Viral and Bacterial Zoonoses of the Dog

More than 150 millions pets in the USA:
Pet ownership: 58-62 % of households

Fish
(185 millions)
Salt water fish
(7 million)

Cats
(68.9-77.7 million)

Dogs
(61.6-65 million)

Rodents
(16.8 million)

Birds
(17.3 million)

Reptiles
(2.8-8.8 million)

Ferrets
(1 million)

Familial Zoonosis
(sometimes professionnal or accidental)
Pet Dogs in the USA:
Dog ownership: 39% of US households own at least one dog

40.6 million households in the USA own a dog (up from 40 million in 2000).

61% of the dogs are male

41% of dogs sleep in their owner’s bed

Familial Zoonosis

Source: 2002 figures, American Pet Product Manufacturers Association

Transmission via dog bites
Rabies

Infectious agent

- *Rhabdovirus, Rhabdoviridae*
- Negative ssRNA genome,
- bullet shaped, enveloped
- Virus is shed in the saliva

Dogs can excrete the virus a few days prior to developing clinical signs
Transmission via dog bites

Rabies

Pathogenesis

Figure 1. The infectious path of rabies virus

1. Raccoon is bitten by a rabid animal.
2. Rabies virus enters the raccoon through infected saliva.
3. Rabies virus spreads through the nervous system to the spinal cord and brain.
4. The virus incubates in the raccoon’s body for approximately 3-12 weeks. The raccoon has no signs of illness during this time.
5. When it reaches the brain, the virus multiplies rapidly, passes to the salivary glands, and the raccoon begins to show signs of disease.
6. The infected animal usually dies within 7 days of becoming sick.

Clinical Signs

Three Stages in Animals and Humans:

1. Prodromal Form (2-3 days)
   Signs: anxiousness, nervousness, and a change in personality

2. Aggressive Form (2-3 weeks)
   Signs: diagnostic reflexes (rage) - i.e. unprovoked attacks, increased aggression, and the animal becomes protective of its territory and food.

3. Paralytic Form (2-3 weeks)
   Signs: progressive paralysis and ultimately death.
Rabies

Clinical Signs
Three Stages in Animals and Humans:

2. Furious Form (1-7 days)
   Signs: irritability, aggression, hypersensitivity, disorientation and occasionally grand mal seizures.

3. Paralytic Form (1-10 days)
   signs: paralysis of one or more limbs then progressing to the entire nervous system
Rabies

Epidemiology
Rabies is endemic in the U.S.A. and is a highly fatal disease (about 1-2 human death/year)

Most common in wildlife in USA, dogs are spill over species (182 dog cases in 1992, 99 in 2002)
### Rabies in Cats and Dogs, USA

<table>
<thead>
<tr>
<th>Year</th>
<th>Cats</th>
<th>Dogs</th>
<th>Total Rabies Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>299</td>
<td>99</td>
<td>7,967</td>
</tr>
<tr>
<td>2000</td>
<td>249</td>
<td>114</td>
<td>7,369</td>
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<tr>
<td>1999</td>
<td>278</td>
<td>111</td>
<td>7,067</td>
</tr>
<tr>
<td>1998</td>
<td>282</td>
<td>113</td>
<td>7,962</td>
</tr>
<tr>
<td>1997</td>
<td>300</td>
<td>126</td>
<td>8,513</td>
</tr>
<tr>
<td>1993</td>
<td>291</td>
<td>130</td>
<td>9,498</td>
</tr>
<tr>
<td>1990</td>
<td>176</td>
<td>148</td>
<td>4,881</td>
</tr>
<tr>
<td>1953</td>
<td>538</td>
<td>5,688</td>
<td>8,837</td>
</tr>
</tbody>
</table>
Rabies Diagnosis

1. Immunofluorescence
2. Virus isolation and/or PCR
3. Histopathology

Rabies Control

1. Report animal bites
2. Mandatory rabies vaccination for dogs
3. If animals bite, they must undergo 10 day isolation/quarantine
4. If clinical signs develop, animals must be tested for rabies (brain).
5. If animal is exposed:
   a. Vaccinated – 30 day isolation (CA), 45 day (USA)
   b. Not Vaccinated – 6 month isolation

*Wolves cannot be licensed*
**Rabies**

**Prevention and Treatment**

**Prevention:**
- Animals: vaccination
- Humans: Pre-exposure vaccination in at risk groups (i.e., veterinarians)

**Treatment:**
1. Animals: NONE
2. Humans:
   a. Vaccinated
      - revaccinate with 2 doses, IM
   b. Not Vaccinated
      - immunoglobulins, 5 doses vaccine IM

**Infectious agent:**
- Most common species are *Pasteurella canis* and *Pasteurella multocida*
- Commensal organism within the oral cavity of the dog
- Gram negative, facultative anaerobe, coccobacillus

**Clinical signs**
- **Dog:** skin abscesses, arthritis, otitis
- **Humans:** intense pain, erythema, swelling, purulent secretion, skin abscesses,
- Complications: arthritis, tenosynovitis, sepsis

**Dog Bites Pasteurellosis**
**Dog Bites Pasteurellosis**

**Epidemiology:**
Pasteurella is the most common agent isolated from infected dog bites. Diagnosis: Culture of bite wound.

**Treatment:**
Most strains are susceptible to penicillin or ampicillin, Amoxicillin-clavulanate.

**Prevention:**
It is a commensal organism, so it can only be prevented by avoiding dog bites and cleaning any wounds thoroughly.

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**Dog Bites Capnocytophaga canimorsus**

**Infectious agent:**
*Capnocytophaga canimorsus* (formerly DF-2, dysgonic fermenter)
Commensal organism within the oral cavity of the dog (16%)
Fastidious Gram negative rod

**Clinical signs:**
No major sign in non-immuno compromised patients
Septicemia, shock, disseminated intravascular coagulation in immuno-compromised patients

**Dog Bites *Capnocytophaga canimorsus***

**Epidemiology:**
C. *canimorsus* is a common bacterium present in dog mouth. 103 human cases reported between 1976 and 1996. Following dog (91%) or cat (8%) exposure, mainly bites (54%) or scratches (8%).

**Underlying conditions:** 61% of cases

> 50 year-old, splenectomy (33%), alcoholism (24%), neoplastic/hematologic disease, immunosuppression (5%).

**Clinical features**
Fever (90%), septicemia (94%), septic shock (40%), disseminated intravascular coagulation (32%), meningitis (13%), renal failure (15%), gangrene (14%), thrombocytopenic purpura (14%), cardiopathy (11%), ARDS/Pneumonia (10-12%), endocarditis (7%)…

**Letality:** 30%
**Dog Bites *Capnocytophaga canimorsus***

Underlying Conditions and Fatality Rates (n=81)

<table>
<thead>
<tr>
<th>Category</th>
<th>Condition</th>
<th>Cases (%)</th>
<th>Fatalities (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>&gt; 50 yrs</td>
<td>42 (52)</td>
<td>17 (40)</td>
</tr>
<tr>
<td>Underlying</td>
<td>Total</td>
<td>57 (70)</td>
<td>18 (32)</td>
</tr>
<tr>
<td>Condition</td>
<td>Splenectomy</td>
<td>29 (36)</td>
<td>10 (34)</td>
</tr>
<tr>
<td></td>
<td>Neoplastic</td>
<td>20 (25)</td>
<td>6 (30)</td>
</tr>
<tr>
<td></td>
<td>Alcoholism</td>
<td>16 (20)</td>
<td>4 (25)</td>
</tr>
<tr>
<td></td>
<td>Pulmonary</td>
<td>13 (16)</td>
<td>6 (46)</td>
</tr>
<tr>
<td></td>
<td>Cardiovascul.</td>
<td>5 (6)</td>
<td>2 (40)</td>
</tr>
<tr>
<td></td>
<td>Steroid use</td>
<td>5 (6)</td>
<td>1 (20)</td>
</tr>
</tbody>
</table>

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**Dog Bites *Capnocytophaga canimorsus***

Major Clinical Features and fatalities (n=81)

<table>
<thead>
<tr>
<th>Feature</th>
<th>Cases (%)</th>
<th>Fatalities (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>73 (90)</td>
<td>--</td>
</tr>
<tr>
<td>Septicemia/bacteremia</td>
<td>43 (53)</td>
<td>16 (37)</td>
</tr>
<tr>
<td>Septic shock</td>
<td>32 (40)</td>
<td>17 (53)</td>
</tr>
<tr>
<td>Dis. Intravascular coagul.</td>
<td>26 (32)</td>
<td>13 (50)</td>
</tr>
<tr>
<td>Meningitis</td>
<td>14 (17)</td>
<td>2 (14)</td>
</tr>
<tr>
<td>Renal failure</td>
<td>12 (15)</td>
<td>5 (42)</td>
</tr>
<tr>
<td>Gangrene, cutaneous,</td>
<td>11 (14)</td>
<td>2 (18)</td>
</tr>
<tr>
<td>Thrombocytopenic purpura</td>
<td>11 (14)</td>
<td>4 (36)</td>
</tr>
<tr>
<td>Acute Resp. Distress Syndr.</td>
<td>10 (12)</td>
<td>5 (50)</td>
</tr>
</tbody>
</table>
**Dog Bites** *Capnocytophaga canimorsus*

**Diagnosis**
Culture of bite wound

**Treatment**
Most strains are susceptible to penicillin or ampicillin

**Prevention**
It is a commensal organism, so it can only be prevented by avoiding dog bites and cleaning any wounds thoroughly.

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**Dog Bites: Other bugs…**

**Epidemiology**
*Staphylococcus* sp., *Streptococcus* sp.  
*Corynebacterium* sp. *Proteus* sp.  
*Bacillus* sp., *Pseudomonas* sp.  
NO-1 (non oxydizer): 22 human cases between 1974-1998

**Prevention**
They are commensal organisms, so they can only be prevented by avoiding dog bites and cleaning any wound thoroughly.
**Gastrointestinal Zoonoses: Campylobacteriosis**

**Infectious Agent**
*Campylobacter jejuni, C. coli, C. upsaliensis*
Comma-shaped, flagellated, gram-negative
Penetrates mucosal surfaces

**Epidemiology**
Contact with diarrheic dogs, especially puppies (50% to 75%), healty dogs can also be intermittent shedders. About 6% of enteric campylobacteriosis transmitted by pet animals.

**Clinical Signs**
- **Humans**: fever, headache, abdominal pain, watery or bloody diarrhea lasting less than a week.
- **Dogs**: diarrhea

**Diagnosis:**
Anaerobic fecal culture
Silver stains done on colonic epithelial tissue

**Treatment:**
Fluid and electrolyte replacement
Erythromycin, especially for *C. jejuni*
Gastrointestinal Zoonoses: **Campylobacteriosis**

**Prevention and Control:**
- Interruption of contact with contaminated materials.
- Infected animals should be isolated.
- Hand washing after contact with pets (handling pet, pet’s toys, feeding utensils).
- Premises should be disinfected (bleach, quaternary ammonium compounds).

---

Gastrointestinal Zoonoses: **Salmonellosis**

**Infectious Agent**
*Salmonella enterica*, many serovars. Intracellular

**Epidemiology**
Contact with diarrheic dogs, especially puppies; healthy dogs can also be intermittent shedders. About 3% of enteric salmonellosis transmitted by pet animals. Infected dogs can shed *Salmonella* for 20-40 days, up to 100 days. Up to 27% of dogs in one study culture +

**Clinical Signs**
- **Humans**: after 12 hours to 36 hours of incubation: fever, nausea, abdominal pain, vomiting, diarrhea lasting less than a week.
- **Dogs**: fever, vomiting, diarrhea, abortion. Often asymptomatic carrier
**Gastrointestinal Zoonoses: Salmonellosis**

**Diagnosis:** Anaerobic fecal culture

**Treatment:**
Fluid and electrolyte replacement
Only in severe cases: Trimethoprim-sulfamethoxazole, fluoroquinolones, broad spectrum cephalosporins.

**Prevention and Control:**
- Interruption of contact with contaminated materials. Infected animals should be isolated.
- Hand washing after contact with pets (handling pet, pet’s toys, feeding utensils).
- Premises should be disinfected (bleach, quaternary ammonium compounds).

---

**Other Gastrointestinal Zoonoses**

**Infectious Agents:**
- *Yersinia enterocolitica*,
- *Y. pseudotuberculosis*,
- *Helicobacter sp.*,  
  *Helicobacter bizzozeronii*: common in dogs and close to *H. heilmannii* has been isolated recently from a human case.  
  *Helicobacter* accounts for 0.2% to 4% of human gastritis cases.
- *Giardia and Cryptosporidium* (see parasitic zoonoses).
Infectious Agent

*Borrelia burgdorferi*

- Helical shaped bacteria (spirochete).
- 10-25 microns in length.
- Gram negative.
- 7 – 10 periplasmic flagella.
- Loosely associated outer membrane which aids in motility.

Vector-borne Zoonoses: Lyme disease

Epidemiology

- Distinctive Geographic pattern
- Distribution based on presence of tick vectors.
- Vectored by ticks
  - *Ixodes scapularis*, Northeast
  - *Ixodes pacificus*, Pacific coast
- *B. burgdorferi* reservoir
  - White-footed deer mouse
- 2 year life cycle
- Larvae feed on infected mice
- Infected nymphs and adults responsible for human/animal transmission
Vector-borne Zoonoses: Lyme disease

**Epidemiology**
- Incidence rapidly increasing in U.S.
- >145,000 cases reported since 1982
- 95% of all reported vector-borne illness in USA

**Clinical Signs**
**Humans:**
- Erythema migrans (50% of cases)
- Fatigue
- Fever / headache
- Lymphadenopathy
- Muscle / joint pain
- Swollen knees (common sequellae)
- Carditis
- Nervous tissue abnormalities, bell palsy
Clinical Signs

**Dogs:**
- 90% present with foreleg limping.
- Local lymphadenopathy.
- Polyarthritis.
- Fever ~ 40 C (103 F).
- Anorexia.
- Renal disease.
- Carditis.
- If untreated- permanent muscle and nerve damage.

Diagnosis

Clinical signs
- “Classic triade”
  - Arthralgia
  - Lymphadenopathy
  - Muscle pain
- History
  - Exposure to ticks
- Laboratory analysis
  - Western blot
  - ELISA
Vector-borne Zoonoses: Lyme disease

Treatment
- Tetracyclines
  3-4 weeks if in early stages of disease
- IV Penicillin / ceftriaxone
  If in later stages of disease
  If neurologic symptoms present

Vector-borne Zoonoses: Lyme disease

Prevention
- Early removal of ticks
  Ticks need to feed for 24 hours before organism can be spread.
- Vaccination
  LYMErix (Humans) Not AVAIL.
  - Recombinant OSP vaccine
  LymeVax (Dogs)
  Galaxy Lyme
  Canine recombinant lyme
  Vaccination SHOULD NOT be used in place of tick prevention!
  Vaccines are not 100% effective
Infectious Agent: Rickettsia rickettsii

- Obligate intracellular coccobacillus
- Gram Negative
- Very small (1.2 x 0.5 microns)
- Usually occur singly may also appear in strands
- EM reveals two layered cell wall with cytoplasmic membrane
- Cause direct damage to cells lining the vascular system, resulting in severe vasculitis.

Clinical Signs

**Humans:**

- **INITIAL SYMPTOMS**
  - Fever
  - Nausea / vomiting
  - Severe headache
  - Muscle pain
- **LATER SYMPTOMS**
  - Rash 2-5 days after onset of fever
  - Abdominal pain
  - Arthralgia
  - Diarrhea
  - Thrombocytopenia / hyponatremia
Vector-borne Zoonoses: Rocky Mountain Spotted Fever

Clinical Signs

**Dogs:**
- Listlessness / Depression
- Fever / Anorexia
- Generalized lymphadenopathy
- Neurologic abnormalities
  - Seizures, stupor, coma
- Thrombocytopenia / hyponatremia
- Diarrhea & vomiting
- Scleral congestion / ocular hemorrhage
- PU/PD

Epidemiology

**Dermacentor variabilis**
(American Dog Tick)
- Transovarial transmission in ticks
- Male ticks may transmit infection to females during mating
- Adults and nymph stages feed on mammals and transmit infection
Vector-borne Zoonoses: Rocky Mountain Spotted Fever

Epidemiology
- 90% of patients with RMSF are infected during Spring and Summer months
  Increased numbers of adult and nymphal Dermacentor ticks
- History of known tick bites noted in only 60% of cases
- 75% of all human cases occur in children < 15 years old
- May correlate with increased exposure to dogs and wooded areas where ticks reside

Diagnosis
- Should be based on history and clinical signs
- Treatment should be administered upon clinical signs and suspicion of exposure to ticks
  Postponed treatment can prove fatal
- Serology
  IFA to confirm diagnosis
- Immunohistochemistry
  Antibody staining of tissue samples
Vector-borne Zoonoses: Rocky Mountain Spotted Fever

**Treatment**

- Should be administered immediately upon suspicion of RMSF
- **Doxycycline** is antibiotic of choice
  - Continue treatment 3-5 days after fever subsides
  - Failure to respond to tetracyclines argues *against* diagnosis of RMSF
- Administration of fluids should be done carefully due to severe vasculitis

**Prevention**

- Limit exposure to ticks
- Early removal of ticks
  - Require 24 hours before infection can be transmitted
- No vaccine available at this time
**Vector-borne Zoonoses: Mediterranean Spotted Fever/Boutonneuse Fever**

**Infectious agent:** *Rickettsia conori*

**Vector** *Rhipicephalus sanguineus* (brown dog tick)

About 88% of the cases are diagnosed between June and September (reproduction cycle of ticks).

**Background:** Boutonneuse fever (BF) is usually a mild rickettsial disease caused by *Rickettsia conorii* (endemic in the Mediterranean basin; Incidence of BF is estimated at 50 cases/100,000 inhabitants per year).

Severe complications can occur in about 10% of patients. Complications are more common in patients with underlying disease or who are elderly (so-called malignant form of BF). Mild forms usually are observed in children.

---

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**Clinical Signs**

**Humans:**
Incubation time usually is 4-15 days

**Fever** 39-40°C, headache, malaise, muscle pain, Erythematous papules, mainly lower limbs. **Tache noire** (eschar, necrotic plaque) at tick bite site.

**Purpura** (45% of patients). In some patients, eruption is papulo-vesicular, in others the only symptom is an isolated lymphadenopathy.

Mortality < 5%.

**Dogs:** None

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**Description of Agent**

*Ehrlichia chaffeensis*

- Small gram negative cocci
- Reside inside leukocytes
- Inside leukocytes they divide to form vacuole bound colonies called morulae
- Organisms persists in leukocytes by preventing lysosomal fusion
Vector Borne Zoonoses: Human granulocytic ehrlichiosis/Anaplasmosis

**Description of Agents**

- **Anaplasma phagocytophilum** *(Ehrlichia equi/E. phagocytophila)*
  - The pathogen that causes human anaplasmosis (formerly granulocytic ehrlichiosis (HGE)) primarily infects granulocytes (neutrophils and rarely eosinophils).

- **Ehrlichia ewingii**
  - Ehrlichia ewingii primarily infects neutrophils and occasionally eosinophils and produces a disease clinically similar to HME and HGE.

Vector Borne Zoonoses Human ehrlichioses/Anaplasmosis

**Clinical Signs in Humans**

- 5-10 day incubation period
- Nonspecific signs
  - Fever / malaise
  - Head & muscle aches
  - Cough
- More severe signs
  - Nausea / diarrhea
  - Joint pain
  - Confusion
  - Occasional rash

- **Ehrlichia chaffeensis** primarily infects mononuclear leukocytes (predominantly monocytes and macrophages), but may also be seen occasionally in the granulocytes of some patients with severe disease.
Vector Borne Zoonoses
Human ehrlichioses/Anaplasmosis

Clinical Signs in Humans
- If untreated
  - Prolonged fever
  - Renal failure
  - Disseminated intravascular coagulopathy
  - Meningoencephalitis,
  - Adult respiratory distress syndrome
  - Seizures / coma

Vector Borne: Zoonoses: *Ehrlichia canis*
Canine monocytic ehrlichiosis

Clinical Signs in Dogs
- Acute phase
  - Fever, anorexia, lethargy
  - Lymphadenopathy
  - Thrombocytopenia
- Most dogs recover at this point, but others progress to sub-acute and chronic phases
- Sub-acute form
  - Thrombocytopenia, Anemia
  - Usually sub-clinical but can last for years
- Chronic form
  - Lethargy, weight loss, Pancytopenia
  - Bone marrow suppression, Hemorrhage
  - Human case reported from Venezuela (1996)
Vector Borne Zoonoses:
Human ehrlichioses/Anaplasmosis

**Epidemiology**
- Transmitted by
  - *Ixodes scapularis* (Black legged tick)
  - *Ixodes pacificus* (Western black legged tick)
  - *Amblyomma americanum* (Lone star tick)
- Number of reported cases increasing in recent years
- > 1200 human cases since 1986
Vector Borne Zoonoses: Human ehrlichioses/Anaplasmosis

Diagnosis
- IFA serology
- PCR
- Detection of organisms in blood smears

Treatment
- Appropriate antibiotic treatment should be initiated immediately when there is a strong suspicion of ehrlichiosis on the basis of clinical and epidemiologic findings
- Doxycycline
- Supportive care
  - Thrombocytopenia usually resolves within 14 days of initialization of treatment
Vector Borne Zoonoses: Human ehrlichioses/Anaplasmosis

**Prevention**
- Limit tick exposure
- Remove ticks within 24 hours

**Vector Borne Zoonoses: Plague**

**Infectious Agent:**
*Yersinia pestis*
Gram negative, Non-motile
Can survive many years at low temperatures (4° – 10° C)

**Epidemiology**
- Transmission via contact with infected rodents
- Fleas found mainly on rodents
- May feed on dogs and cats as well
- Dogs infested with rodent fleas may bring fleas in close contact with humans
- Agent able to remain dormant for years in rodent burrows
Vector Borne Zoonoses: Plague

**Signs in Dogs**
- Usually, no or little clinical signs.
- Produces brief, self-limiting illness
- Used as sentinels (serological testing)

**Signs in Humans**
- Incubation period 2 – 6 days
- Early in infection
  - Chills, fever, nausea, headache and vomiting
- 3 Forms
  - Bubonic
  - Pneumonic
  - Septicemic

![Map of United States showing the distribution of human plague cases from 1970-1997](map.png)

![Diagram illustrating the signs and symptoms of bubonic and pneumonic plague](diagram.png)
**Vector Borne Zoonoses: Bartonellosis**

**Infectious Agent**
- Short, pleomorphic, Gram negative rods
- Aerobic
- Intra-erythrocytic
- *Bartonella vinsonii* subsp. *berkhoffii*
- *B. claridgeiae*
- *B. washoensis*
- *B. henselae*

**Epidemiology (Bartonella vinsonii subsp. berkhoftii)**
- Ticks are potential vectors
  - Distribution of known infections in wild canids in California coincides with geographic prevalence of tick species
    - *Ixodes pacificus*
    - *Dermacentor variabilis*
**Bartonella Infection in Domestic Dogs, U.S.A.**

<table>
<thead>
<tr>
<th>Bartonella species</th>
<th>Clinical signs</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>B. vinsonii subsp. berkoffii</em></td>
<td>Endocarditis, Arrhythmias, Myocarditis, Granulomatous rhinitis, Granulomatous lymphadenitis.</td>
</tr>
<tr>
<td><em>B. henselae</em></td>
<td>Peliosis hepatis, Granulomatous hepatitis</td>
</tr>
<tr>
<td><em>B. clarridgeiae</em></td>
<td>Endocarditis</td>
</tr>
<tr>
<td><em>B. washoensis</em></td>
<td>Endocarditis</td>
</tr>
</tbody>
</table>

**Vector Borne Zoonoses: Bartonellosis**

**Clinical Signs In Dogs**
- Lymphadenopathy
  - Granulomatous lymphadenitis
- Fever
- Lameness
- Endocarditis
  - Prevalence in large breed dogs

**Clinical Signs In Humans**
- Endocarditis (*B. v. berkoffii*)

**Treatment**
- **Humans**
  - Erythromycin
  - Rifampicin
  - Doxycycline
- **Dogs**
  - Doxycycline
  - Treatment will not eliminate infection but has shown to reduce level of bacteremia
**Vector Borne Zoonoses: *Coxiella burnetii* (Q Fever)**

- Gram negative Coccobacilli
- Intracellular (Monocytes and Macrophages)
- Resists lysosomal destruction: Lives in low pH, Resistance to proteolytic enzymes
- Aerosol transmission, mainly
- Rare cases of human contamination from aborted dogs or bitches giving birth.
- **Humans**: flu-like symptoms, atypical pneumonia, hepatitis, endocarditis
- **Treatment**: Doxycycline

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**Vector Borne Zoonoses: Tularemia**

**Infectious agent**

- *Francisella tularensis*
- Gram-negative rod
- Agent of “rabbit fever”

- Rare instances of transmission by dogs, coyote bites. Usually tick-bite transmitted, contact with rodents, rabbits, aerosols….

- Fever, lymphadenopathy, lesion at inoculation site (skin ulcer), pneumonia

- **Treatment**: Doxyxline, Ciprofloxacin
Other Bacterial Zoonoses: Anthrax

**Infectious agent**

*Bacillus anthracis*

large, gram-positive, non-motile, spore-forming bacterial rod
Virulence factors include: edema toxin, lethal toxin and a capsular antigen.

Not common in dogs, Chronic anthrax more commonly seen in dogs: pharyngeal and lingual edema.

**Treatment of choice**: penicillin, ciprofloxacin

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Bordetellosis = Kennel cough

**Infectious agent**

*Bordetella bronchiseptica*

Kennel cough in dogs, highly contagious, upper respiratory track infections: tracheobronchitis
Cases reported in immunocompromised patients (HIV, especially)
Mild upper respiratory symptoms to severe pneumonia

**Treatment of choice**: Enrofloxacin, doxycycline in severe cases
Brucellosis

**Infectious agent and Epidemiology**

*Brucella canis, B. melitensis, B. abortus, B. suis* (Small, gram-negative rod)

*B. canis* is transmitted between dogs via copulation. Long bacteremia

Aborted fetuses have a high number of organisms

**Clinical signs & Treatment**

**Dogs:** persistent bacteremia, reproductive disturbances, epididymitis, arthritis

**Humans:** undulant fever, chills, fever, sweats, erythema multiformans and joint pain

**Diagnosis:** Specific *B. canis* serology (rapid slide agglutination test)

**Treatment:** Doxycycline and streptomycin for at least 4-5 weeks

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Leptospirosis

**Infectious agent and Epidemiology**

*Leptospira canicola, L. icterohaemorrhagiae (Small, gram-negative spirochete)*

*L. pomona, L. grippotyphosa, L. bratislava*

Rodent borne zoonosis. Dogs are the natural reservoir for *L. canicola*

Other reservoirs include: skunks, raccoons, opossums, mice & rats.

Less than 100 human cases/year in USA, recent outbreak associated with triathlon

*Leptospira* survive well in fresh water
Leptospirosis

In the past: mainly serovars:
- L. canicola,
- L. icterohaemorrhagiae

Increased cases in dogs in USA in recent years,
in California: L. pomona, L. bratislava
In Massachusetts, New Jersey, New York, Michigan:
- L. grippotyphosa, L. pomona, L. autumnalis

Clinical changes: acute renal failure rather than hepatic insufficiency or coagulation abnormalities.

Leptospirosis

Clinical signs & Treatment

Dogs: Gastro-enteritis, icterus
bacteremia leading to fever, shock, renal failure and death. The organism colonizes renal epithelium

Humans: include fever, chills, myalgia, nausea, diarrhea, cough, and conjunctival suffusion. Manifestations of severe disease can include jaundice, renal failure, hemorrhage, pneumonitis, and hemodynamic collapse.

Treatment:
Penicillin, Doxycycline, ampicillin, and enrofloxacin
Tuberculosis

Infectious agent & Epidemiology

- *Mycobacterium tuberculosis, M. bovis* (less frequently).
- Rare in dogs, usually infection from human case.
- Aerosol transmission, dogs licking infected sputum. Increased risk in homeless, immunocompromised people.

Symptoms

- Dogs and Humans: weight loss, chronic coughing, pleuropneumonia, often granulomatous.
**Tuberculosis**

**Diagnostic & Treatment**

- **Diagnosis**: Humans: intradermal skin test, tracheal washing & PCR
  Dogs: diagnosis is difficult, PCR on bronchioalveolar rinsage fluid…

- **Treatment**: Humans: long term (6 months or more) treatment with multiple antibiotics
  Dogs: Not recommended – Euthanasia

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**Viral and Bacterial Zoonoses of the dog**

**Major Zoonoses (Frequent or Severe)**

- *Salmonella, Campylobacter, E. coli.*
- *Pasteurellosis*
- *Rabies, Capnocytophaga canimorsus*
- *Leptospirosis*
Viral and Bacterial Zoonoses of the dog

Minor Zoonoses (less Frequent or mild or limited role in transmission)


- Anthrax, Brucellosis, Tuberculosis, Q fever