsillitis
- ▶ Cervical, preauricular and retropharyngeal lymphadenopathy



# TULAREMIA

## ▶ PNEUMONIC

- ▶ Nonproductive cough
- ▶ Substernal tightness
- ▶ Pleuritic chestpain
- ▶ Hilar adenopathy, infiltrate or plural effusion

## ▶ THYPOIDAL

- ▶ Combination of symptoms



# TULAREMIA

- ▶ LAB
- ▶ Normal to elevated
- ▶ WBC
- ▶ Sed rate
- ▶ Hyponatremia
- ▶ Increased Liver Enzymes
- ▶ Increased CK
- ▶ Myoglobinuria
- ▶ Sterile Pyuria
- ▶ DIAGNOSTICS
- ▶ Isolation of *F tularensis*
- ▶ 4 fold increase in Ab titer

# TULAREMIA

## ▶ TREATMENT

### ▶ ADULTS

- ▶ Streptomycin 1 gr IM BID 10 days
- ▶ \*Gentamicin 5 mg/ kg IM or IV qd x 10 days
- ▶ \*Ciprofloxacin. 400 mgr IV or 500 PO BID x 10-14 days
- ▶ Doxycycline 100 mgr BID x 14-21 days

### ▶ CHILDREN

- ▶ Streptomycin 15 mg/kg TID x 10 days
- ▶ \*Gentamycin 2.5 mg/kg TID x 10 days
- ▶ \*Cipro 15 mg/kg BID x 10 days
- ▶ \*not US FDA approved but has been used successfully

# PREVENTION

- ▶ Insect repellents and deet
- ▶ Treat animals
- ▶ Check for ticks
- ▶ TICK REMOVAL
- ▶ Tweezers around head
- ▶ PROPHYLAXIS
- ▶ Doxycycline is not contraindicated
- ▶ Start within 72 hours of tick removal

# Sanctuary of the Monarch Butterflies, El Rosario, Michoacan, Mexico.

