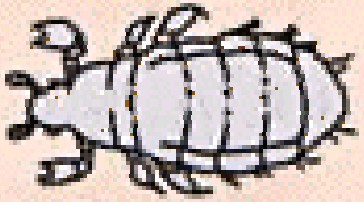
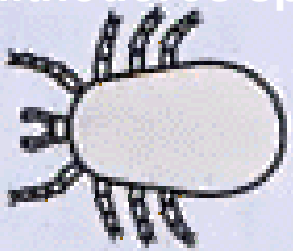
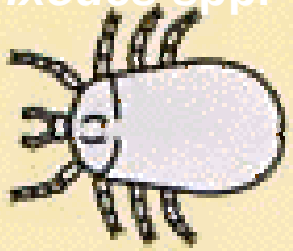
Borrelia

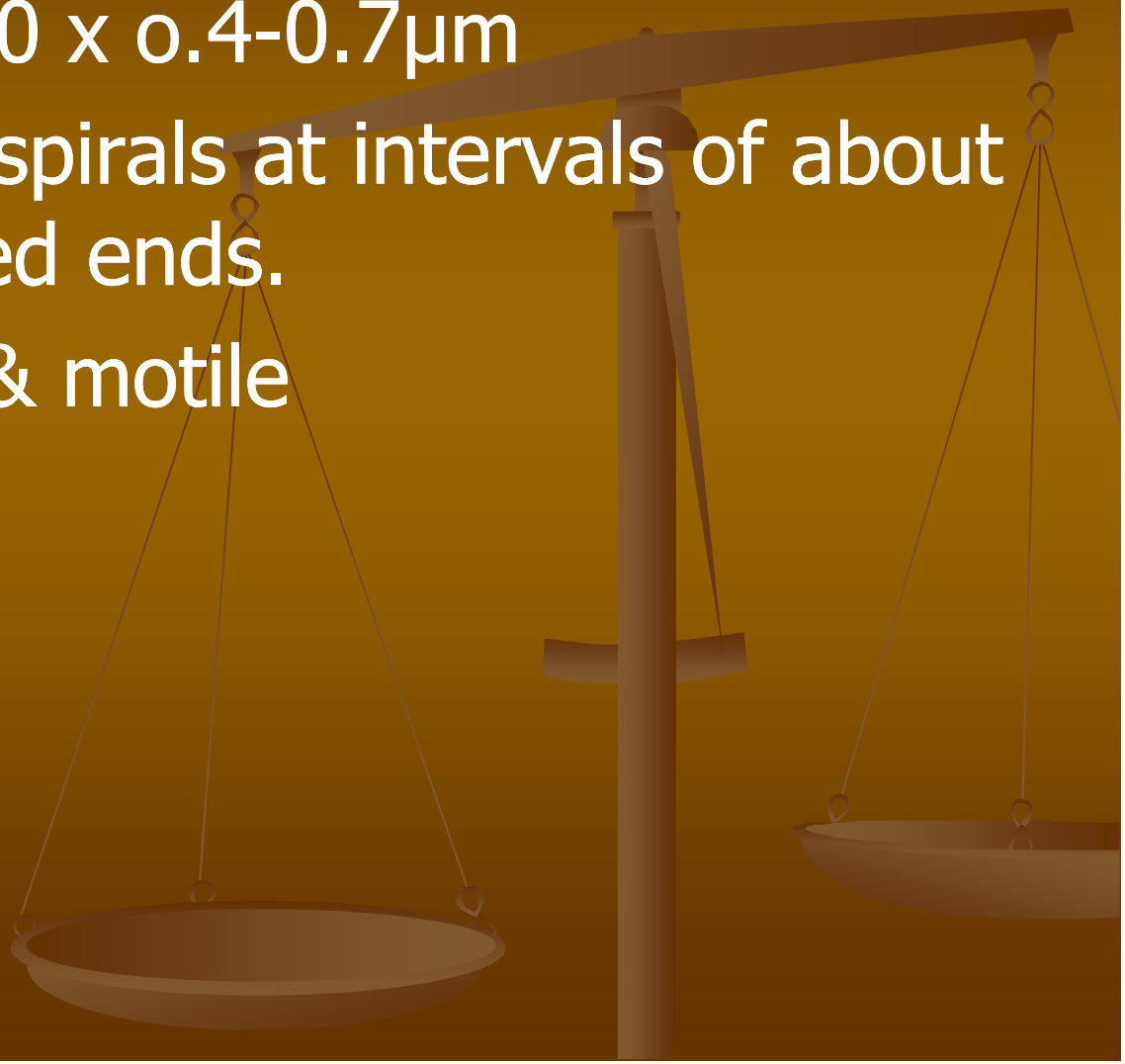
- Comprises of commensal spirochetes of buccal and genital mucosa & pathogens of man & animals.
- Differ from other spirochetes in being larger with wide & open coils.
- Motile, stain readily with ordinary dyes & gram negative.

Epidemiology of Borrelia Infections

	Infection	Reservoir	Vector
Borrelia recurrentis	Relapsing fever Epidemic (louse-borne)	Humans	Body louse *Pediculus humanus* 
Borrelia spp.	Relapsing fever Endemic (tick-borne)	Rodents, soft-shelled ticks	Soft-shelled tick *Ornithodoros* spp. 
Borrelia burgdorferi	Lyme disease	Rodents, deer, domestic pets, hard-shelled ticks	Hard-shelled tick *Ixodes* spp. 

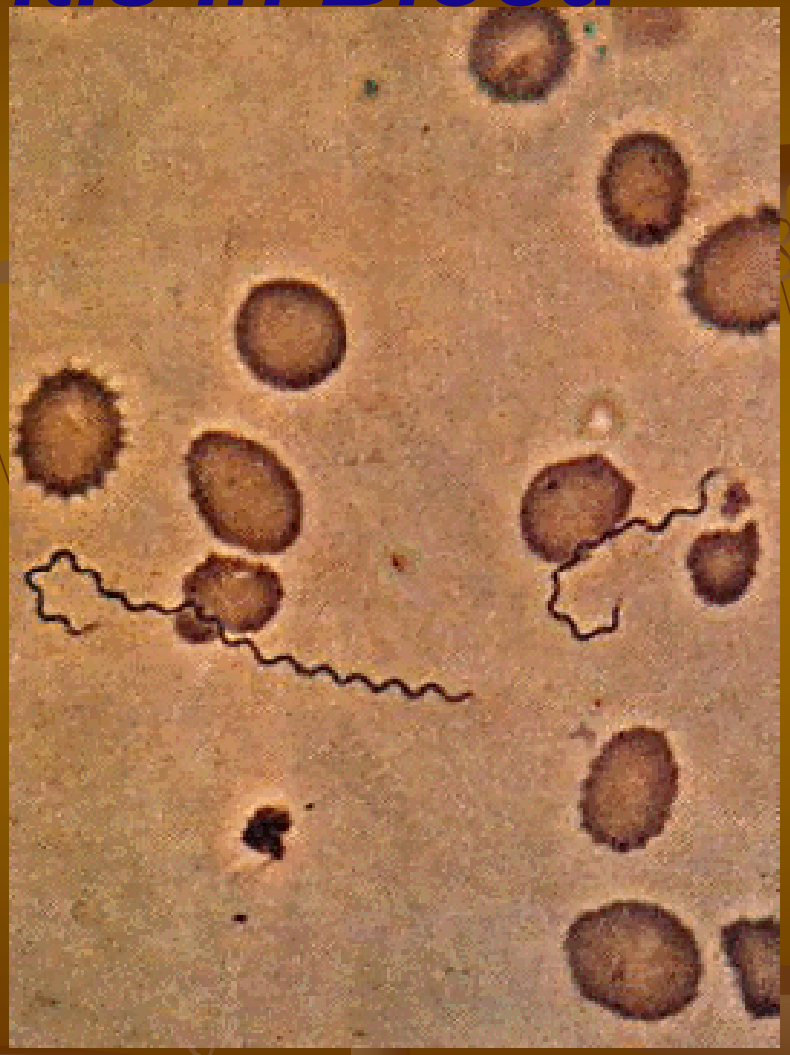
Morphology

- Measures10 – 30 x o.4-0.7µm
- 5 to 8 irregular spirals at intervals of about 2µm with pointed ends.
- Gram negative & motile



Giemsa Stain of Borrelia recurrentis in Blood

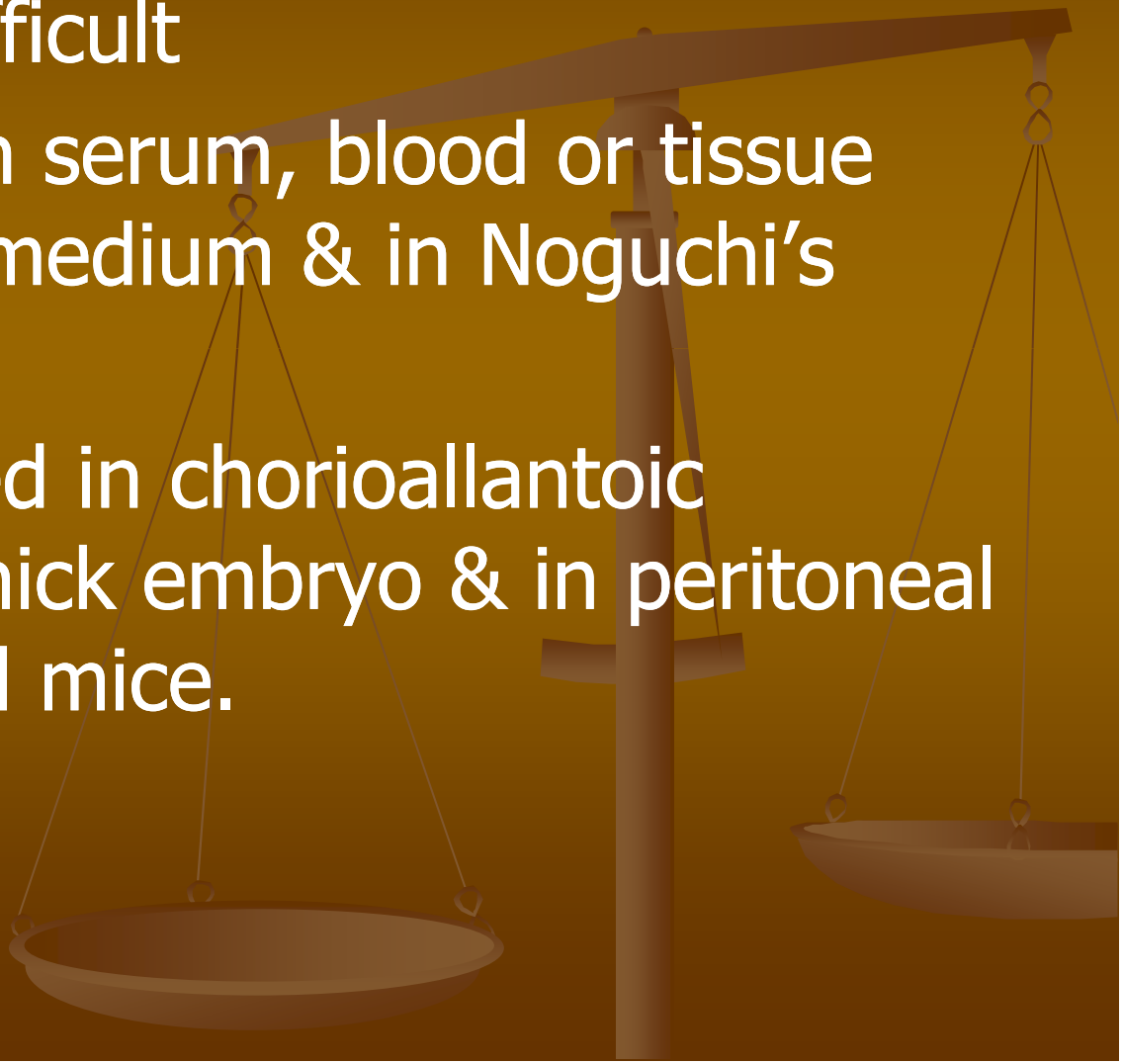
Light Microscopy



Phase Contrast Microscopy

Culture

- Cultivation is difficult
- Can be grown in serum, blood or tissue enriched liquid medium & in Noguchi's medium .
- Can be cultivated in chorioallantoic membrane of chick embryo & in peritoneal cavity of rat and mice.



Pathogenicity

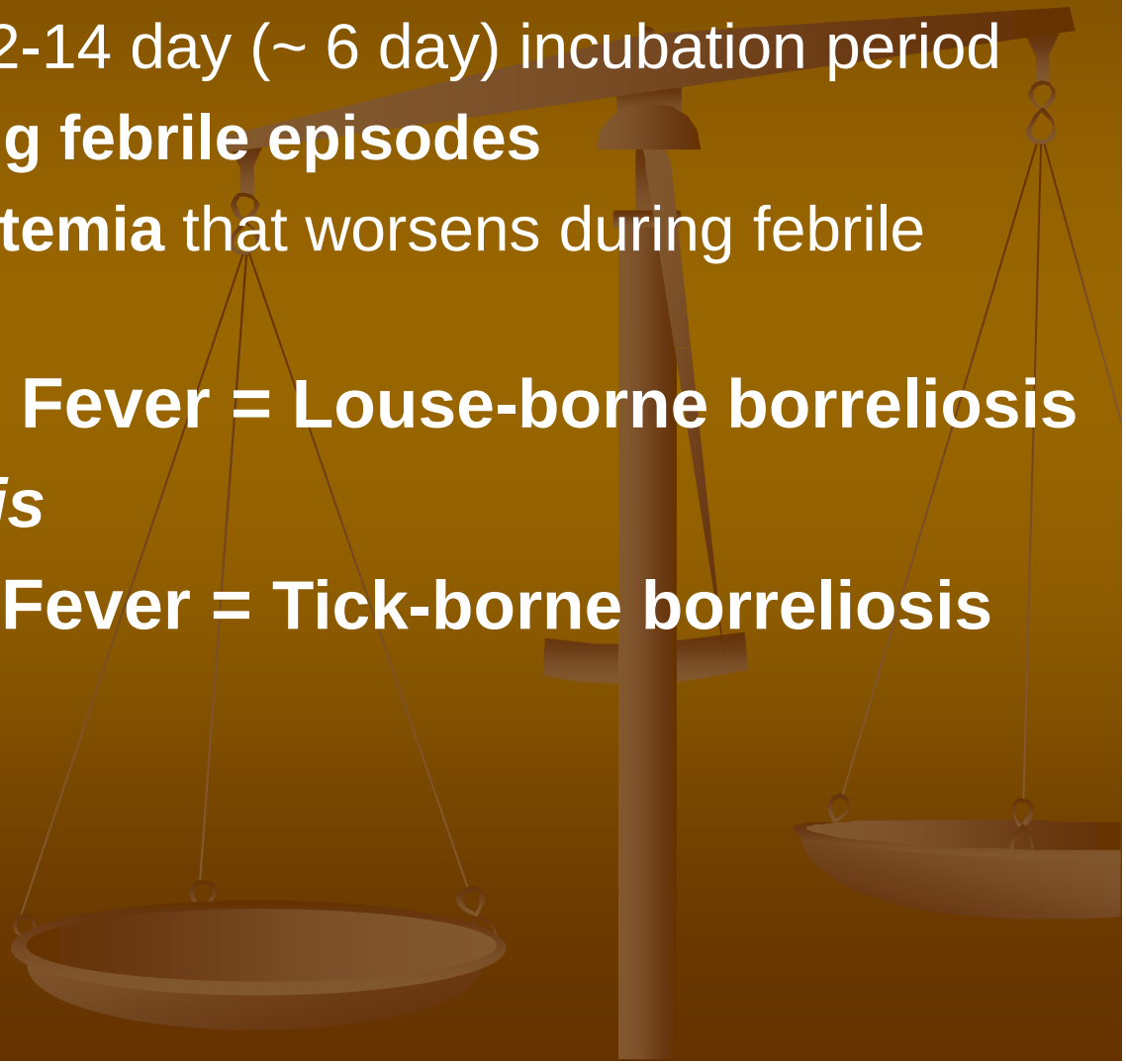
- Relapsing fever
- Lyme disease
- Vincent's angina

Epidemiology of Relapsing Fever

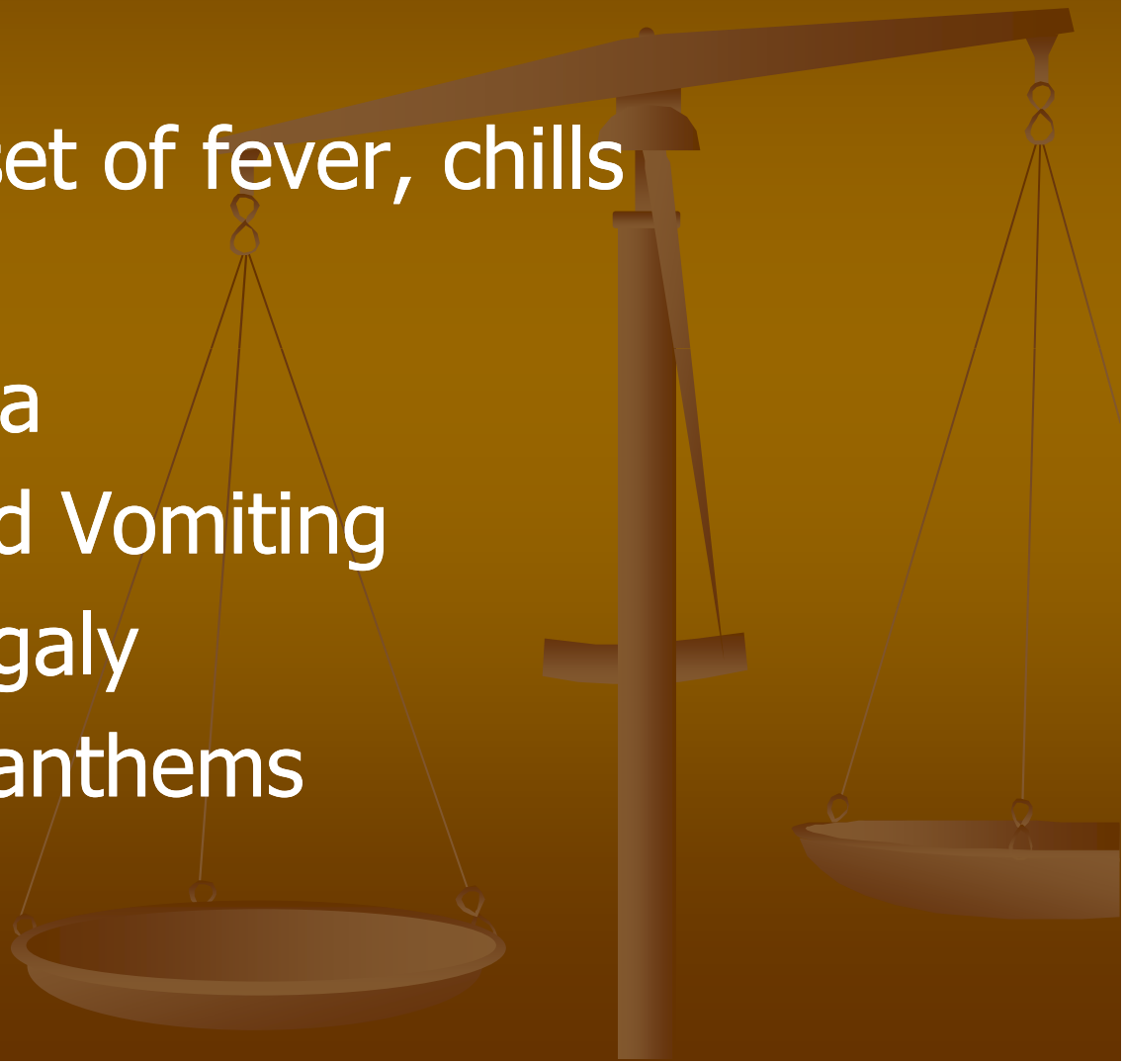
- Associated with **poverty, crowding, and warfare**
- **Arthropod vectors**
  - **Louse-borne borreliosis = Epidemic Relapsing Fever**
    - ✓ Transmitted **person-to-person** by human body lice (vectors) from infected **human reservoir**
    - ✓ Infect host only when louse is injured, e.g., during scratching
    - ✓ Therefore, a single louse can only infect a single person
    - ✓ Lice leave host that develops a fever and seek normal temperature host
  - **Tick-borne borreliosis = Endemic Relapsing Fever**
    - ✓ Sporadic cases
    - ✓ Transmitted by soft body ticks (vectors) from **small mammal reservoir**
    - ✓ Ticks can multiply and infect new human hosts

Pathogenesis of Relapsing Fever

- Relapsing fever (tick fever, borreliosis, famine fever)
  - Acute infection with 2-14 day (~ 6 day) incubation period
  - Followed by **recurring febrile episodes**
  - **Constant spirochaetemia** that worsens during febrile stages
- **Epidemic Relapsing Fever = Louse-borne borreliosis**
  - ***Borrelia recurrentis***
- **Endemic Relapsing Fever = Tick-borne borreliosis**
  - ***Borrelia spp.***



Relapsing Fever: Signs and Symptoms



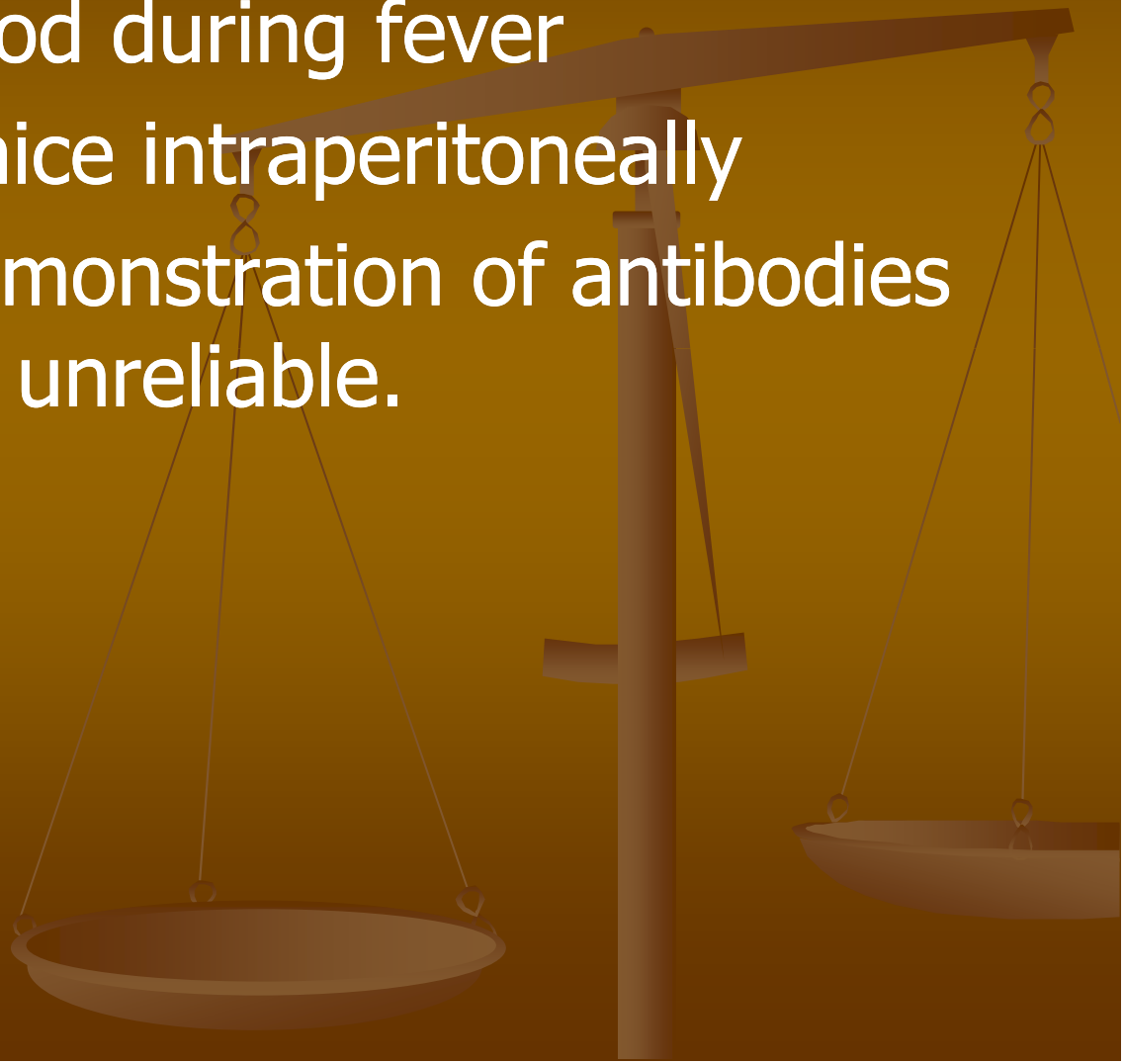
- Abrupt onset of fever, chills
- Headache
- Tachycardia
- Nausea and Vomiting
- Organomegaly
- Various exanthems

Relapsing Fever: Signs and Symptoms

- Attacks last 3-10 days
- Recur every 1 to 2 weeks
- Relapses might occur up to 10 times before complete recovery

Laboratory diagnosis

- Detection in blood during fever
- Inoculation in mice intraperitoneally
- Cultivation & demonstration of antibodies are difficult and unreliable.



Relapsing Fever: Treatment of Louse-borne

- Tetracycline [generic]: 500 mg po x 1

or

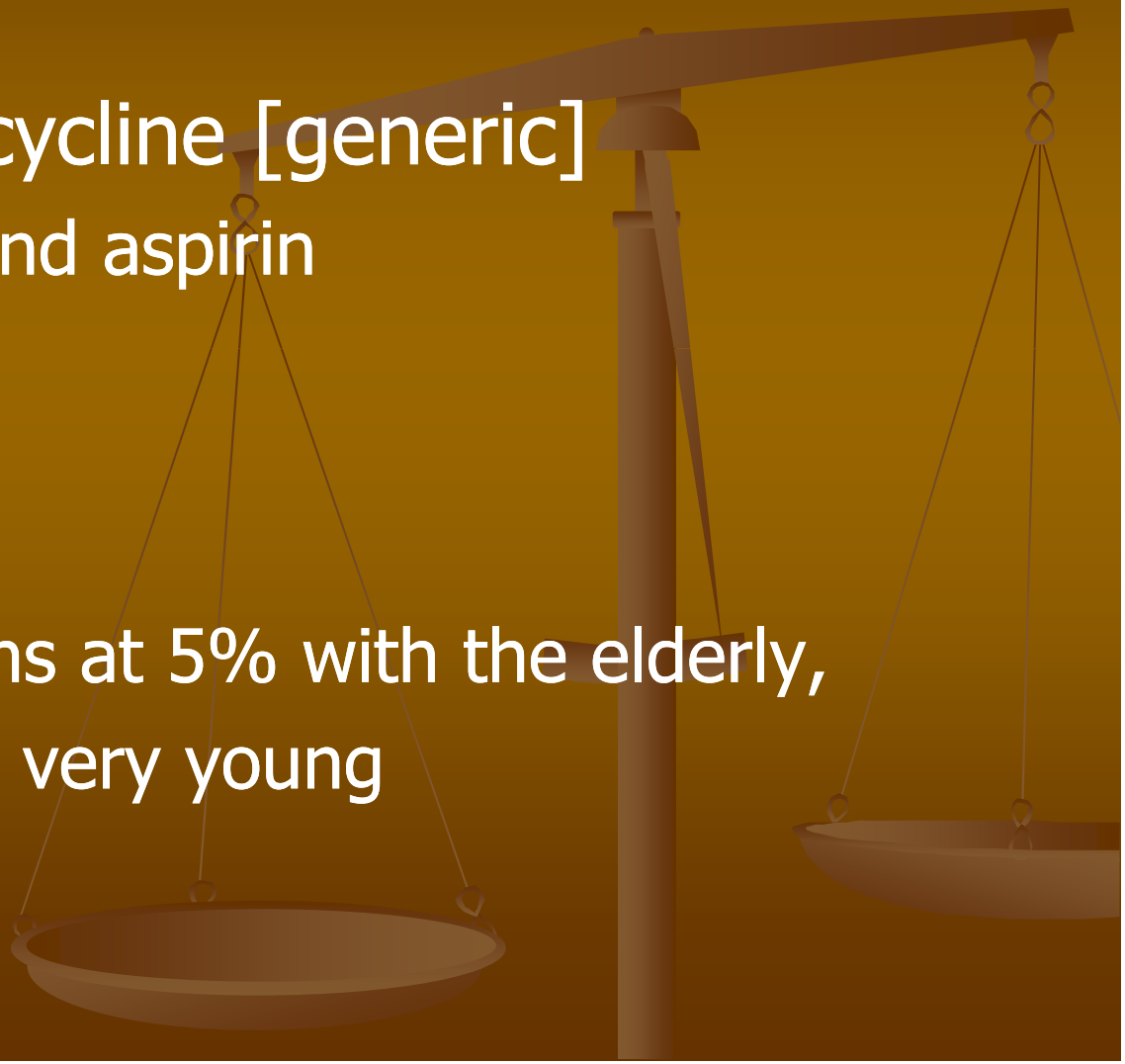
- Procaine PCN G [generic]: 600,000 units IM x 1

Relapsing Fever: Treatment of Tick-borne

- 500 mg Tetracycline [generic]
  QID x 10 days and aspirin

- Prognosis

  Mortality remains at 5% with the elderly, debilitated, and very young



Borrelia burgdorferi

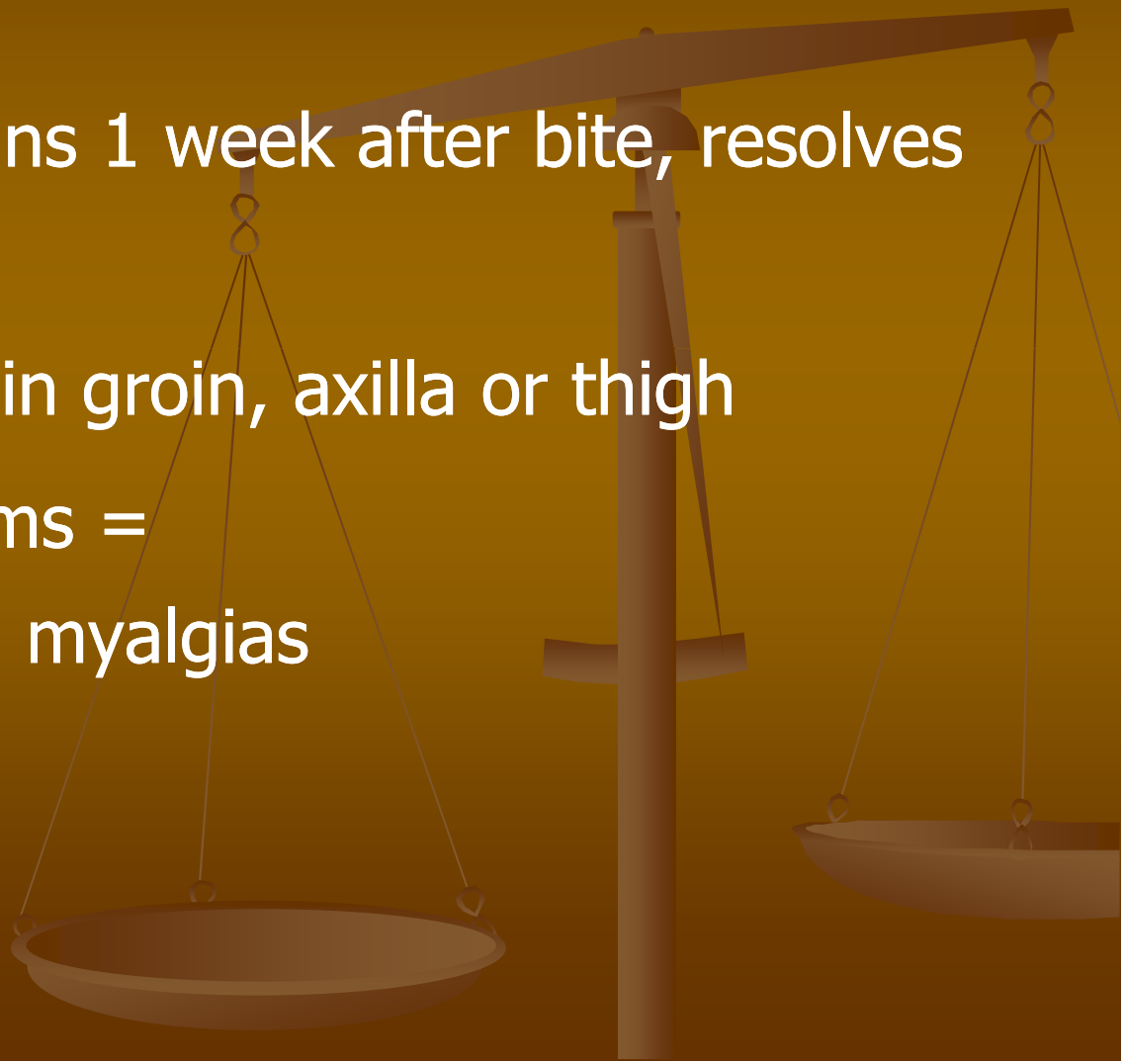
Lyme Disease/Lyme Borreliosis

- Etiology: Borrelia burgdorferi
- The most common vector-borne disease in the United States
- Deer Tick is primary carrier the United States, the bite generally painless

Deer tick

Lyme Disease: Signs and Symptoms

- **Stage 1**
  - Erythema Migrans 1 week after bite, resolves in 3-4 weeks
  - Lesion appears in groin, axilla or thigh
  - Flu like symptoms = fever, chills and myalgias



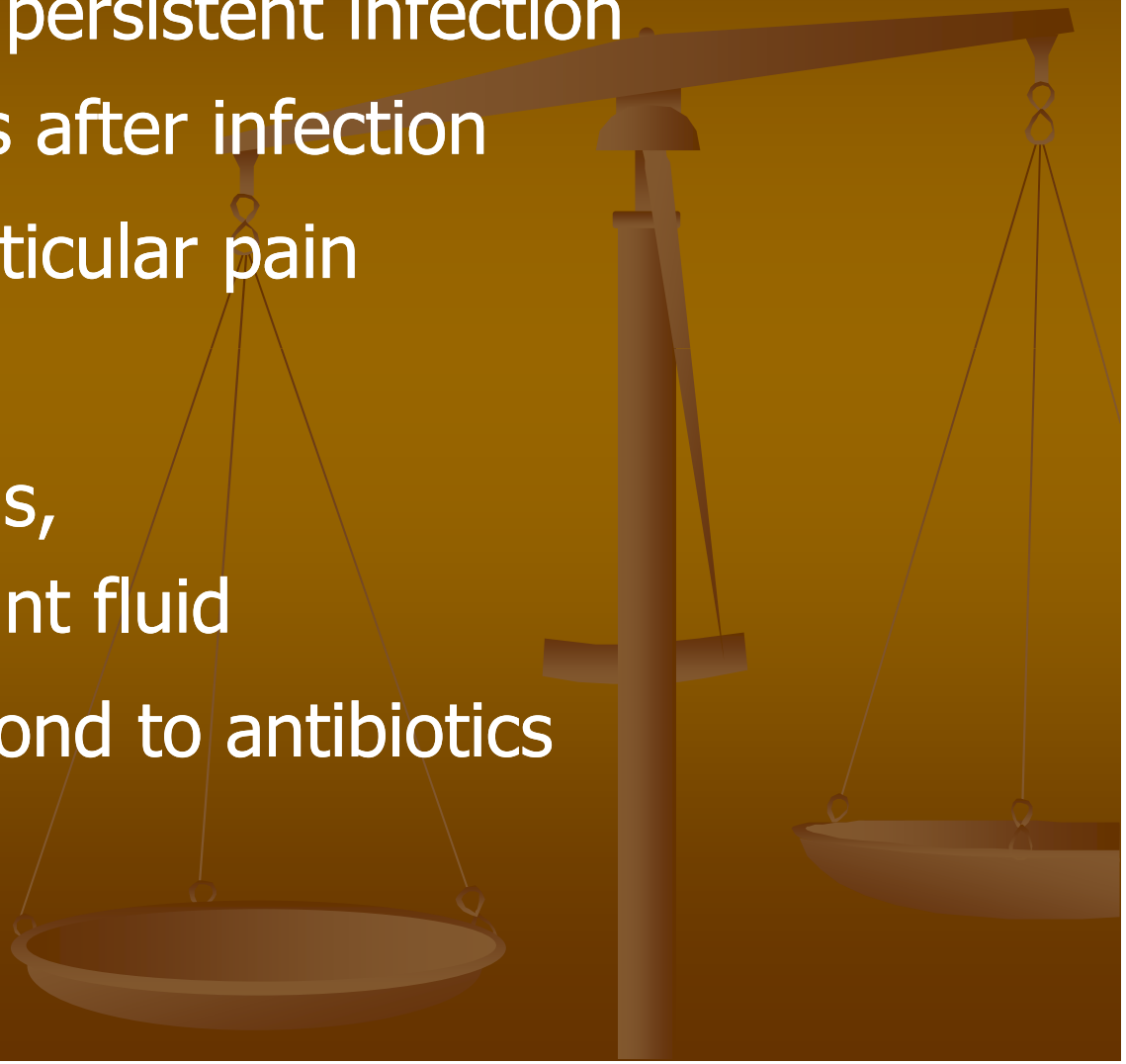
Erythema chronicum migrans of Lyme Borreliosis

Lyme Disease: Signs and Symptoms

- **Stage 2** **Early disseminated infection**
  - Spirochetes move to blood or lymph
  - Most often affects skin, CNS/MS systems
  - Secondary lesions may develop in 50%
  - Multiple myalgias, Fatigue, Malaise
  - Pain is migratory
  - Neuro signs are meningitis, Bell's Palsy, encephalitis, forgetfulness/irritability

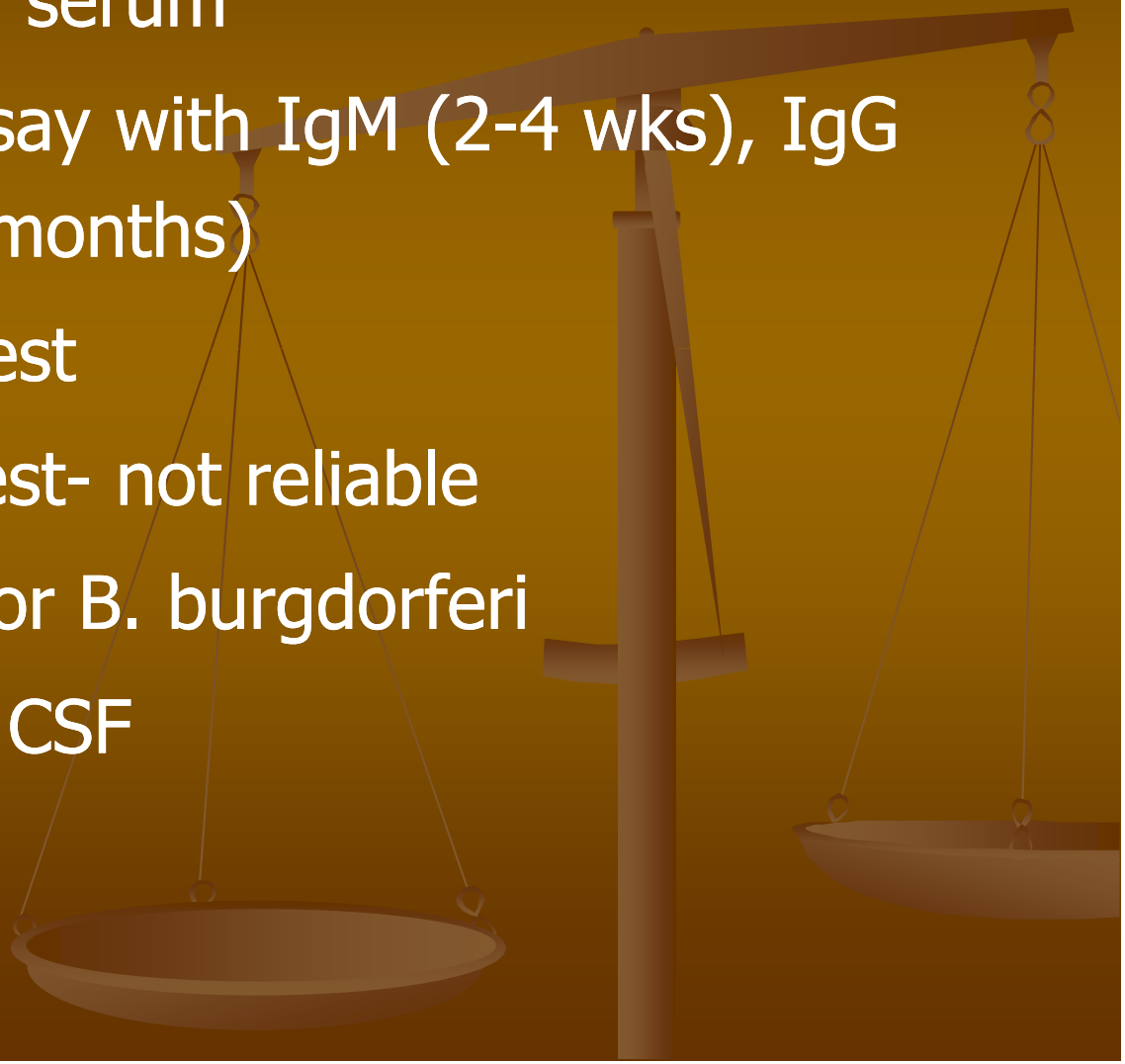
Lyme Disease: Signs and Symptoms

- Stage 3 The late persistent infection
  - Months to years after infection
  - Joint and periarticular pain
  - Frank arthritis
  - Chronic synovitis, antibodies in joint fluid
  - May fail to respond to antibiotics



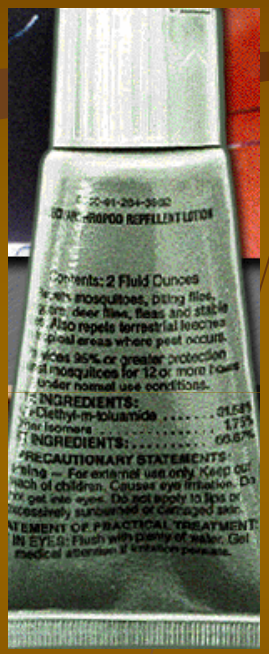
Lyme Disease: Lab Findings

- B. burgdorferi in serum
- Western Blot assay with IgM (2-4 wks), IgG antibodies (4-6 months)
- Positive ELISA test
- Lyme Urinary Test- not reliable
- Blood Cultures for B. burgdorferi
- Inflammation in CSF



Treatment: Lyme Disease

- Prevention is best treatment with proper clothing
- Prophylaxis post tick bite controversial, unproven to enhance protection
- Recombinant Vaccine developed but pulled from market
- Tetracycline: drug of choice
- Ampicillin/Ceftriaxone, Zithromax®

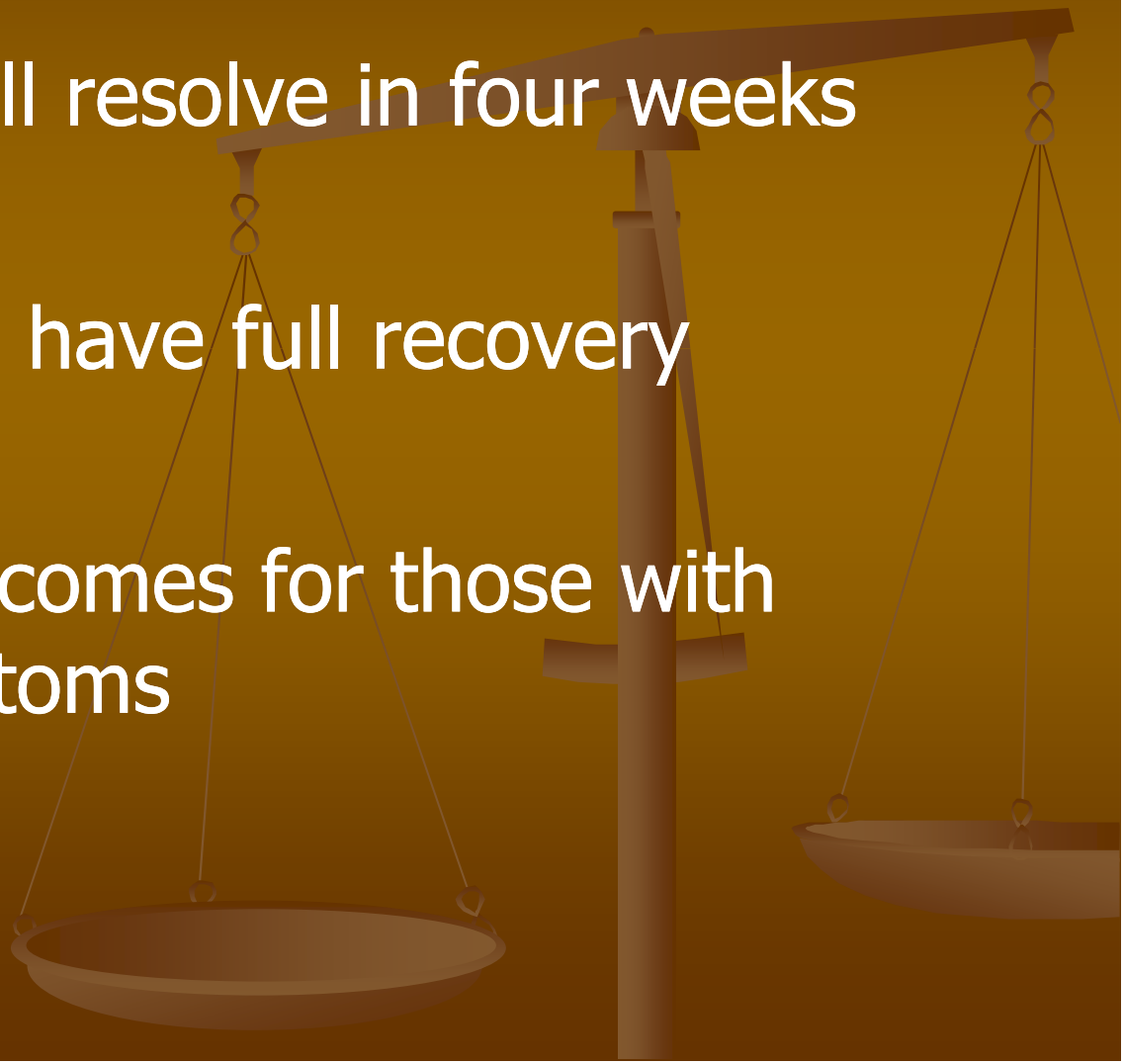


Lyme Disease: Treatment

- Erythema Migrans:
  Doxycycline 100 mg BID
- Bell's Palsy: Doxy or
  Amoxicillin for three weeks
- Meningitis: Ceftriaxone 2
  grams IV QD for 2 to 4 weeks
- Arthritis: ATB therapy and NSAIDs

Lyme Disease: Prognosis

- Symptoms will resolve in four weeks
- Most patients have full recovery
- Unknown outcomes for those with cardiac symptoms



Lyme Disease: Prognosis

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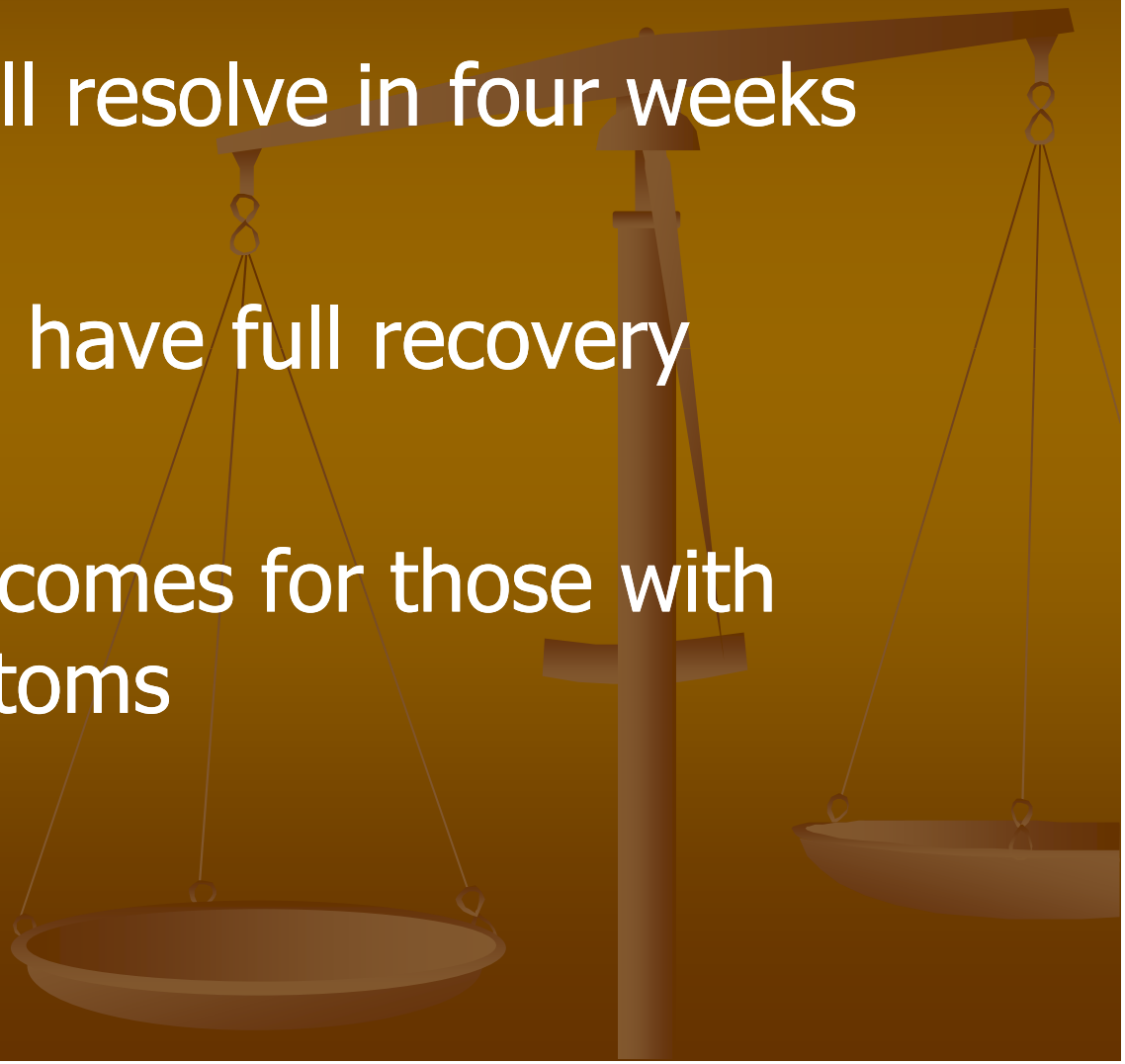
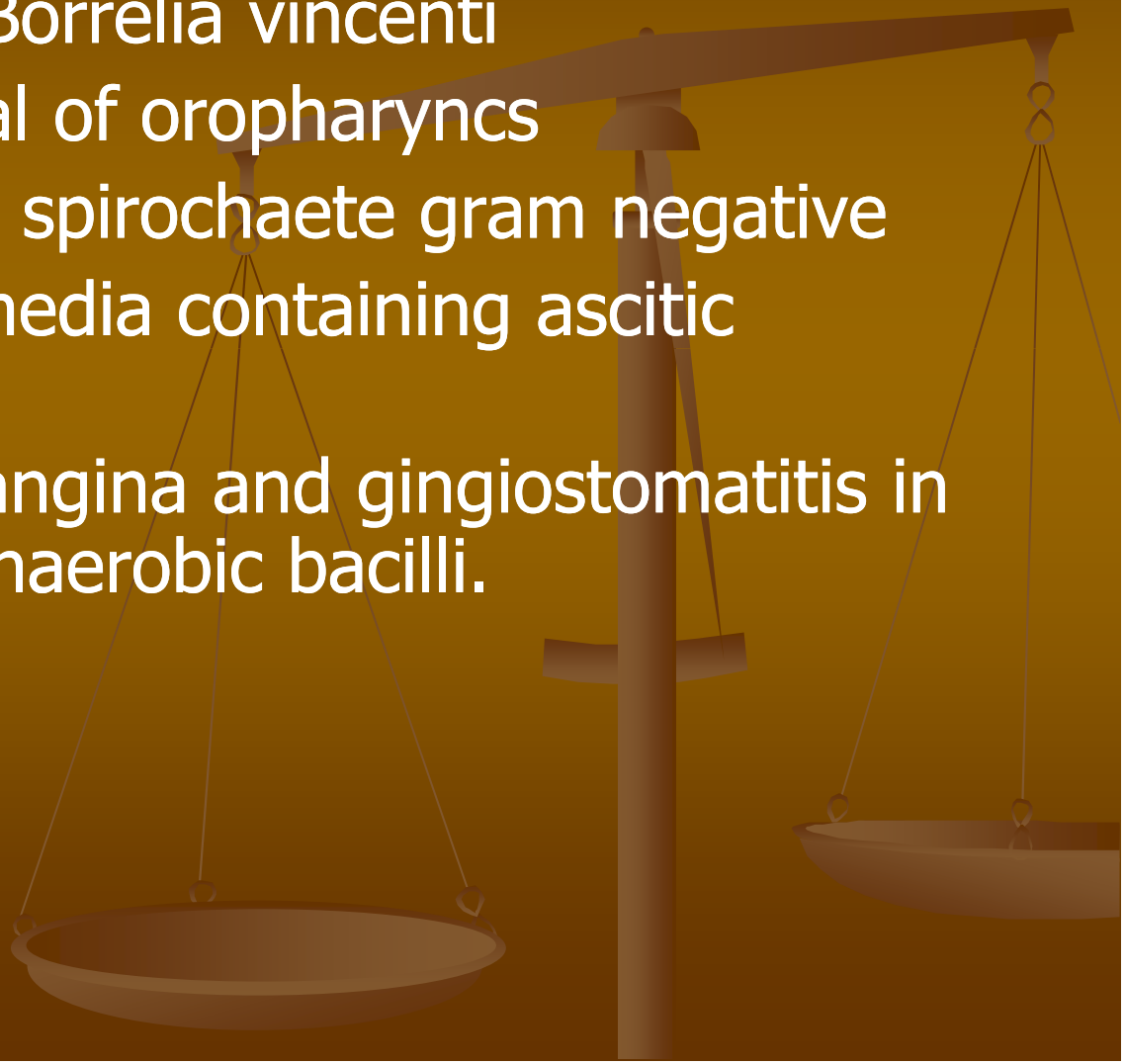


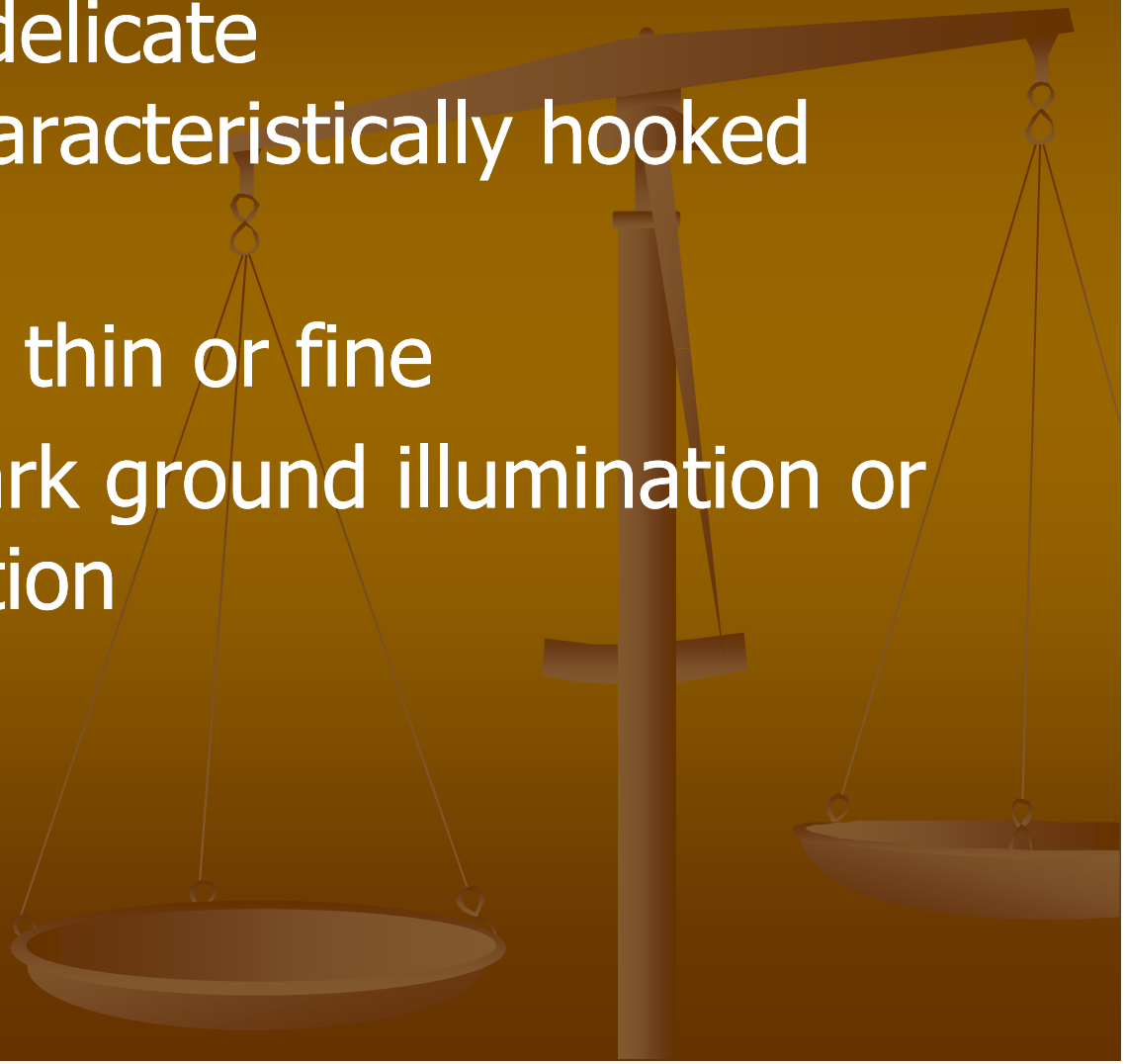
Vincent’s Angina

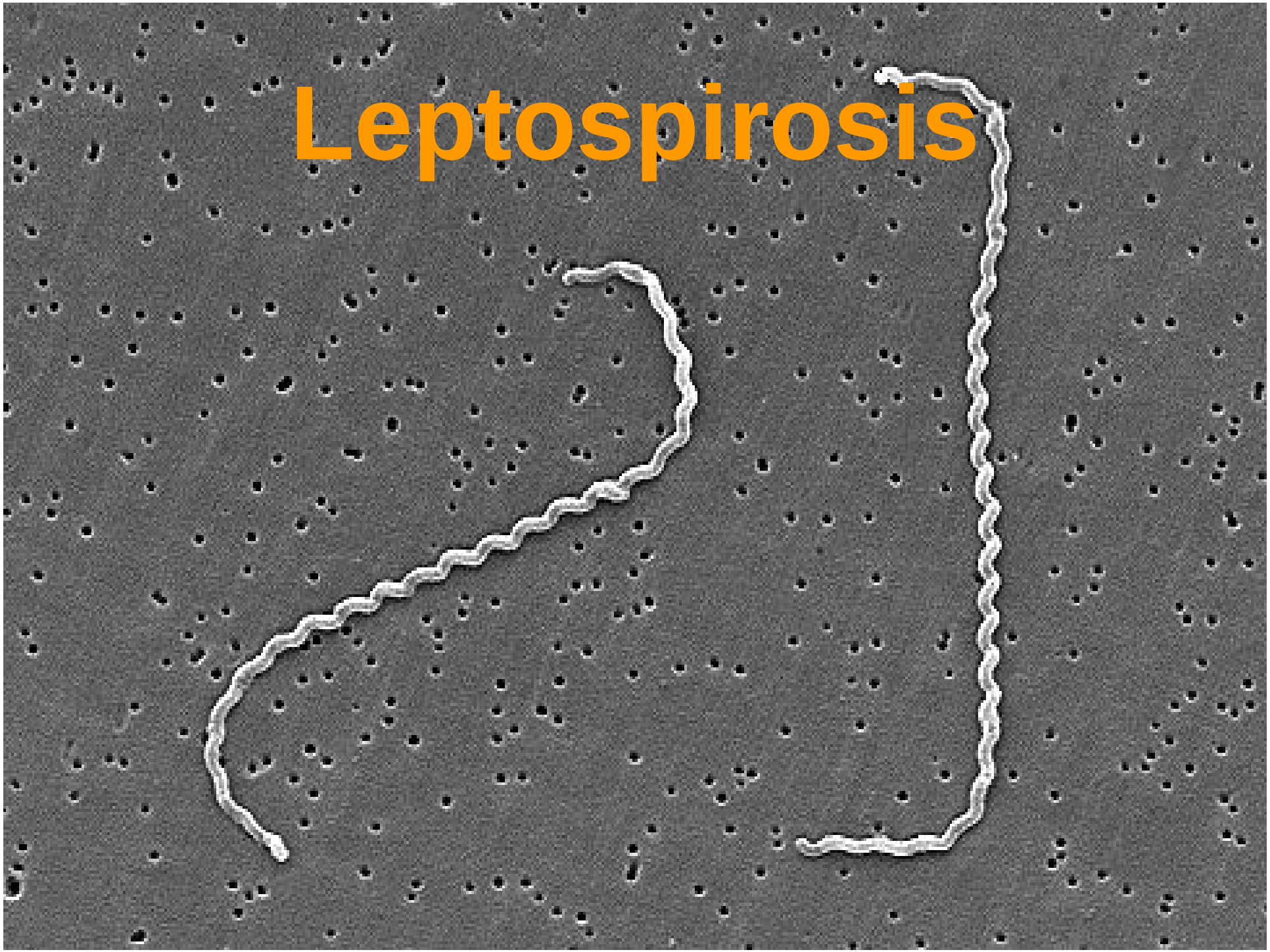
- Causative agent: Borrelia vincenti
- Normal commensal of oropharyncs
- Morphology: large spirochaete gram negative
- Culture: grow in media containing ascitic fluid,serum.
- Causes Vincent’s angina and gingiostomatitis in association with anaerobic bacilli.



Leptospira

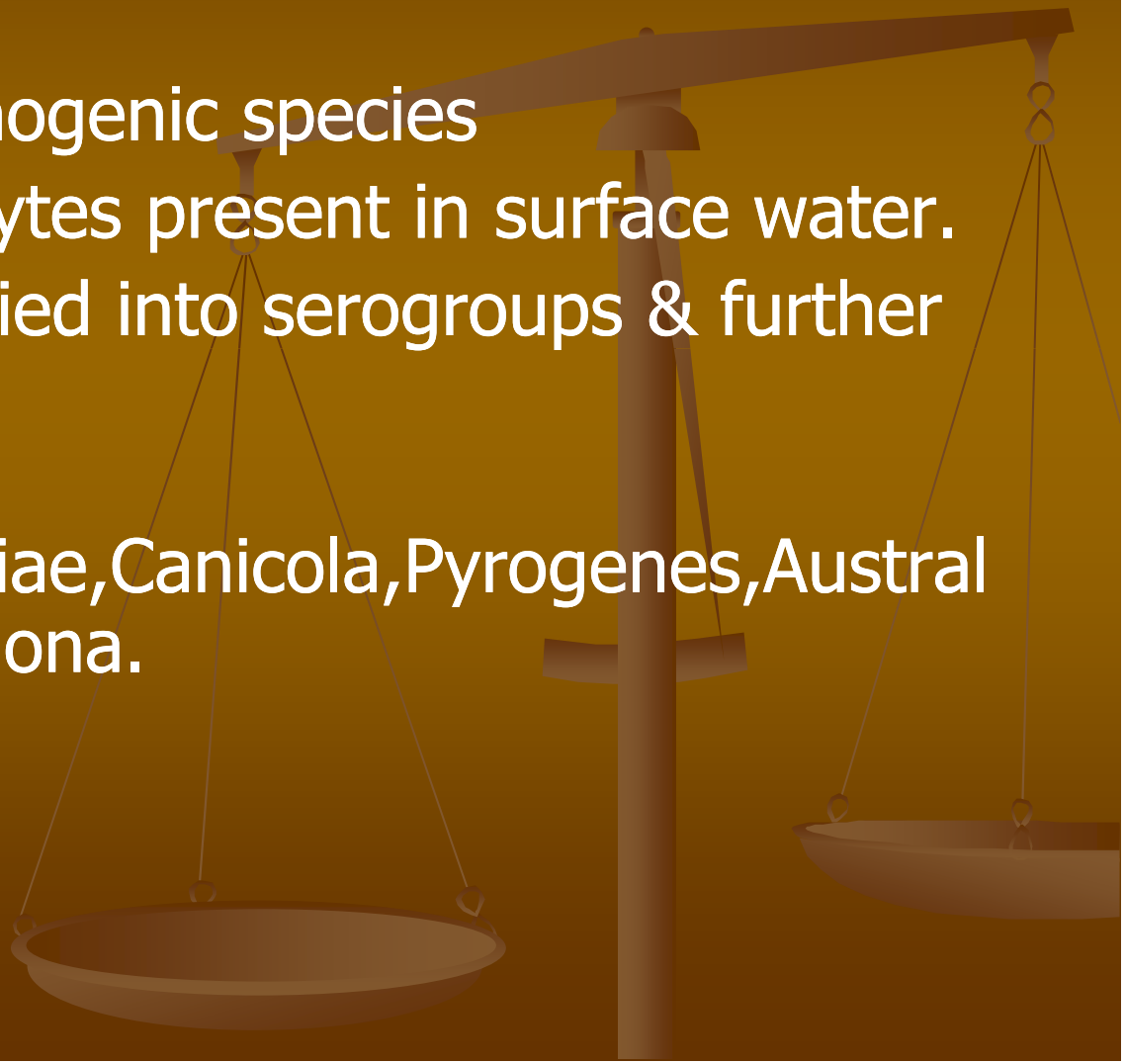
- Actively motile,delicate spirochaetes,characteristically hooked ends.
- Leptos meaning thin or fine
- Visualized by dark ground illumination or silver impregnation




Leptospirosis

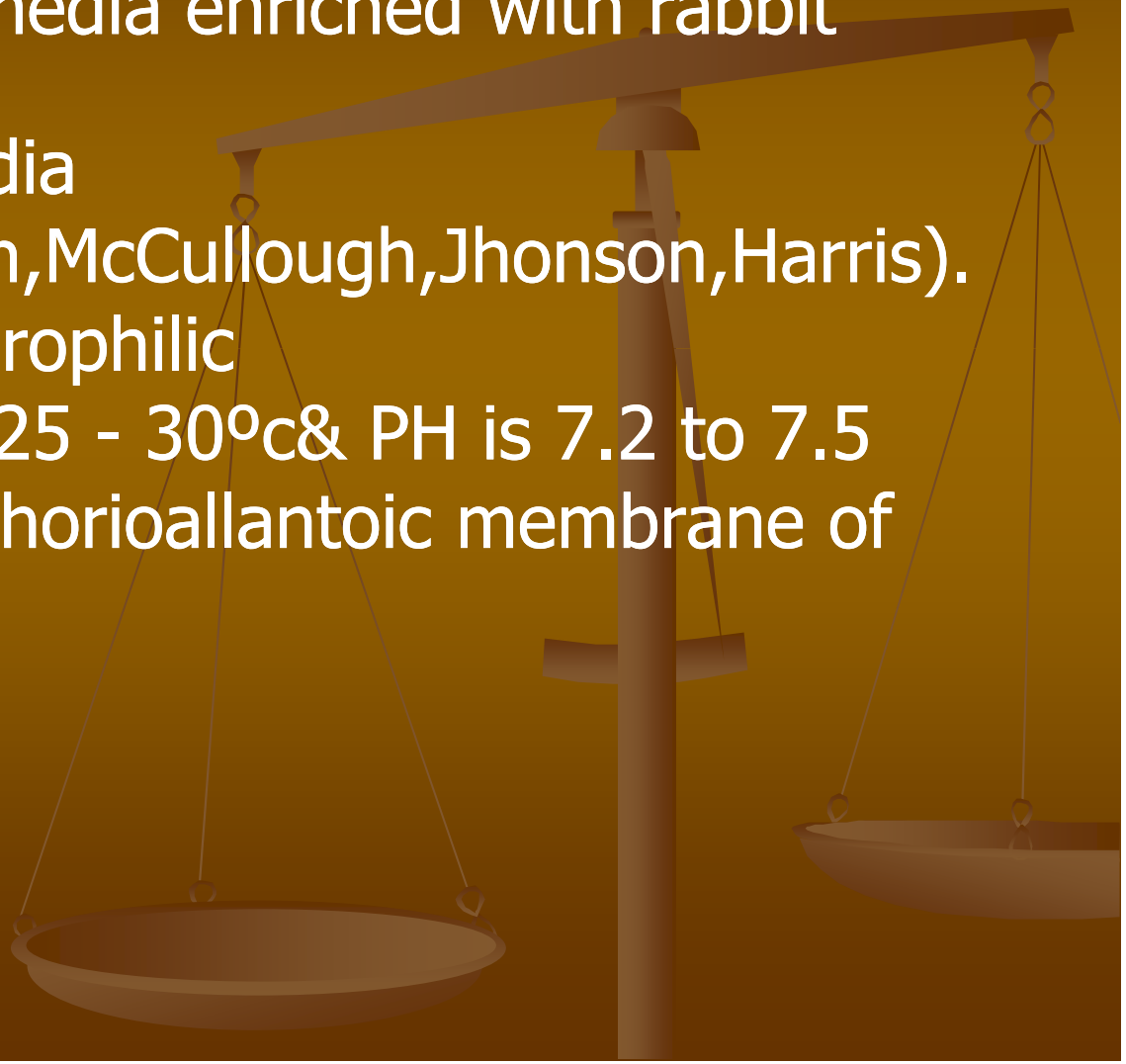
Classification

- Two species
- L.interrogans-pathogenic species
- L.biflexa- saprophytes present in surface water.
- Species are classified into serogroups & further into serovars.
- L.interrogans-Icterohaemorrhagiae,Canicola,Pyrogenes,Australis,Autumnalis,Pomona.



Culture Character

- Can be grown in media enriched with rabbit serum.
- Semisynthetic media
- EMJH(Ellinghausen,McCullough,Jhonson,Harris).
- Aerobic & microaerophilic
- Optimum temp is 25 - 30ºc& PH is 7.2 to 7.5
- Can be grown in chorioallantoic membrane of chick embryo.



Transmission

- infected urine
  - rodents
  - farm animals
- water
- through broken skin.

Leptospirosis Clinical Syndromes

- Mild virus-like syndrome
- (**Anicteric leptospirosis**) Systemic with aseptic meningitis
- (**Icteric leptospirosis**) Overwhelming disease (Weil's disease)
  - ✓Vascular collapse
  - ✓Thrombocytopenia
  - ✓Hemorrhage
  - ✓**Hepatic and renal dysfunction**

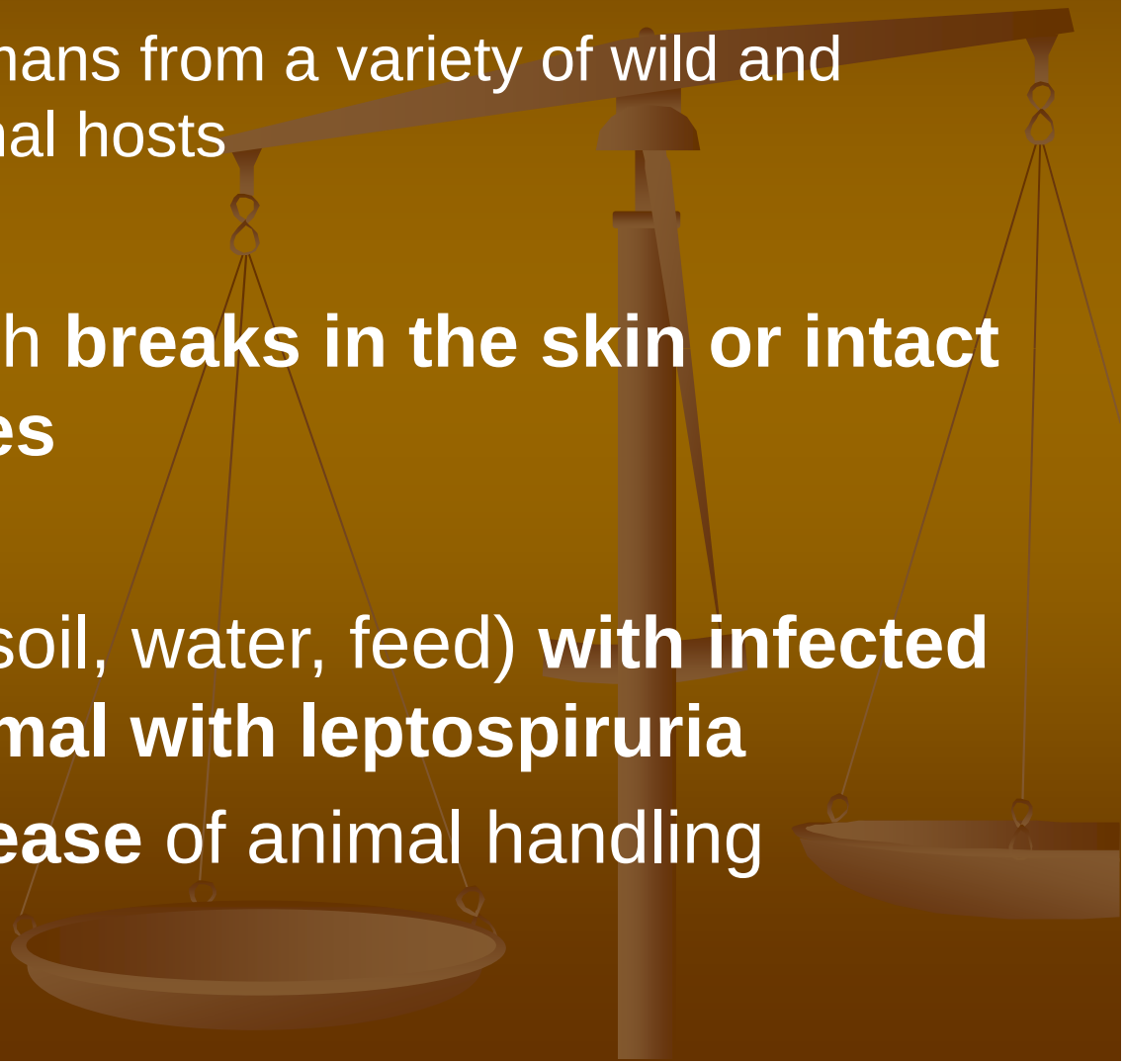
NOTE: **Icteric** refers to **jaundice** (yellowing of skin and mucus membranes by deposition of bile) and **liver involvement**

Pathogenesis of Icteric Leptospirosis

- Leptospirosis, also called **Weil's disease** in humans
- Direct **invasion** and **replication** in tissues
- Characterized by an **acute febrile jaundice & immune complex glomerulonephritis**
- Incubation period usually 10-12 days with flu-like illness usually progressing through **two clinical stages:**
  i. **Leptospiremia** develops rapidly after infection (usually lasts about 7 days) without local lesion
  ii. Infects the **kidneys** and organisms are shed in the urine (**leptospiruria**) with **renal failure and death** not uncommon
- **Hepatic injury** & **meningeal irritation** is common

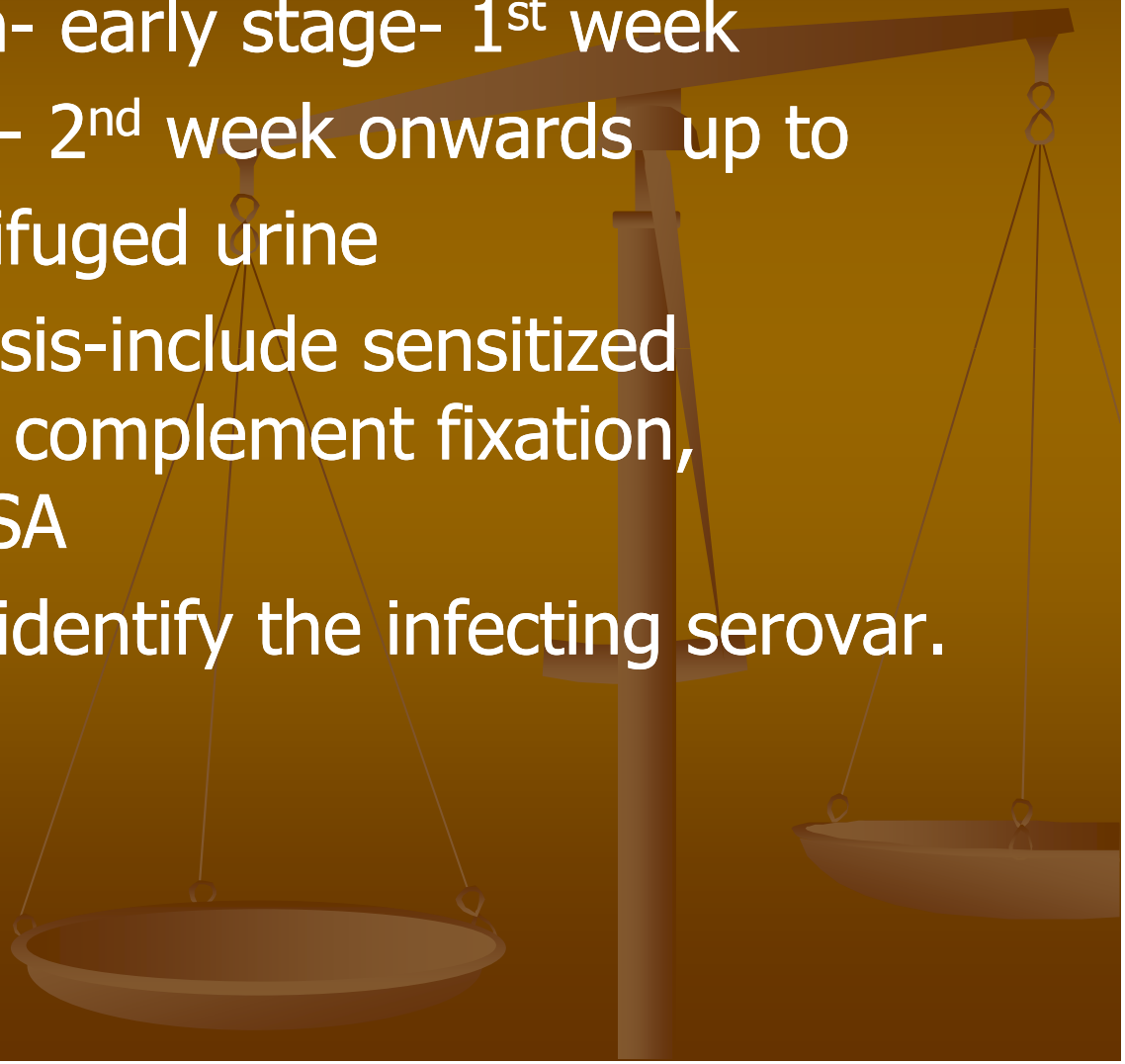
Epidemiology of Leptospirosis

- Mainly a **zoonotic** disease
  - Transmitted to humans from a variety of wild and domesticated animal hosts
- Transmitted through **breaks in the skin or intact mucus membranes**
- **Indirect contact** (soil, water, feed) **with infected urine from an animal with leptospiruria**
- **Occupational disease** of animal handling



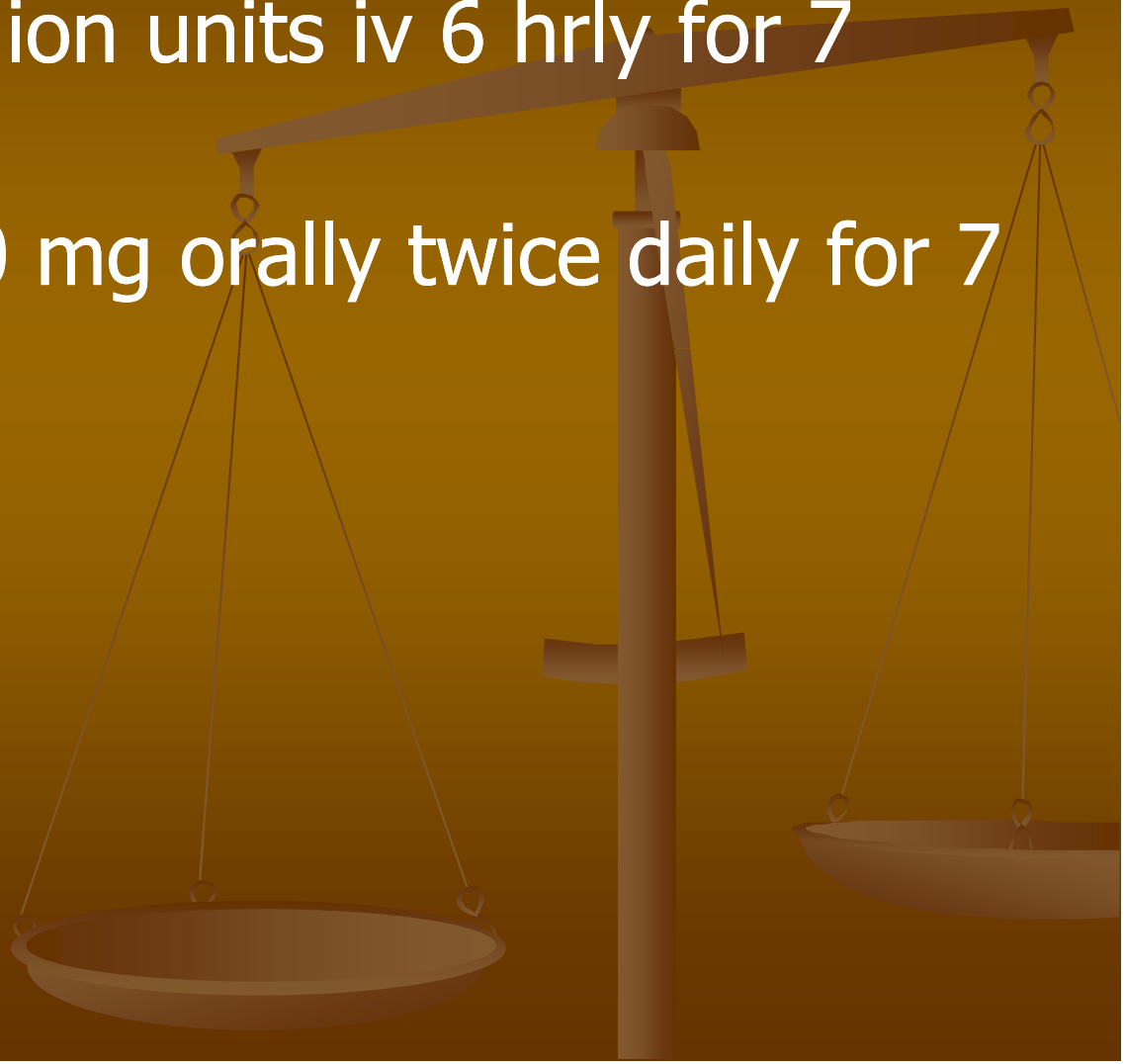
Laboratory diagnosis

- Blood Examination- early stage- 1st week
- Urine examination- 2nd week onwards up to 4 – 6 weeks-centrifuged urine
- Serological diagnosis-include sensitized erythrocytes lysis, complement fixation, agglutination, ELISA
- Type specific test identify the infecting serovar.



Treatment

- Penicillin 1-2million units iv 6 hrly for 7 days
- Doxycycline 100 mg orally twice daily for 7 days.




THANK YOU