



Anthrax



Bacillus anthracis

- Large, gram-positive, non-motile rod
- Two forms
 - Vegetative, spore
- Spores
 - Very resistant
 - Survive for decades
 - Taken up by host and germinate



Human Transmission


- Cutaneous
 - Contact with infected tissues, wool, hide, soil
 - Biting flies
- Inhalational
 - Tanning hides, processing wool or bone
- Gastrointestinal
 - Undercooked meat

Animal Transmission

- ▶ Bacteria present in hemorrhagic exudate from mouth, nose, anus
- ▶ Oxygen exposure
 - ▶ Spores form
 - ▶ Soil contamination
- ▶ Sporulation does not occur in a closed carcass
- ▶ Spores viable for decades
- ▶ Ingestion
 - ▶ Most common
 - ▶ Herbivores
 - ▶ Contaminated soil
 - ▶ Heavy rainfall, drought
 - ▶ Carnivores
 - ▶ Contaminated meat
- ▶ Inhalation
- ▶ Mechanical (insects)

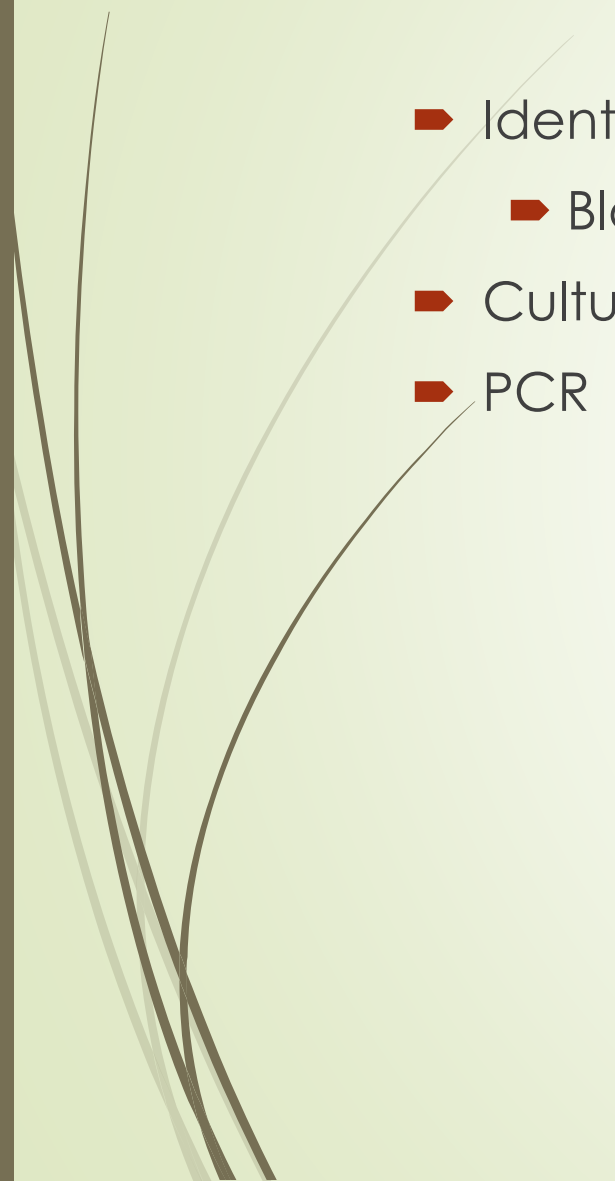


Disease in Humans

- Cutaneous Anthrax
 - Gastrointestinal Anthrax
 - Inhalational Anthrax
- 



Diagnosis

- Identification of *B. anthracis*
 - Blood, skin, secretions
 - Culture
 - PCR
- 



Treatment, Prevention and Control in Human

- Antibiotics (penicillin, ciprofloxacin, doxycycline) (for human)
- Vaccination
- Humans protected by preventing disease in animals
 - Veterinary supervision
 - Trade restrictions
- Safety practices in laboratories



Disease in Animals

Clinical Signs

- Many species affected
 - Ruminants at greatest risk
- Three forms
 - Peracute: Ruminants (cattle, sheep, goats)
 - Acute: Ruminants and equine
 - Subacute-chronic: Swine, dogs, cats



Diagnosis, Treatment and Vaccination

- Necropsy not advised!
- Do not open carcass!
- Samples of peripheral blood needed
 - Cover collection site with disinfectant soaked bandage to prevent leakage
- Reportable disease
- Livestock in endemic areas
- Vaccination !
 - Sterne strain:live encapsulated spore vaccine



Prevention and Control

- Report to authorities
- Quarantine the area
- Do not open carcass
- Minimize contact
- Wear protective clothing (latex gloves, face mask)
- Remove organic material and disinfect structures
- Vaccination
 - In endemic areas
 - Endangered animals





Brucellosis



***Brucella* spp.**

- Gram negative coccobacillus
 - Facultative, intracellular organism
- Multiple species
 - Associated with certain hosts
- Environmental persistence
 - Withstands drying
 - Temperature, pH, humidity
 - Frozen and aborted materials, dust, soil

| Species | Biovar/ Serovar | Natural Host | Human Pathogen |
|--|--------------------|------------------------|-------------------|
| <i>B. abortus</i> | 1-6, 9 | cattle, bison, buffalo | + |
| <i>B. melitensis</i> | 1-3 | goats, sheep | + |
| <i>B. suis</i> | 1, 2, 3 | swine | + |
| | 2 | European hares | + |
| | 4* | reindeer, caribou | + |
| | 5 | rodents | + |
| <i>B. canis</i> | none | dogs, other canids | + |
| <i>B. ovis</i> | none | sheep | - |
| <i>B. neotomae</i> | none | rodents | - |
| <i>B. maris</i> <i>B. pinnipediae</i> , <i>B. cetaceae</i> (?) | | marine mammals | +? |



Transmission in Humans

- Ingestion
 - Raw milk, unpasteurized dairy products
- Mucous membrane or abraded skin contact with infected tissues
 - Vaginal discharge, aborted fetuses, placentas
- Aerosol
 - Laboratory, pens, stables, slaughter houses
- Inoculation with vaccines
 - *B. abortus* strain 19, *B. melitensis* Rev-1
 - Conjunctival splashes, injection
- Person-to-person transmission rare



Transmission in Animals


- Ingestion of infected tissues or body fluids
- Contact with infected tissues or body fluids
 - Mucous membranes, injections
- Venereal
 - Swine, sheep, goats, dogs
- Fomites

Disease in Humans

- Incubation period
 - Variable; 5 days to three months
- Multisystemic
 - Any organ or organ system
 - Cyclical fever
- Flu-like illness
 - May wax and wane
 - Chronic illness possible
 - Complications of Brucellosis (arthritis, spondylitis, epididymo-orchitis, chronic fatigue, etc)

■ Congenital Brucellosis

- Variable symptoms
 - Premature delivery
 - Low birth weight
 - Fever
 - Failure to thrive
 - Jaundice
 - Hepatomegaly
 - Splenomegaly
- Abortion risk unclear



Diagnosis, Treatment and Prognosis in Humans

- Isolation of organism (blood, bone marrow, other tissues)
- Serum agglutination test
- Immunofluorescence (organism in clinical specimens)
- PCR
- Antibiotics necessary
 - Rarely fatal if treated
 - Death usually caused by endocarditis, meningitis
 - About 5% of treated cases relapse



Brucellosis in Animals



- Cattle
 - Third trimester abortions with *B. abortus*
 - Retained placenta
 - Endometritis
 - Birth of dead or weak calves
 - Low milk yield
- Sheep and Goats
 - *B. melitensis*
 - Late term abortions
 - Goats
 - Articular, periarticular hygroma localizations
 - *B. ovis*
 - Abortions, fertility problems in sheep
 - Orchitis, epididymitis
 - Abnormal breeding soundness exam



Brucellosis in Animals



- Horses

- *B. abortus* most common
 - Susceptible to *B. suis*
- Tendo, joint and muscular inflammation

- Dogs

- *B. canis*
 - Abortions
 - Bacteremia
 - Failure to conceive, stillbirths, prostatitis, epididymitis
- Also susceptible to
 - *B. melitensis*, *B. abortus*, and *B. suis*

Diagnosis and Treatment in Animals

- Isolation of organism (blood, semen, other tissues)
- Serology (brucellosis card test, ELISA)
- Brucella milk ring test
- Demonstration by fluorescent antibody of organism in clinical specimen (placenta, fetus)

- Treatment options
 - Combination antibiotic therapy
 - High rate of failure
- Prognosis
 - Disease may last days, months, or years
 - Eradication program

Prevention and Control

➤ According to Law No. 3285

Brucellosis in cattle :
compulsory notice and compensated

Brucellosis in sheep:
compulsory notice

- Education about risk of transmission
 - Farmers, veterinarians, abattoir workers, butchers, consumers, hunters
- Wear proper attire if dealing with infected animals/tissues
 - Gloves, masks, goggles
- Avoid consumption of raw dairy products
- Immunize in areas of high prevalence
 - *Brucella abortus* S19 conjunctival vaccine (calves)
 - *B. melitensis* Rev.1 conjunctival vaccine (young goats and sheep)
- Eradicate reservoir
 - Identify, segregate, and/or cull infected animals