RESPIRATORY SYSTEM L - 5

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CONTAGIOUS CAPRINE PLEUROPNEUMONIA

- an acute highly contagious disease of **goats** caused by a Mycoplasma F38 biotype, characterized by fever, coughing, severe respiratory distress, and high mortality.
- The principal lesion at necropsy is **fibrinous pleuropneumonia**.

Aetiology and epidemiology

- Two organisms have been reported as the causative agents for contagious caprine pleuropneumonia (CCPP).
  - *Mycoplasma capricolum capripneumoniae*, commonly known as *Mycoplasma* biotype F38, is the most contagious and virulent of the two.
  - ***Mycoplasma mycoides capri*** (type **PG-3**) also appears to cause the disease in goats, although much less commonly and with somewhat different signs.
  - Other mycoplasma organisms can cause pneumonia in goats, but are not considered to cause CCPP.
    - **M. mycoides mycoides** large colony type.

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Geographic Distribution

- CCPP found in
  - Africa
  - Middle East
  - Eastern Europe
  - Former USSR
  - Far East

- Never been found in North America

Morbidity/Mortality

- Morbidity often 100%
- Mortality ranges from 60-100%
- Influencing factors
  - Close confinement
  - Type of Mycoplasma
    - Strain F38
    - *M. mycoides capri*

Animal Transmission

- Incubation period: 6-10 days or 3-4 weeks
- Direct contact
  - Inhalation of infected respiratory droplets
- F38 strain more contagious
- Carrier animals
  - Shed more organisms
    - Stress, sudden changes in climate

Clinical Signs

- *Mycoplasma* F38 strain
  - Respiratory symptoms
    - Coughing, labored respiration
  - High fever, lethargy, anorexia
  - Nasal discharge - frothy
  - Stringy saliva
  - In acute disease, which occur in fully susceptible **goats**, death occurs within **7 to 10 days** after the onset of clinical signs.

Clinical Signs

- *M. mycoides capri*
  - Septicemia
  - generalized infection
  - Reproductive, GI, respiratory symptoms
  - less contagious than F38-induced disease,
  - the mortality and morbidity rates are also lower.

Post Mortem Lesions: ***Mycoplasma* F38**

- Limited to lungs (one or both)
  - Granular appearance,
  - Fibrinous pneumonia
  - Straw-colored fluid in thorax
  - Pea-sized yellow nodules on lungs
  - Congestion around the nodules
  - Adhesions to chest wall
    - Thickened pulmonary pleura

Post Mortem Lesions
M. mycoides capri

- Encephalitis, meningitis
- Lymphadenitis, splenitis
- Genitourinary tract inflammation
- Intestinal lesions
- Lung lesions
  - Resemble contagious bovine pleuropneumonia
  - Often unilateral
  - Fibrinous pneumonia

Diagnosis
Clinical and Differential

- Suspect CCPP with
  - Severe respiratory disease
  - High morbidity and mortality
  - Characteristic postmortem lesions
- Differential
  - Other causes of pneumonia
    - Pasteurellosis
    - Peste des petits ruminants (PPR)

Sampling

- Before collecting or sending any samples, the proper authorities should be contacted
- Samples should only be sent under secure conditions and to authorized laboratories to prevent the spread of the disease

Diagnosis: Laboratory

- Isolation/identification of organism
  - Immunofluorescence
  - Culture Isolation
  - PCR
- Serology
  - Used for herd diagnosis
    - Complement fixation
    - Passive hemagglutination
    - ELISA

BOVINE TB

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Acta Tropica

Risk factors associated with the presence of positive reactions in the SCCIT test in water buffalo around two cities in Punjab, Pakistan

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BOVINE TUBERCULOSIS

- Although bovine tuberculosis was once found worldwide, control programs have eliminated or nearly eliminated this disease from domesticated animals in many countries.
- Nations currently classified as tuberculosis-free include Australia, Iceland, Denmark, Sweden, Norway, Finland, Austria, Switzerland, Luxembourg, Latvia, Slovakia, Lithuania, Estonia, the Czech Republic, Canada, Singapore, Jamaica, Barbados and Israel.
- Eradication programs are in progress in other European countries, Japan, New Zealand, the United States, Mexico, and some countries of Central and South America.
- Although bovine tuberculosis has been eradicated from the majority of U.S. states, a few infected herds continue to be reported, and a few states may periodically lose their disease-free status.
- In particular, a focus of infection in wild white-tailed deer has complicated eradication efforts in Michigan. Similar problems exist with infected badgers in the U.K. and Ireland, and infected brush-tailed opossums in New Zealand.
- Bovine tuberculosis is still widespread in **Africa**, parts of **Asia** and some **Middle Eastern** countries.

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Mycobacterium

- *M. bovis* can survive for several months in the environment, particularly in cold, dark and moist conditions.
- At 12-24°C (54-75°F), the survival time varies from 18 to 332 days, depending on the exposure to sunlight.
- This organism is infrequently isolated from soil or pastures grazed by infected cattle.

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Mycobacterium

- **Resistant**
  - To drying (6-8 months in sputum)
  - To acids (3% HCl, 6% H_2SO_4)
  - To alkalis (4% NaOH)
  - Can remain viable for extended periods in cold weather
- **Sensitive**
  - To moist heat (60 °C – 30 min; 70 °C – 3 min)
  - Disinfectants (Alcohol, formalin, gluteraldehyde)
  - Drugs (rifampin, paraaminosalicylic acid, streptomycin, isoniazid, pyrazinamide)
  - Can be killed by a weak solution of common household bleach (1 part bleach to 9 parts water)
  - UV light

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- ✓ ***Mycobacterium* bovis (bovine)**
- ✓ ***Mycobacterium* avium (bird)**
- ✓ ***Mycobacterium* tuberculosis (human)**

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Transmission

- Tuberculosis can be transmitted either by the respiratory route or ingestion.
- In cattle, aerosol spread is more common.
- Other routes Cutaneous, Genital, and Congenital infections have been seen but are rare.
- Infectious bacteria can be shed in the respiratory secretions, feces, milk, and in some individuals in the urine, vaginal secretions, or semen.
- Not all infected animals transmit the disease.

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PATHOGENESIS

- By ingestion of contaminated feed & water > Localize at point of entry > produce typical tubercle in associated organs & lymph nodes (pharyngeal & mesenteric L.N)
- By inhalation > enter alveoli > mucosa of bronchial tree > neutrophilic infilteration > undergo necrosis & macrophages accumulates > form multiplayer zone around bacteria & dead cells >
- Some epitheloid cells fuse > form langhan's giant cells
- Some bacilli destroyed & phagocytosed > zone of lymphocyte & fibrous C.T. form around epitheloid cells > caseous necrosis > Ca-salt deposits in foci of necrotic tissue > some foci of infection coalesce > form tubercles > healing of primary lesion may take place >
- Some bacilli may come out > invade lymph channels > lymph nodes (bronchial & mediastinal) > bacilli enter lymphatics in pleural surface > tuberculous pleuritis

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STAGES OF PATHOGENESIS

1. Primary stage (localize at point of entry > produce lesion)
2. Post primary dissemination - extend to body cavities, blood vessels, lymph nodes
3. Stage of generalization-extensive lesion due to low host resistance

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Key Steps in TB Pathogenesis

- **Bacteria get into the cell**
- **Bacteria survive in phagocytes**
  - **Avoidance of activated macrophage response**
- **Bacteria thrive in phagocytes**
  - **How to make the macrophage your home**
- **Bacteria apparently wait it out**
- **Tissue destruction**

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CLINICAL FINDINGS

- Referable to site of localization
- Tuberculosis is usually a chronic debilitating disease in cattle, but it can occasionally be acute and rapidly progressive.

RESPIRATORY SYSTEM

- In the late stages, common symptoms include progressive emaciation,
- a low–grade fluctuating fever,
- weakness and in-appetence.
- have a moist cough that is worse in the morning, during cold weather or exercise, and may have dyspnea or tachypnea.
- In the terminal stages, animals may become extremely emaciated and develop acute respiratory distress.
- In some animals, the retropharyngeal or other lymph nodes enlarge and may rupture and drain.
- Greatly enlarged lymph nodes can also obstruct blood vessels, airways, or the digestive tract.

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LESIONS

- Tubercles b/w 1-2 mm diameter on different organs.
- Commonly affected organs are lungs, liver, pleura, peritoneum, kidney, spleen regional L.Ns & glands.
- Some cases; bones, joints, C.N.S. .
- Occasionally; male and female Genital organs.

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- Tubercle deep in soft tissues or bulging from mucus serous surface.
- Tubercle –firm, hard, white, grey or yellowish nodule.
- Calcification common in bovine.
- Tuberculous lesion consist of caseous core, surrounded by necrotic tissue, encapsulated with fibrous tissues.
- Nodules on pleura & peritonium.
- Lesions may enlarge involving whole lungs, liver, or small & numerous (milliary TB)
- T.B lesion may persist for entire life

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HISTOPATHOLOGY

- Characteristic Microscopic lesion is tubercle.
- Caseous necrosis in centre encircled by epitheloid cells, lymphocytes.
- Calcification in caseous centre of necrosis
- Langhan's giant cells - pale acidophilic cytoplasm and no. of round neuclei arranged in crescent at corner + lipid droplets + bacilli.

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DIAGNOSING BOVINE TB

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Diagnosis

- Comparative Cervical Tuberculin Test (CCTT)
- Tuberculin results

Increase in Skin Thickness	Result
<3.0 mm	Negative
3-3.9 mm	Suspected
4 or >4mm	Positive

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Diagnosis

- gross examination
- histological (microscopic) examination
- ZN staining and isolation of organism on Stonebrink's medium

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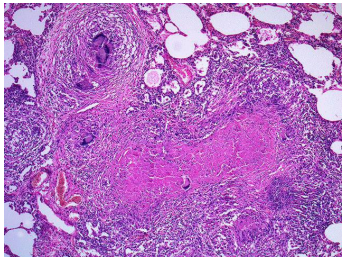
Histopathology

- Most common lesion associated with bovine TB is the granuloma



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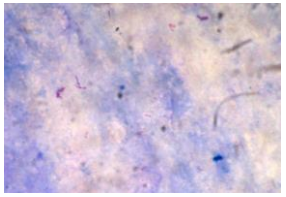
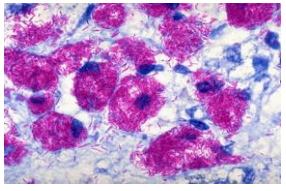
ZN Staining





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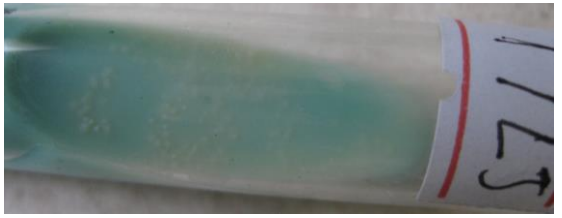
Culture

- *Stonebrink's medium*
- Culturing usually takes 8 to 16 weeks



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Polymerase Chain Reaction (PCR)

- Used to detect the presence of DNA that is specific to the organism
- PCR amplifies the specific portion of DNA
- The product can be easily visualized gel electrophoresis
- PCR is very sensitive
  - Can detect organism even when present at very low levels

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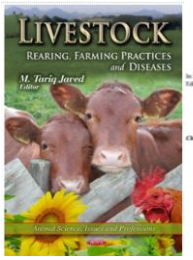

LIVESTOCK

REARING, FARMING PRACTICES AND DISEASES

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Chapter 10

BOVINE TUBERCULOSIS AT THE HUMAN-ANIMAL INTERFACE, SITUATION AND POSSIBLE RISK FACTORS OF DISEASE IN ANIMALS IN PAKISTAN, FUTURE OF DISEASE AND ACTION PLAN

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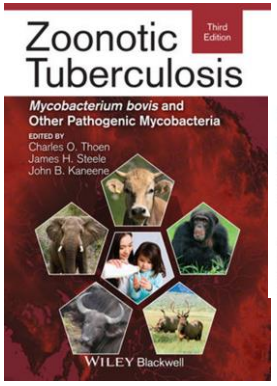
ABSTRACT



Chapter 15

Status and control of tuberculosis in animals in Pakistan

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Pakistan's neighboring countries include India, China, Afghanistan, and Iran. The economic survey report of 2010–11 indicates that livestock accounts for 55.1% of Pakistan's agriculture, and it contributes to 11.5% in the national gross domestic product. Among dairy animals, the same report indicates that 35.6 million head of cattle, 31.7 million head of buffalo, 28.1 million head of sheep, and 61.5 million head