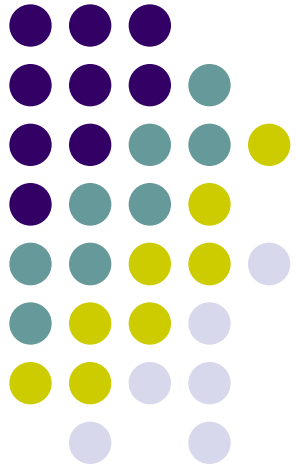
牛型結核菌

衛生署 疾病管制局
中區傳染病防治醫療網
王任賢 指揮官

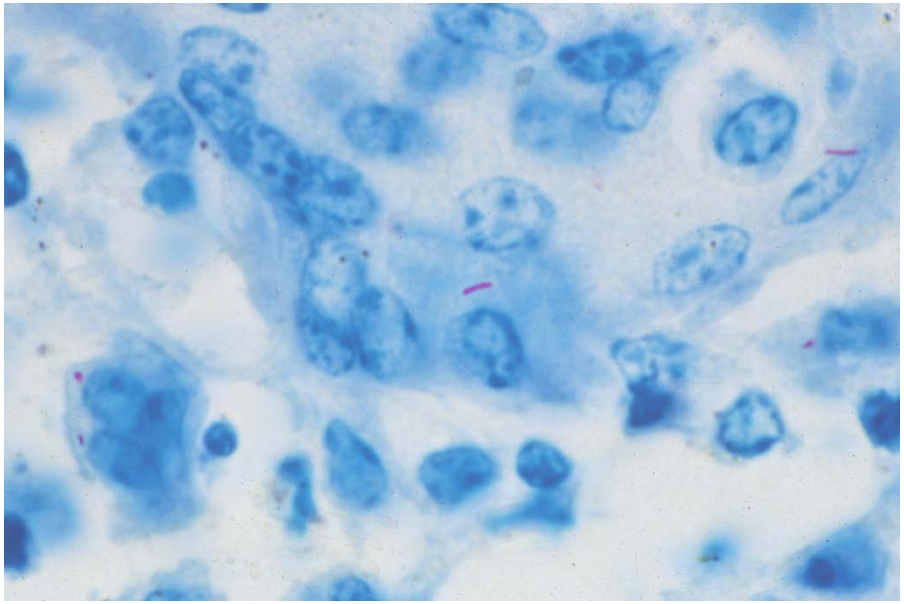


Implications

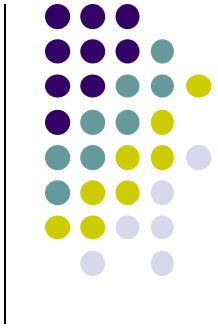
- Bovine tuberculosis is a human health issue in many foreign countries where the milk is not pasteurized and there are high rates of human infection
- Bovine TB is an economic issue!! Until the disease is eradicated from livestock, other countries will continue to impose restrictions on the sale and movement of livestock

What is Tuberculosis?

- Tuberculosis (TB) is a contagious disease of both animals and humans
- It is caused by *Mycobacterium*



Mycobacterium

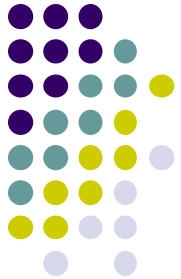


- Unique bacteria
- Cell walls contain a lot of waxy material (mycolic acid)
  - inhibits the uptake of nutrients into the bacterial cell
  - causes the cell to clump
    - these factors contribute to the slow growth rate
- Mycobacteria do not grow outside of a host except in cultured media
  - Slow growth rate
  - Multiply approximately once every 20 hours

Mycobacterium

- Require oxygen for growth
- Very heat sensitive
- Can be killed by a weak solution of common household bleach
  - 1 part bleach to 9 parts water
- Can remain viable for extended periods of time in cold weather

Three Types of Tuberculosis



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

Mycobacterium bovis

- Bovine TB can be transmitted from livestock to humans, deer and other animals
- No other organism has as great a host range as bovine TB
- Bovine TB can infect all warmblooded vertebrates

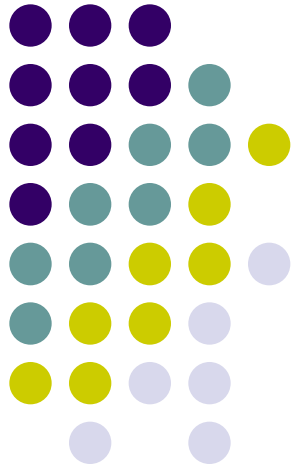
Mycobacterium avium

- Can affect all species of bird
- Can affect hogs and cattle

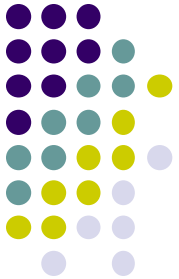
Mycobacterium tuberculosis

- Primarily affects humans
- Can be transmitted to hogs, cattle, and dogs

Bovine TB

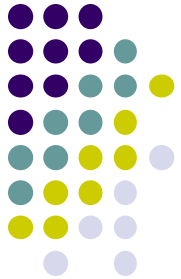


Bovine Tuberculosis



- *Mycobacterium bovis*: control measures have led to a greatly reduced prevalence in Europe. Spread is promoted by high densities of animals and immune suppression.
- Generally a primary respiratory infection leads to tubercules in the lung and associated lymph nodes (bronchial and retropharyngeal).
- Antibiotic treatments are long term and very expensive for animals. Consequently tuberculin testing and culling of exposed animals.
- Prevent cattle movement

Epidemiology of bovine TB

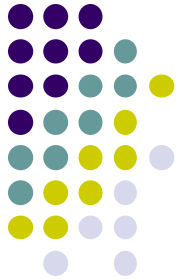


- Cattle transmit infection to cattle via infected respiratory droplets – respiratory route
- Badgers(獾) transmit *M. bovis* between themselves by the respiratory route and by biting. Mums transmit to cubs but not by milk
- Cattle may get *M. bovis* from badgers via grazing on pasture contaminated with badger urine, faeces and bronchial pus or badgers urinate and defecate in cattle feeders.
- Aerosol transmission via coughing may be possible or via dried badger saliva in cattle houses
- This may apply to cattle to badger transmission

Example of *M. bovis* prevalence in wildlife

Wildlife species	Percentage of TB breakdown farms reporting presence of wildlife	*M. bovis* infection prevalence (n)
Badgers	80%	4% (n=21,731)
Deer	Fallow 12% Muntjac 9% Red1% Roe2% Sika 1%	1% (n=1817)
Ferrets/Polecats	6%	4% (n=26)
Foxes	83%	1% (n=954)
Rabbits	80%	0% (n=144)
Rats	76%	1% (n=412)
Stoats / Weasels	35%	0% (n=66)

TB Transmission

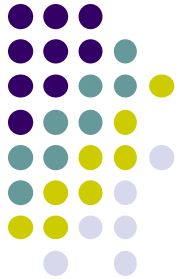


- Can be transmitted from animals to humans and vice versa
- Young animals and humans can contract the disease by drinking raw milk from infected dams
- Can be transmitted through saliva and other discharges of infected animals
- Most common means of transmission
  - RESPIRATION

Who is at risk?

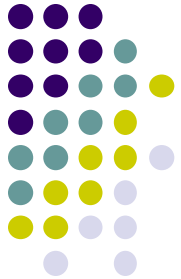
- Animals kept in close contact with other infected animals in enclosed areas like barns are at greatest risk for exposure to bovine TB.

Animal Immune Response



- Immune system recognizes bacteria
- Imflammatory cells (macrophages) are sent to dispose of it
- *Mycobacterium* is resistant to destruction
  - once ingested by the macrophages it may replicate and kill the macrophage

Animal Immune Response



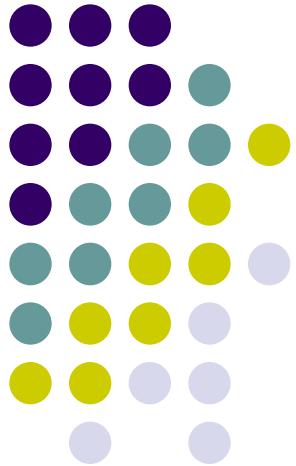
- Immune system continues to send macrophages to help destroy the bacteria
- Results in an accumulation of living and dead macrophages at the site of the bacteria
- Accumulation is called a tubercle

Animal Immune Response

- Thick capsule may form around the tubercle; called a granuloma

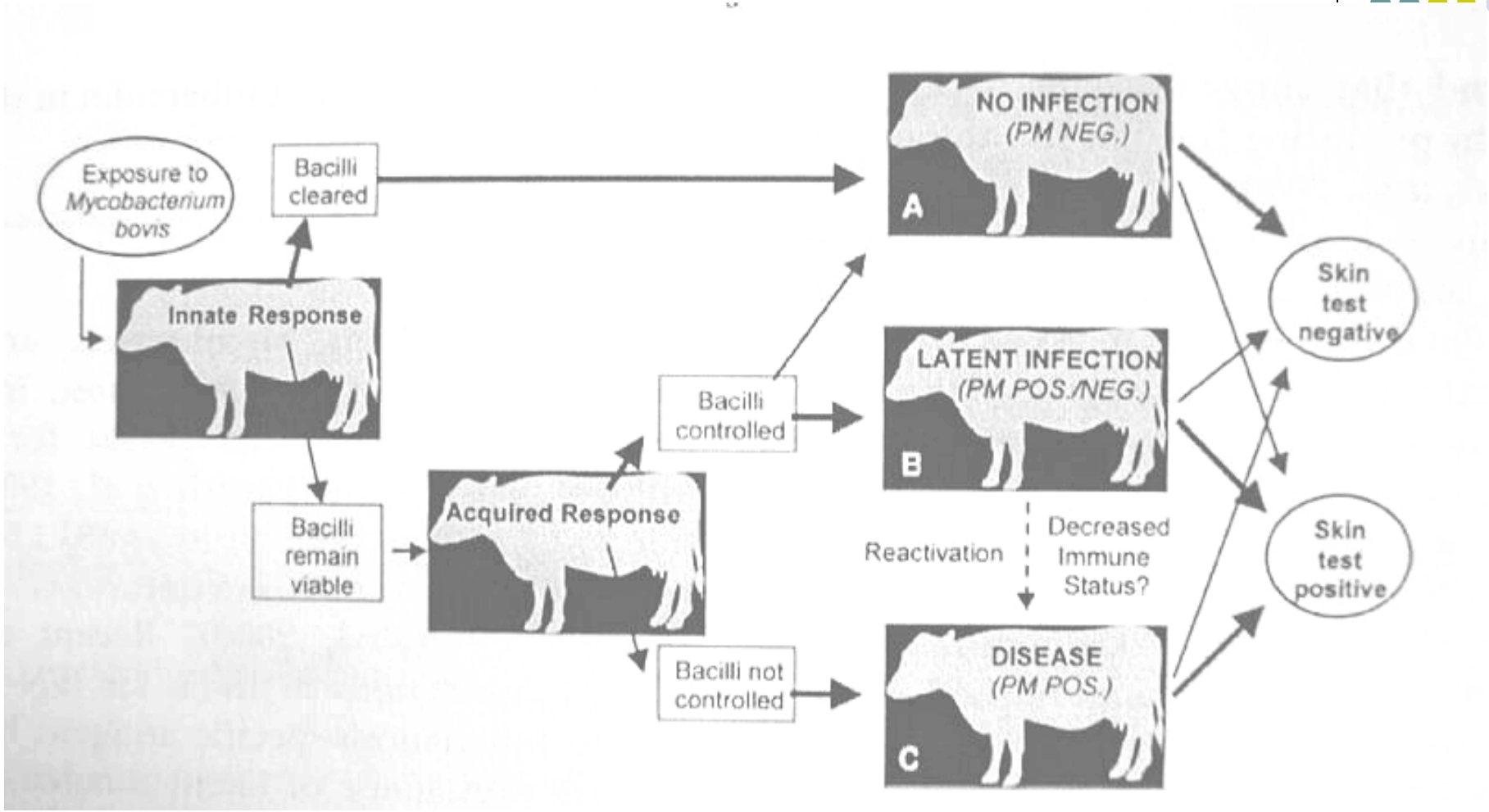
Pericardial granuloma

Diagnosing Bovine TB



Steps in Diagnosis

- The result of each on farm test determines if follow up tests are necessary
- Cattle suspected of being infected after CFT test and CCT test are submitted to an animal diagnostic laboratory for necropsy (animal autopsy)
  - gross examination
  - histological (microscopic) examination


Exposure to Mycobacterium bovis
Bacilli cleared
Innate Response
Bacilli remain viable
Acquired Response
Bacilli controlled
Bacilli not controlled
NO INFECTION (PM NEG.)
A
LATENT INFECTION (PM POS./NEG.)
B
Reactivation
Decreased Immune Status?
DISEASE (PM POS.)
C
Skin test negative
Skin test positive

- No, It's Not New…

  There have been and continue to be Public Health Risks of Consuming Raw Milk and Raw Milk Products

Milk from tuberculous mastitis

Before pasteurisation *M. bovis* infection in man was common (pre-1930's)

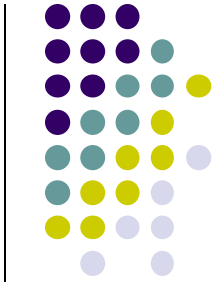
Now *M. bovis* rare in humans
Causes <1% of all human TB cases in developed countries

Elderly (inc. reactivated infections)
Immunosuppressed (e.g. HIV, cancer)
Foreign travellers

Raw Milk Cheese

Food Safety Risk

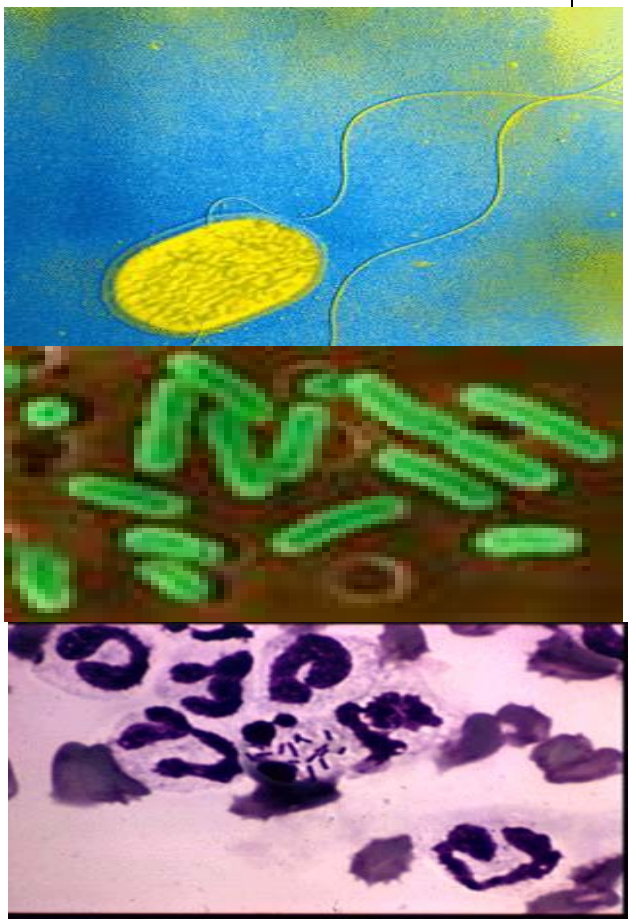
Long History of Risk



- FDA and other Federal and State agencies have acknowledged a long history of the risks associated with the consumption of raw milk.
- Raw milk (no bactericidal/bacteriostatic treatment, apart from cooling) is a vehicle for transmission of pathogens, such as:
  - *Listeria monocytogenes*
  - *Brucella* spp.
  - *E. coli*
  - *Campylobacter* spp.
  - *Mycobacterium bovis*
  - *Coxiella burnetti*
  - *Salmonella* spp.

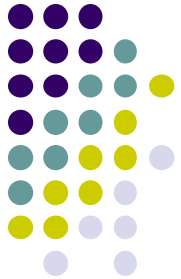
Pasteurization

- Pasteurization destroys pathogenic bacteria



Such as *Listeria monocytogenes*

Why Pasteurize?



- Pasteurization was first implemented to destroy *Mycobacterium bovis*, which causes systemic tuberculosis in humans.
- Pasteurization temperatures were later increased to destroy *Coxiella burnetii*, which causes Q-fever.
- Pasteurization can destroy emerging pathogens, such as *E. coli* O157:H7 and *Salmonella typhimurium* DT-104, which cause serious illness and are difficult to treat due to resistance to many common antibiotics (Cornell Univ.).

懇請賜教